

# NEA Annual Report 2001



**N U C L E A R • E N E R G Y • A G E N C Y**

**Organisation for Economic Co-operation and Development**

## The NEA in Brief

**27** Member countries (21 in the Data Bank)  
Governing body: the Steering Committee for Nuclear Energy

**43** years of international service

**7** standing technical committees

**12** international joint projects funded by participants

**72** professional and support staff

**535** national experts participating in NEA committees

**4 000** experts participating annually, on average, in policy and technical meetings organised at OECD headquarters

**€ 9.2 million** budget for the NEA in 2001, supplemented by voluntary contributions

**€ 2.6 million** budget for the Data Bank in 2001, supplemented by voluntary contributions

**60** publications in 2001



The Nuclear Energy Agency (NEA) is a semi-autonomous body within the Organisation for Economic Co-operation and Development (OECD), located in the Paris area in France. The objective of the Agency is to assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes.

The European Commission (EC) takes part in the work of the NEA. A co-operation agreement has been in force with the International Atomic Energy Agency (IAEA) since 1960. The NEA also maintains contacts with several non-member countries as well as the nuclear industry and a number of civil society organisations.



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Mr. Luis Echávarri  
Director-General of the NEA

# 2001 in Perspective

Several substantive developments in the nuclear field, taken in the wider context of energy and the environment, have helped make 2001 a pivotal year in the development of nuclear energy at the international level.

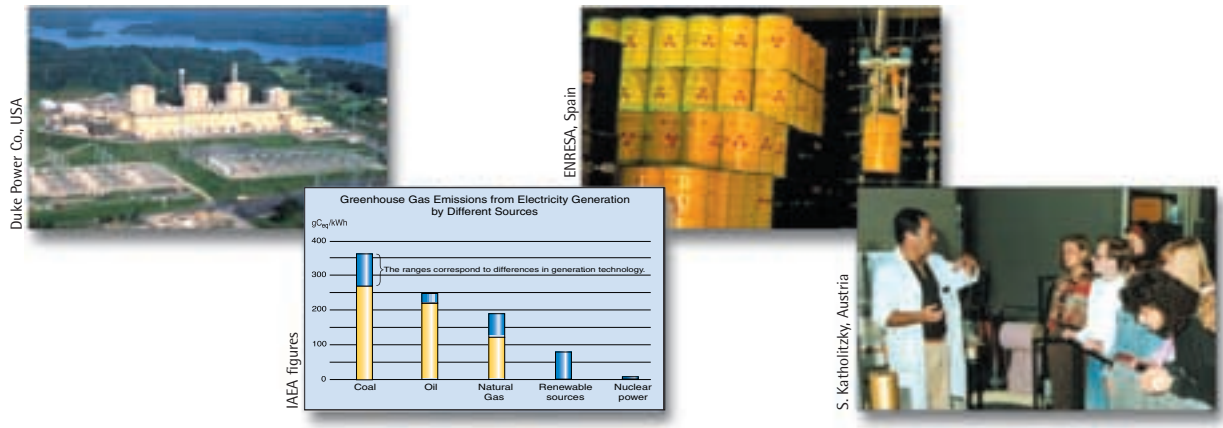
In the OECD area, the amount of electricity produced by nuclear fission continued to rise – from 2 132 TWh in 2000 to 2 189 TWh in 2001 – while the share of electricity generated by nuclear power as a percentage of total electricity production remained relatively stable, amounting in 2001 to approximately 24%.

In the United States, during 2001 the operating licence of one nuclear power plant was extended from 40 to 60 years, and six other plants (12 units) applied for an extension of their licences. In Japan, a new nuclear unit entered into operation, and the Finnish Government took a positive stand in favour of the construction of a fifth unit.

The Kyoto Protocol discussions reminded countries around the world of the need for an international effort to limit the emissions of greenhouse gases, and of the role that nuclear energy, which produces no such gases, can play in a global context.

The further development of new technologies in the nuclear field is an important element influencing the planet's energy future. The relaunching in the United States of research and development on future reactor systems – even safer, more cost-competitive, better secured





against proliferation – and their internationalisation in the Generation IV International Forum, bears witness to the confidence shown by several large countries in the future of nuclear energy.

In another area, often regarded as being one of the weak points of nuclear energy, efforts undertaken in 2001 resulted, in early 2002, in a recommendation by the President of the United States to the US Congress that the Yucca Mountain site in Nevada should be used for the construction of a national deep geological radioactive waste repository. The Nuclear Energy Agency contributed to this process by carrying out, in conjunction with the International Atomic Energy Agency, an international peer review of the methodologies used in the site recommendation process. In Finland, a parliamentary "decision in principle" was taken in favour of beginning work to implement a deep geological repository at Olkiluoto.

These few examples of developments or decisions in the past year in certain crucial fields affecting the present and future use of nuclear energy merit attention, as they show along which path nuclear energy will be able to play its full role in the mix of energy types to be used to fuel the economic growth of OECD countries. Let us beware, however, of self-satisfaction. Like any major industrial activity, nuclear energy must forever strive for continued improvement in its operating safety, enhanced economic competitiveness, minimisation of the volume and safe management of the waste it generates, and, perhaps above all, a more candid, more transparent and mutually beneficial relationship between decision makers and civil society.



# Trends in Nuclear Power

## Nuclear energy development

At the end of 2001, 360 nuclear power units were connected to the grid in OECD countries, generating approximately 24% of total electricity supply. Eleven units were under construction: one in the Czech Republic, four in Japan, four in Korea and two in the Slovak Republic. In the next decade, while total electricity generation in the OECD area is projected to increase steadily, the nuclear share is expected to decline, although less than previously anticipated due to plant lifetime extensions already authorised or being planned in several countries.

The impacts of "September 11" on nuclear power projects and programmes are difficult to predict. On the one hand this type of terrorist action enhances the relevance of policies aiming at energy independence and security of supply, while on the other hand it brings to the fore the issues of security of nuclear facilities and proliferation risks. Considerable work is being done in OECD countries to maximise security in this respect.

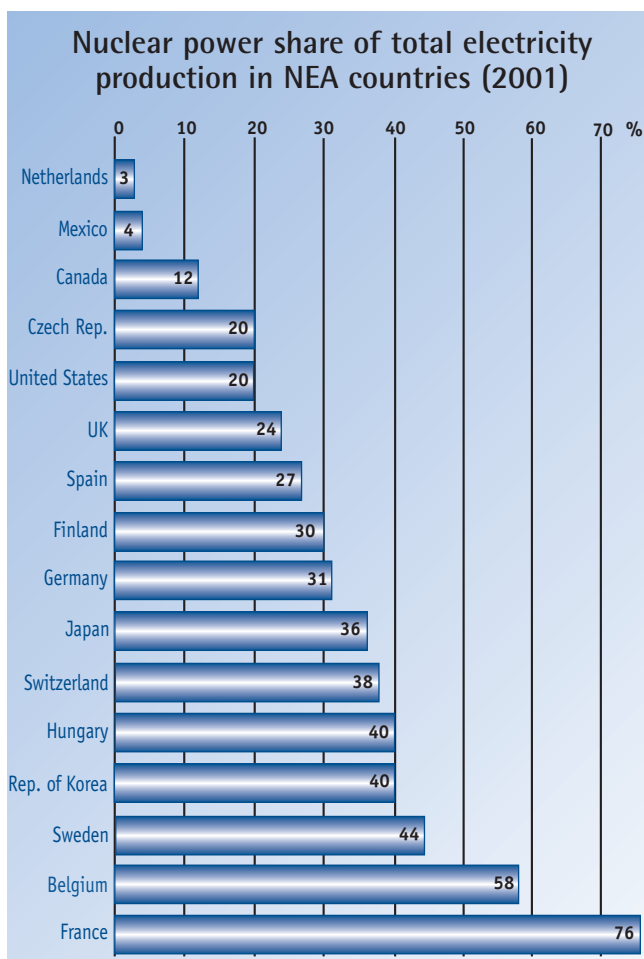
Several Member countries reviewed their energy policies recently. Reviews include the report of the AMPERE Commission in Belgium, the national energy review, within the framework of the National Climate Strategy, in Finland, the government's energy review supervised by the Cabinet's Performance and Innovation Unit (PIU) in the United Kingdom and the report by the National Energy Policy Development Group in the United States. In addition, the European Commission issued a Green Paper on security of energy supply.

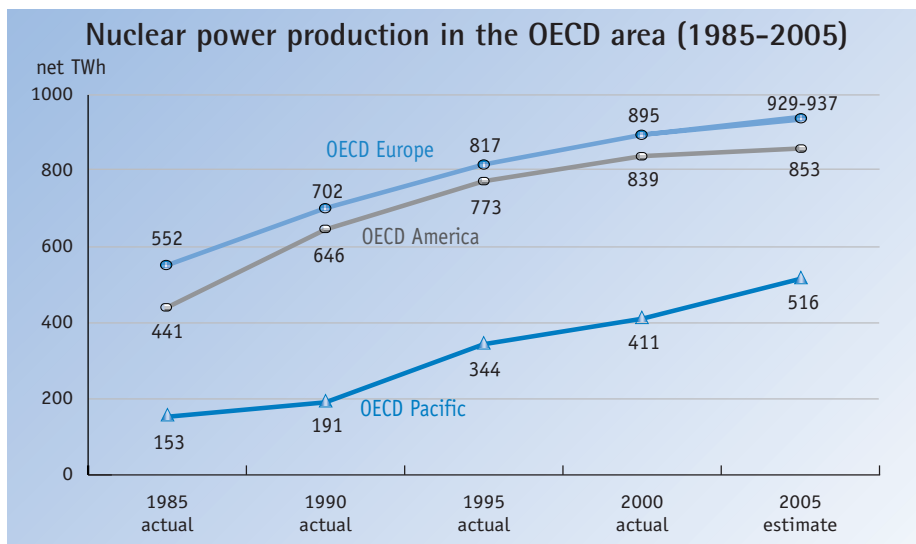
National and regional contexts and views differ on policy issues such as the importance of energy supply security, the need to alleviate or mitigate climate change and the role of various energy sources and technologies in this regard. However, recent reviews generally note the relevance of re-assessing the potential role of nuclear energy and have triggered renewed interest in the nuclear option. International projects on innovative reactor technology and advanced fuel cycles initiated in this context, such as the Generation IV International Forum (GIF) and the IAEA International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), have progressed steadily. GIF pursued its "roadmap" process, which is expected to lead by fall 2002 to the selection of the most promising reactor concepts and a multi-lateral R&D programme that would enable their development.

Trends towards electricity market deregulation were confirmed, inciting producers to emphasise economic efficiency and cost reduction in their business strategies. At the same time, electricity shortages and even the blackouts that occurred in California raised concerns in the public and highlighted the need for policy makers to ensure that market mechanisms do not jeopardise security of supply.

Existing nuclear power plants generally perform well in deregulated markets due to their low marginal costs and the effectiveness of technical and managerial measures taken by operators to increase the average availability factors of the plants and to reduce operating, maintenance and fuel costs. Nuclear power plant lifetime extension has proven to be a least-cost energy option in many countries and, accordingly, a number of operators requested and obtained license renewals.

Although nuclear energy already contributes to reducing greenhouse gas emissions, its future role in alleviating the risk of climate change will depend on national policies and international agreements. Nationally, several countries have recognised nuclear energy's positive contribution in this area and are looking to expand or maintain their generating capacity; others have renounced this option.





Internationally, nuclear energy can help meet the targets set out in the Kyoto Protocol. Decisions were nevertheless taken in 2001 by the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) to exclude nuclear energy from the Clean Development Mechanism and Joint Implementation. However, they are unlikely to have a significant effect on the development of nuclear projects in NEA Member countries, which are being undertaken based on a range of criteria.

### Nuclear safety and regulation

Steady improvement in the operational safety performance of nuclear power plants in OECD countries continued in 2001, as reflected in many published performance indicators. An analysis of operating experience shows, however, that many events are recurring. Several events involving failures of electrical systems occurred during the year.

Analyses carried out during the year did not reveal any safety-related events which were directly associated with the introduction of competition in the electricity market. It is generally agreed, however, that continuing vigilance is required since competition-related experience to date is limited, and effective methods to detect early degradation of performance need to be developed further.

Regulatory bodies in OECD countries continue to be concerned with maintaining an adequate level of competence and research capability in the long run. In many countries, these bodies are examining their activities and seeking ways to increase their effectiveness and their contacts with stakeholders, including through the development of indicators of effectiveness.

### Radiation protection

Change continues apace in the international radiation protection field. Even as the currently accepted international recommendations, established in 1990, are being adopted into international standards

and national regulations, work to improve these recommendations has begun in earnest.

Experience with the 1990 general recommendations of the International Commission on Radiological Protection (ICRP) has led to the identification of certain discrepancies and points that require clarification, including the issue of natural radioactivity. In addition, new approaches to risk governance are emerging, including the need to clearly recognise the boundaries between the scientific aspects of risk assessment, the social aspects of risk evaluation and management, and the regulatory aspects of risk management. Such distinctions are essential in defining the roles and responsibilities of all stakeholders in decision-making processes. To address these challenges, the international radiation protection community has begun work, through the ICRP, to refine and improve its recommendations to better meet the needs of decision makers, regulators and practitioners.

Fifteen years after the Chernobyl accident, significant lessons have been learnt in the areas of emergency preparedness and the management of contaminated territories. National and international radiation protection policy has increasingly focused on improving emergency communications through various international conventions, bilateral agreements and technological initiatives. Stakeholder

Radiation protection measures  
at the Chinon nuclear power plant, France.



Marc Moreneau, EDF, France

issues and the need for flexibility have emerged as key aspects in addressing the needs of populations living in contaminated territories and developing new radiation protection recommendations as discussed above. Finally, it has been shown that contaminated soils have become environmentally stable, such that the further removal of radionuclides will progress primarily through natural decay. The 30-year half-life of caesium-137, one of the most radiologically significant remaining contaminants, means that policy makers will need to continue to address this situation for some time.

### Radioactive waste management

Important steps were taken in the area of geologic disposal programmes for long-lived radioactive waste in 2001. In Finland, the government's "Decision in Principle" to evaluate a site for a deep geologic repository for spent fuel in the Olkiluoto municipality was ratified by the Finnish Parliament. Based on the comprehensive "SR-97" study on the experience of site-independent safety analyses, the Swedish national programme for geologic disposal moved a decisive step forward in the investigation of three possible candidate sites for a deep geologic repository. In the USA, the project for a geologic repository for spent fuel reached an important milestone, with key documentation being finalised for the site recommendation process, including an NEA/IAEA international peer review. (Since then, the Secretary of Energy formally recommended the Yucca Mountain Site in Nevada, and the US President, George W. Bush, approved this recommendation and transmitted it to Congress.)

Other programmes have undergone major reorganisation or legal changes. In Canada, a new bill for long-term management of nuclear fuel waste was introduced into the legislative process. It calls for

nuclear utilities to form a waste management organisation that would report regularly to the Government of Canada. In France, nuclear regulatory reforms passed the Council of Ministers and will result in the reorganisation of the main regulatory agency, DSIN, and its research support institutions. In Italy, in the framework of the privatisation of the national utility ENEL, all of its nuclear liabilities and assets were separated into an industrial branch called SOGiN, and a new decree was issued, establishing plans and procedures for funding the decommissioning of nuclear facilities, including waste disposal. In Germany, a broad initiative to establish new general criteria for a final repository has gained momentum and is nearing its final report, which should become the basis for a public consensus initiative. While most major waste producing countries have policies not to import radioactive waste, the Russian Duma passed legislation which will allow the country to bring foreign waste into Russia.

### Nuclear science

Growing interest in the next generation of nuclear reactors, exemplified by the Generation IV International Forum, has renewed the debate on the most promising future reactor systems and fuel cycle concepts. Analyses are being conducted of over 100 potential nuclear systems to determine which six or so designs merit the R&D necessary to develop these concepts for potential commercialisation, including the scientific research that has to be undertaken before any prototype can be constructed.

Important scientific issues for existing nuclear reactor systems concern fuel cycle and reactor stability applications. For the fuel cycle, emphasis is being placed on studying higher burn-up of fuels and the

Storage of vitrified high-level waste at the ONDRAF site in Belgium.

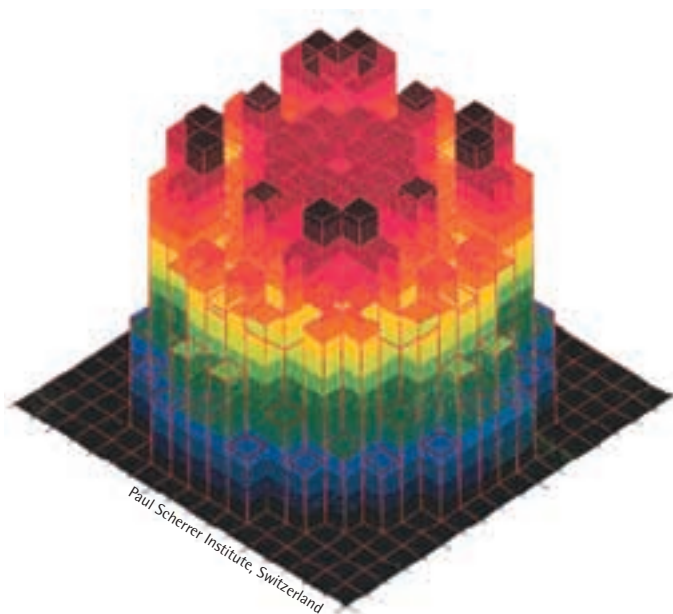


Administration de l'énergie, Belgium



use of both reactor-grade and weapons-grade plutonium in mixed-oxide fuels (MOX). Research related to reactor physics is focusing on advanced modelling of reactor stability problems, using computer programs that incorporate a full three-dimensional reactor core model into system transient codes in order to study the interaction between reactor core behaviour and plant dynamics.

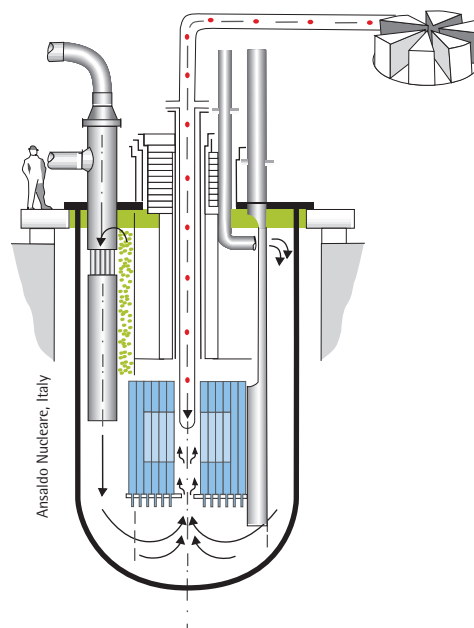
Power distribution modelling in an advanced reactor.



### Nuclear data and software

The need for precise, experimental, neutron-induced and charged-particle-induced nuclear data remains very strong. The neutron-induced data are needed to improve predictions of different reactor parameters in existing reactors. This enables potential economies related, for example, to new fuel designs and higher burn-up to be made. These data are also needed in developing advanced reactor systems, such as actinide burner systems. The charged-particle-induced data are needed in many different applications, for example, in nuclear waste transmutation, medicine and astrophysics. The possibility to theoretically predict charged-particle nuclear data is also being pursued through the development of different statistical nuclear model codes.

The trend to use the statistical simulation method, mainly Monte Carlo methods, in many different nuclear applications persists. The continued increase in computing power makes it possible to better model more complex physical phenomena, such as radiation transport in materials. In addition, it is now possible to obtain good accuracy within reasonable computing times.



Schematic diagram of an accelerator-driven system (ADS). This type of system is often considered for burning actinides and/or long-lived fission products.

### Nuclear law

The existence of sound national and international legal frameworks is essential to the safe use of nuclear energy worldwide. More particularly, modernising the international nuclear liability conventions and encouraging adherence to them will help ensure the equitable compensation of nuclear damage in the event of a nuclear incident, while at the same time facilitating international trade of nuclear materials and equipment. In response to efforts made by the international community in 1997 to reform the Vienna Convention on Civil Liability for Nuclear Damage and to establish a global Convention on Supplementary Compensation for Nuclear Damage, the Contracting Parties to the Paris and Brussels Supplementary Conventions advanced their negotiations on the revision of both Conventions, with a final meeting to approve the texts of both amending Protocols scheduled for early 2002. Approval will ensure that increased amounts of compensation will be available to a greater number of victims for a broader range of damages incurred, as well as compatibility with other international instruments in the nuclear liability field.

The strengthening of the institutional and legislative frameworks in the field of nuclear energy in the countries of Central and Eastern Europe and the New Independent States is still taking place. Countries from these regions are continuing their efforts to adhere to the international nuclear liability conventions and to adopt or modify their national legislation accordingly.

Growing concerns in OECD Member countries over the need to maintain nuclear education and training have also been experienced in relation to nuclear law. The marked decrease in young qualified professionals familiar with the specialised area of nuclear law led to widespread support by Member countries for the establishment of the International School of Nuclear Law at the University of Montpellier 1, in co-operation with the NEA, to provide high-quality education in this discipline.

# Nuclear Development and the Fuel Cycle

## Nuclear Development Committee (NDC)

***Alongside pursuing its ongoing role as an authority on the economics, resources and technology of nuclear energy, the NDC is incorporating two new dimensions into its work. The first concerns the review of the nuclear energy option in the context of competitive electricity markets. The second stems from a revival of interest in nuclear energy as a potentially attractive option for enhancing security of supply and environmental protection.***

### Nuclear policy issues

NDC work in the field of nuclear energy and sustainable development served as a basis for NEA contributions to major international meetings on this topic held in 2001 including the OECD Ministerial meeting and Forum 2001 and the United Nations Committee on Sustainable Development (CSD) meeting in preparation of "Rio +10". The results and findings of NEA analyses were commented and debated in those international fora where the benefits and challenges of nuclear energy were addressed by policy makers and other stakeholders. A number of recommendations for future Agency work, in particular on indicators of sustainable development in the nuclear energy sector, emerged from those discussions.

Recognising that getting the prices right is a prerequisite for energy market mechanisms to work effectively towards the development of sustainable energy mixes, the NEA and the IEA jointly organised a workshop on "Externalities and Energy Policy: The Life Cycle Analysis Approach". Policy makers from governmental bodies and the industry participated in the meeting and discussed the role and limitations of external cost valuation, in particular through life cycle analysis, in policy making for the energy sector. The proceedings from the workshop will be published on the websites of the two agencies and issued by the NEA as a free report early in 2002.

*Management of Depleted Uranium* was published in 2001, presenting the main findings and conclusions of a study carried out under joint NEA and IAEA auspices. The report provides information on inventories and potential uses of depleted uranium, highlights key issues for consideration by governments and policy makers and explores ideas for international co-operation in the field.

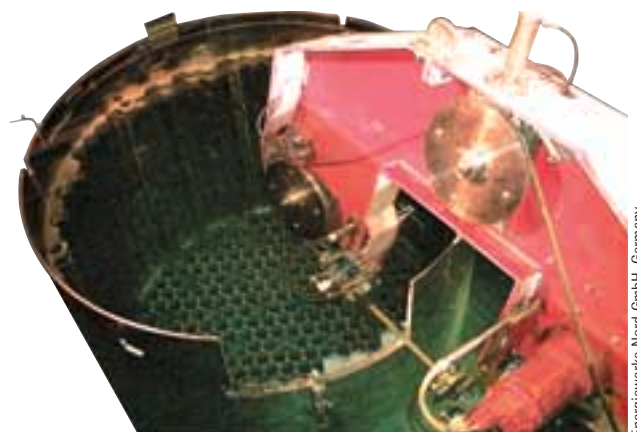
As the social dimension is playing an increasingly important role in the nuclear energy policies of Member countries, the NDC initiated a study on society and nuclear energy, examining in particular public perception of the related risks and benefits. The first phase of the study, an in-depth review of authoritative literature and expert opinions on the topic, was completed in 2001. The outcomes compiled during a desk study highlight a number of issues that need further analysis to better assess ways and means of improving

communication with various stakeholders on nuclear energy matters and broadening public participation in the decision-making process. The NDC will continue to work on this topic in 2002 and beyond in order to identify driving factors and eventually point to good practice. Further details are available on this activity in the section "Nuclear Energy and Civil Society".

The NEA participated in several in-depth energy policy reviews carried out by the IEA in countries where nuclear energy forms a significant part of the supply mix. In 2001, the countries concerned were the Czech Republic, the Republic of Korea, Spain and the United States.

### Economics

In most OECD Member countries where nuclear energy programmes started in the 1960s and 1970s, the ageing of nuclear power plants is an important issue. Plant life management and extension was investigated by the NDC in its previous work programme. In 2001, a study on decommissioning policies, strategies and costs was initiated. The main objectives of the study are to collect and analyse data on the costs of decommissioning nuclear power plants and to assess the impact of national policies and industrial strategies on those costs.



Cutting the core basket during the dismantling of Unit 5 at Greifswald, Germany.

Energiwerke Nord GmbH, Germany

The study should be completed in 2002 with the publication of a report containing data, analyses, findings and conclusions.

### Technology

NDC activities concerning nuclear fuel cycle technologies emphasised the back-end of the fuel cycle. Owing to the renewed interest of Member countries in innovative nuclear systems, this work received high priority.

A report on *Trends in the Nuclear Fuel Cycle: Economic, Environmental and Social Aspects* was completed. The study carried out by a group of experts from governmental agencies, the nuclear industry and research laboratories reviewed developments in the nuclear fuel cycle that may further improve the competitiveness and sustainability of nuclear energy systems. The report complements other NEA publications on nuclear energy and sustainable development and provides findings of interest to policy makers as well scientific and technical experts.

The proceedings of the Sixth Information Exchange Meeting on *Actinide and Fission Product Partitioning and Transmutation*, held in Madrid, Spain in December 2000, were published. The publication, jointly issued by the NEA and the European Commission, includes a CD-ROM containing the 79 papers presented during the meeting as well as a book summarising the key issues addressed by the experts, and the findings and conclusions of the discussions. It provides a comprehensive review of the state of the art and new developments in P&T activities, and highlights key aspects relevant for policy makers in charge of planning R&D programmes in the field.

A study on innovative reactor development, undertaken jointly by the IEA, the IAEA and the NEA, was completed in 2001. The "Three Agency Study" reviews how some of the innovative nuclear fission technologies under development attempt to address the challenges facing nuclear energy. A summary report entitled *Innovative Nuclear Reactor Development: Opportunities for International Co-operation*, based upon information provided by designers and research laboratories, and compiled and analysed by the Secretariats of the three agencies, investigates how innovative technologies could help overcome existing challenges and how international co-operation could reduce the time and cost needed to make them available on the market.

Renewed interest in nuclear energy in several Member and non-member countries has led to new initiatives regarding the development of innovative reactors and associated fuel cycles. The Generation IV International Forum (GIF), initiated by the USDOE and now carried out by ten countries (including three non-NEA member countries), aims at identifying nuclear systems meeting the sustainability, safety, reliability and economic goals of the 21<sup>st</sup> century and the R&D challenges for their deployment by 2030. During the "roadmap" phase of the project, the Agency is providing support to GIF, drawing from its expertise and the authoritative knowledge available in its reports and publications. It is anticipated that the organisational skills of the Agency will be of assistance in the second phase of the project when multinational, co-operative R&D projects will be defined and managed.

- Issues related to nuclear energy and sustainable development were addressed in several high-level meetings, including the OECD Ministerial Meeting and Forum 2001 and the UN Committee on Sustainable Development meeting. The Agency contributed to the debates, drawing from the findings and conclusions of its study on *Nuclear Energy in a Sustainable Development Perspective* published at the end of 2000.
- The Agency organised jointly with the International Energy Agency (IEA) a workshop on "Externalities and Energy Policy: The Life Cycle Analysis Approach".
- A report on *Trends in the Nuclear Fuel Cycle: Economic, Environmental and Social Aspects* was completed.
- The Agency contributed to the activities of the Generation IV International Forum (GIF), initiated by the US Department of Energy (DOE) and currently carried out by ten countries (including three non-NEA member countries).

### Data and resource assessment

In the field of resource assessment and management, trends in Member countries to explicitly recognise sustainable development goals have been reflected in the work of the Agency by giving enhanced consideration to environmental issues. One example of this trend is the publication of the Joint NEA/IAEA Uranium Group report on *Environmental Remediation of Uranium Production Facilities*. The report is based on information provided by participating countries on past, ongoing and planned remediation activities at uranium mining and milling sites. It includes an in-depth expert analysis of the most relevant issues. The joint Uranium Group has prepared the 2001 edition of the "Red Book" (*Uranium 2001: Resources, Production and Demand*) and will continue to foster information exchange in this area as well as on environmental aspects of uranium mining and ore processing.

The 2001 edition of the "Brown Book", *Nuclear Energy Data*, was issued in May. The Secretariat, under the guidance of the Member countries, developed a new questionnaire for the 2002 edition of the booklet, adding requests for information on various levels of the fuel cycle and mid-term nuclear energy projections. It is expected that this will allow a more comprehensive coverage of nuclear energy data and issues in the publication.



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# Nuclear Safety and Regulation

## Committee on the Safety of Nuclear Installations (CSNI)

*The CSNI contributes to maintaining a high level of safety performance and safety competence by identifying emerging safety issues, contributing to their resolution, and helping to establish international research projects.*

### Analysis and management of accidents

CSNI activities regarding the analysis and management of accidents continue to be very important. They cover aspects of thermal-hydraulics, severe accidents and their management, and the confinement of accidental radioactive releases.

In the area of thermal-hydraulics, most activities concentrated on international standard problem (ISP) exercises, based on experiments performed in the PANDA, KAEVER and QUENCH facilities in Switzerland and Germany. ISP exercises are comparative exercises in which computer code predictions or recalculations of a given physical problem with different best-estimate computer codes are compared with each other and above all with the results of a carefully specified experimental study. Fission product work also focused on an ISP exercise, this time based on experiments performed in the RTF facility in the United States.

In the area of severe accidents, the SERENA (Steam Explosion Resolution for Nuclear Applications) Programme was set up. The objective of the programme is to obtain international technical consensus on fuel/coolant interaction processes and on methods to estimate reliably the magnitude of containment loading under realistic conditions.

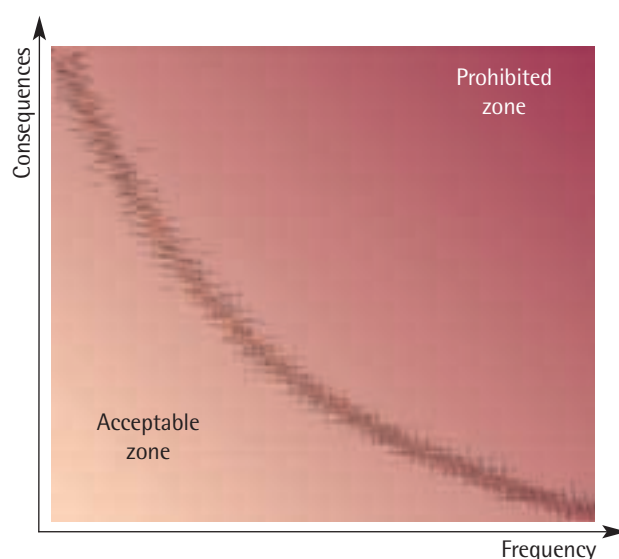
Workshops were held on "Operator Training for Severe Accident Management and Instrumentation Capabilities During Severe Accidents", and "Implementation of Severe Accident Management Measures".

### Risk assessment

The main mission of the working group on risk assessment (WGRISK) is to advance the understanding and utilisation of probabilistic safety assessment (PSA) in ensuring the continued safety of nuclear installations in Member countries. While PSA methodology has matured greatly over the past years, further work is required. WGRISK has been active in several areas, including human reliability, software reliability, passive systems reliability and low power and shutdown risk. In order to maintain a current perspective, the working group collaborates

with other CSNI groups, such as those on operating experience and organisational factors, and maintains close co-ordination with other international organisations. A new database on fire events, called OECD-FIRE, is being established.

A workshop on "Building the New Human Reliability Analysis (HRA): Errors of Commission from Research to Application" took place in May in Washington, DC. State-of-the-art reports are being completed on passive systems reliability; risk monitor applications for nuclear power plants; and the use of PSA in Member countries. A second workshop on human reliability analysis was delayed until early 2002. Planning is under way for workshops on passive systems PSA and risk monitors.



Risk assessment and the probability/consequence diagram: the concept of event probability and its associated consequences have been incorporated into safety analysis procedures by taking account of the fact that the probability of an accident must be inversely proportional to the severity of the potential consequences for the public and the environment.

### Ageing and structural integrity of reactors

The main topics investigated in this area include metal components, concrete structures and seismic behaviour. One workshop was held and four reports were issued.

In the area of metal components, a report was released on a benchmark which focused on methodologies for evaluating fatigue crack growth on piping and allowed participants to fine-tune the models, parameters and tools used. In addition, three main areas have been identified for future work: non-destructive examination, reactor pressure vessel integrity and thermal fatigue.

Regarding concrete structures, a report on long-term behaviour of concrete structures was completed. This report defines future activities in this new area. Activities on containment are ongoing and a workshop on the evaluation of defects, repair criteria and methods of repair for concrete structures at nuclear power plants is planned for 2002.

In the field of seismic engineering, a workshop was held in March 2001 on the seismic re-evaluation of all nuclear facilities. Participants showed wide interest and stressed the importance of such re-evaluation as part of plant life management policy.

### Operating experience

The joint NEA/IAEA Incident Reporting System (IRS) continues to be the only international system of its kind providing regulators and governmental organisations with an assessment of safety-significant events. IRS co-ordinators exchanged information about significant events at their annual joint meeting; it was noted that several events involving failures of electrical systems had occurred. An in-depth study was thus initiated. Other work being carried out in this area is described below:

- An in-depth discussion was held on events related to deregulation. The main conclusions were that it was too early to assess the impact on safety, and better methods to detect early possible deterioration in the safety performance were necessary.
- The International Common-cause Data Exchange (ICDE) continued to collect data with the objective of improving the qualitative understanding of common-cause failure events. Databases for selected components were established (see the section on Joint Projects for further details).
- A database on operational experience related to computer-based systems important to reactor safety continued to be tested in connection with its trial period.
- A report on the knowledge base for sump screen clogging (an important issue related to the emergency core cooling system) was finalised.
- A workshop was held on safety performance analysis and a report on safety performance indicators was prepared.

### Fuel safety margins

Most of the currently existing fuel safety criteria were established during the 1960s and early 1970s, and verified against experiments

- The SETH Project, which is intended to study experimentally thermal-hydraulic phenomena of interest to accident management, has been established with the financial and technical support of 14 NEA Member countries. Three other projects are in preparation and will be established early in 2002. The total budget of the CSNI-sponsored safety research projects is US\$ 120 million.

- The CSNI and the CNRA issued 31 reports during the year. The CSNI reports deal with technical subjects including operating experience and human factors, structural integrity and ageing, accident management and fuel safety margins. The CNRA reports cover such topics as assuring future nuclear safety competence and regulatory effectiveness.

- Several workshops were organised during the year, with one on "Research in a Regulatory Context" bringing together senior regulators, researchers and licensees to define commonalities and differences in their approaches to research and to propose ways of solving current problems.

with fuel that were available at that time, often with unirradiated specimens. In the safety evaluations performed at that time, the use of conservative assumptions was the basic method for ensuring safety. One of the key questions that remained unsolved in such an approach was how conservative were the safety evaluations, and consequently what was the level of the "safety margins" obtained.

A Special Expert Group on Fuel Safety Margins continued its work in this area with the objective of improving current understanding and addressing issues related to fuel safety margins. It seeks in particular to systematically assess the technical basis for current safety criteria and their applicability to high burn-up, and to the new fuel designs and materials being introduced in nuclear power plants.

In March 2001 a topical meeting was organised to review loss-of-coolant-accident (LOCA) fuel acceptance criteria, in particular the 17 per cent maximum oxidation of cladding criterion and its applicability to high burn-up fuel with different cladding materials. The meeting showed that performance of new cladding materials under LOCA situations, especially at high burn-up, is not well understood at this time. Therefore, it is important to verify the safety margins for high burn-up fuel with new cladding alloys and to introduce, as necessary, relevant burn-up dependent limits for these new materials.

### Human and organisational factors

The Special Expert Group on Human and Organisational Factors concentrated its activities on developing two state-of-the-art reports (SOARs), one on the management of change, and the other on the

scientific approach to safety management. To provide input to the SOARs, two workshops were organised. Many Member countries are looking for methods to evaluate changes and good practices, and seeking input from relevant areas outside the nuclear community. Methods are being evaluated and proposed for use when appropriate.

### **Computer-based instrumentation and control systems**

A workshop on "Licensing and Operating Experience of Computer-based Instrumentation and Control (I&C) Systems" was held in the Czech Republic to review the current state of the art. During the past five years, computer-based I&C systems have been installed and operated in both safety and non-safety systems in a number of nuclear power plants all over the world. Overall, great progress has been made in the application of computer-based I&C systems. The life cycle processes adopted by most of the countries are based on the

requirements of national or international standards which have similar structures and methodologies. At the same time new problems have emerged, for example, certification of commercial off-the-shelf products, previously developed software and previously existing software, obsolescence of digital spare parts, reclassification of some computer-based systems, and regulatory efficiency and effectiveness for computer-based systems important to safety. Future concerns from the regulatory point of view relate to the adoption of the established qualification methods for software-based I&C systems, new developments in software technology and the improvement of licensing procedures.

As progress in digital technology is very rapid, there is a need to follow this progress and to accumulate operating experience. Collecting and evaluating operational experience of computer-based systems as initiated by the CSNI Task Force on Computer-based Control Systems Important to Safety (COMPSIS) will be essential for evaluating the reliability characteristics of such systems and devices.

# **Nuclear Regulation**

## **Committee on Nuclear Regulatory Activities (CNRA)**

*The CNRA works towards developing a consistent and effective regulatory response to current and future regulatory challenges, such as interface between the public and the regulator, regulatory effectiveness, the introduction of competition in the electricity market, the development of advanced reactors and the decommissioning of nuclear facilities.*

### **Nuclear regulators and the public**

Good governance and efficiency in decision making by governmental authorities are increasingly dependent upon mutual trust and confidence between those authorities and the public. During a workshop held at the end of 2000, there was consensus that ways should be found to continue sharing information and experience in the field of public communication by nuclear regulatory organisations. In response to that request, the CNRA set up a working group on public communication to share information, news, documents and experiences; to discuss developments, progress, techniques and achievements; and to develop an action plan in the area of nuclear regulatory communication. The group exchanged information on the way participating organisations had reacted to the September 11 events in the United States.

### **Assuring future nuclear safety competence**

Maintaining nuclear safety competencies in nuclear regulatory bodies and the industry will be one of the most critical challenges to effective regulation of the nuclear power industry in the coming decades. The challenge arises partly from the age profile of staff in the regulatory bodies, which could result in the loss of much of the present nuclear safety knowledge base due to retirements over the next decade or so. It is also partly caused by a decline in the number of students graduating from courses in nuclear science and engineering and thus available for recruitment to fill the vacancies left by retirements. Whatever the future of nuclear generation programmes, i.e. regardless of whether new nuclear power plants will be built in Member countries, there will be an ongoing requirement in nuclear regulatory bodies and the industry for several decades to

recruit qualified staff. In addition, it is increasingly clear from CSNI activities that in many technical fields transmittal of information and knowledge from the older to the younger generations does not work properly anymore, and that training and competence transfer are becoming inadequate. The CNRA continued to discuss the conclusions of a study it sponsored in this area, and to compare national experiences with a view to identifying international responses to the problems.

### Regulatory inspection practices

Inspectors from regulatory bodies meet periodically to exchange information and experience related to regulatory safety inspections, discuss commendable inspection practices and carry out studies. Reports were issued on the "Inspection of Maintenance on Safety Systems During NPP Operation", "The Effectiveness of Nuclear Regulatory Inspections", a "Status Report on Regulatory Inspection Philosophy, Inspection Organisation and Inspection Practices" and "The Effectiveness of Licensees in Inspecting the Management of Safety".

The NEA is currently studying several inspection issues including: inspection of research reactors; inspection of fuel cycle facilities; inspection of contracted work; and improving inspection programmes for site selection, fabrication and construction of NPPs. The sixth international workshop on regulatory inspection practices is being planned for 2002 and will cover inspection activities related to events and incidents; inspecting internal and external hazards; and the inspection of the effects of economic deregulation.

### Research in the regulatory context

One of the key challenges currently confronting the nuclear community is to define and maintain adequate capability in regulatory research. Approximately 100 senior regulators, researchers and utility representatives were brought together in June 2001 in a workshop on this subject to identify the commonalities and differences that exist in their approaches to research. In addition, a survey was conducted to establish current and future trends in regulatory research in NEA Member countries.

The conclusions of this activity, which is documented in a collective statement by the CSNI and the CNRA (see [www.nea.fr/html/nsd/reports/nea-3288-statement.pdf](http://www.nea.fr/html/nsd/reports/nea-3288-statement.pdf)), highlight the need for the regulator to be able to supervise or commission independent confirmatory and anticipatory research.

A number of specific recommendations were made for further work by the NEA. These include ways to review issues that hinder close co-operation between industry and the regulatory authority, and the development of the type of criteria to be used for the "close out" of specific research activities.

### Regulatory effectiveness

A report by a group of senior-level experts was published on *Improving Nuclear Regulatory Effectiveness*. Following the recommendations of



K. Niederau, KKB/NOK, Switzerland

Reinstallation of the main reactor coolant pump after inspection and overhaul at the Beznau nuclear power plant, Switzerland.

the report, the CNRA created a Task Group on Regulatory Effectiveness Indicators, which is developing a model set of indicators on the effectiveness of the regulatory process. Building upon the definition of an effective regulator as defined in the report, the Task Group selected 45 candidate areas for performance indicators distributed over the five effectiveness attributes. The Group was fully aware of the "pros and cons" of indicators and decided on an approach that would make extensive use of pilot projects. The pilot projects will run for at least one year beginning in March 2002. Periodic reports and updates will be provided to the CNRA throughout this period. An interim working paper entitled "Indicators for Nuclear Regulatory Effectiveness and Efficiency", to be produced by the Task Group, will be combined with key elements of the original report to produce a final report to the CNRA following completion of the pilot projects.



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# Radiation Protection

## Committee on Radiation Protection and Public Health (CRPPH)

*The most significant challenge currently facing the radiation protection community is how to better integrate radiation protection within current concepts of, and approaches to, risk governance. In response to this issue, the internationally accepted principles of radiation protection, upon which virtually all national legislation is based, are in the process of being reviewed and updated. The CRPPH strategic objective is to ensure that consensus on directions for improvement is reached among radiation protection experts from national regulatory authorities, and that this consensus is taken into account during the development of new approaches and international recommendations.*

### Improving the system of radiological protection

While the CRPPH has, in general, found the system of radiological protection as set out in the International Commission on Radiological Protection (ICRP) Publication 60 to be robust, it has identified certain discrepancies and points that require clarification. It therefore developed with the help of an expert group a document for discussion addressing several specific areas in which the system of radiological protection could be improved to better meet current governmental and social needs, that is, to be clearer, easier to regulate and implement, more transparent, and more complementary to the management of other risks. This document will be published and offered directly to the ICRP, but also to the international radiation protection community for consideration in the development and application of international and national recommendations and regulations. The CRPPH also held two meetings with the Chair of the ICRP to provide regulator and implementor feedback on the directions being considered for the development of new recommendations.

### Stakeholder involvement in radiation protection decision making

Involving various stakeholders in national and international-level decision making, particularly in areas concerning public health and environmental protection, is becoming widespread. The CRPPH pursued its investigation of stakeholder involvement in radiation protection decision making principally through holding the "Villigen series" of workshops in Switzerland. The Second Villigen Workshop was held in January 2001. A policy-level summary report of the workshop discussions has been published, and proceedings will be issued in early 2002. To facilitate national-level use of the wealth of information developed during the First and Second Villigen Workshops, good practice in the procedural aspects of how stakeholders are involved in the decision-making processes will be studied using regional analyses. This will also serve as input for the Third Villigen Workshop which is planned to be held in 2003. More information on this activity may be found in the section entitled "Nuclear Energy and Civil Society".

### Radiological protection of the environment

In recent years, NEA Member countries have shown an increasing interest in identifying opportunities to enhance protection of the environment as part of their sustainable development initiatives. In order to promote and establish a process for developing a policy for radiological protection of the environment that is as broadly informed as possible, and to foster information exchange between various initiatives, the NEA, in close collaboration with the ICRP, has developed a series of fora and supporting workshops on radiological protection of the environment. The CRPPH is interested in seeing that any policy developed in this area represents international consensus, addresses national-level needs and can be practically implemented. The first of three fora was scheduled to take place in February 2002 in Italy.

The environment surrounding the PAKS nuclear power plant, Hungary.



Miklos Beregyei, PAKS nuclear power plant, Hungary

### Implications of effluent release options

Radioactive effluent releases from nuclear installations during normal operation have been reduced in recent years, but are still subject to discussion. The demand for further reductions is generally driven by societal concerns about the protection of the environment. For



example, the OSPAR Commission, a political body concerned with pollution of the marine environment, introduced a strategy regarding radioactive substances that calls for a reduction of radioactive emissions to a level that would result in concentrations of artificial radionuclides in the environment that are close to zero. To assist experts and decision makers in fully understanding the technical implications and feasibility of the various effluent release options being discussed, the CRPPH is conducting a study on this subject. The results of this work will also serve as input to the CRPPH study on the evolution of the system of radiological protection. Final results are expected in 2002.

### Nuclear emergency matters

The NEA has organised and analysed several international nuclear emergency exercises (INEX 1: 1993; INEX 2 series: 1996-1999). The national and international policy-level implications, experience and lessons learned from all four of the INEX 2 regional exercises were analysed, summarised and published during 2001. As a result of the INEX 2 experience, improvements have been made in emergency preparedness at the national and international levels. Areas for further improvement have also been identified. In order to validate the monitoring and data-management strategy which had been developed based on experience from the INEX 2 exercises, and to see how well lessons from INEX 2 had been implemented, the INEX 2000 exercise was developed. Based on a simulated accident at the Gravelines nuclear power plant, in France, this exercise took place in May 2001, and was to be analysed at a follow-up meeting in January 2002.



The Internet is increasingly being used for emergency communications, as shown by the Swiss website above which was prepared as part of the INEX 2000 exercise.

As part of the INEX 2000 exercise, the NEA Nuclear Law Committee and the CRPPH jointly organised a workshop to explore, for the first time, various operational aspects of implementing the

- The Committee delivered proposals for useful and effective improvements to the system of radiological protection.
- Policy-level lessons in stakeholder involvement in radiological protection decision making were developed based on experience from the "Second Villigen Workshop".
- The final evaluation of the INEX 2 series of international nuclear emergency exercises was published.
- A Forum on Radiological Protection of the Environment was prepared in collaboration with the International Commission on Radiological Protection (ICRP) in order to support the development of policy in this field.
- Participation grew in the ISOE system on occupational exposure management at nuclear power plants.

Paris and Brussels Conventions on nuclear third-party liability. Conclusions were drawn at the national and international levels regarding the application of these Conventions, and will be reported in the workshop proceedings, due to be published in 2002 (see also the chapter on Legal Affairs, page 24).

As a continuing point of interest, the CRPPH reviewed the status of knowledge from the Chernobyl accident. A report that will be published in 2002 shows that the most important radiological protection lessons from the accident are in the areas of emergency management and site rehabilitation. The INEX series of exercises has helped the nuclear emergency management community to make great improvements in preparedness, and to identify areas where further improvement is needed. Stakeholder aspects of rehabilitating contaminated sites have emerged as central to addressing the needs of populations living in contaminated areas. And finally, it has been shown that the radioactive caesium in the contaminated territories has become environmentally stable, such that further removal of this radiation source from the affected zones will only be through its physical decay. Given that caesium-137 has a 30-year half-life, there will be measurable contamination in these areas for some time to come. National policy is in the process of taking these lessons into account.



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# Radioactive Waste Management

## Radioactive Waste Management Committee (RWMC)

*The RWMC is working to help Member countries find long-term solutions for radioactive waste management, and is currently focusing its efforts on improving both technical and social confidence in geologic disposal. In addition to long-lived radioactive waste, materials from decommissioning are of specific concern for the RWMC.*

### Waste management policy issues

To gain the necessary public confidence in engineered geologic disposal, it is important to show that progress towards disposal will be made using a cautious and flexible step-wise decision process, with opportunities provided to review decisions made taking account of both technical and public interest matters. The RWMC held a topical session on step-wise decision making in this field in March 2001 and has undertaken work to further elucidate this concept.

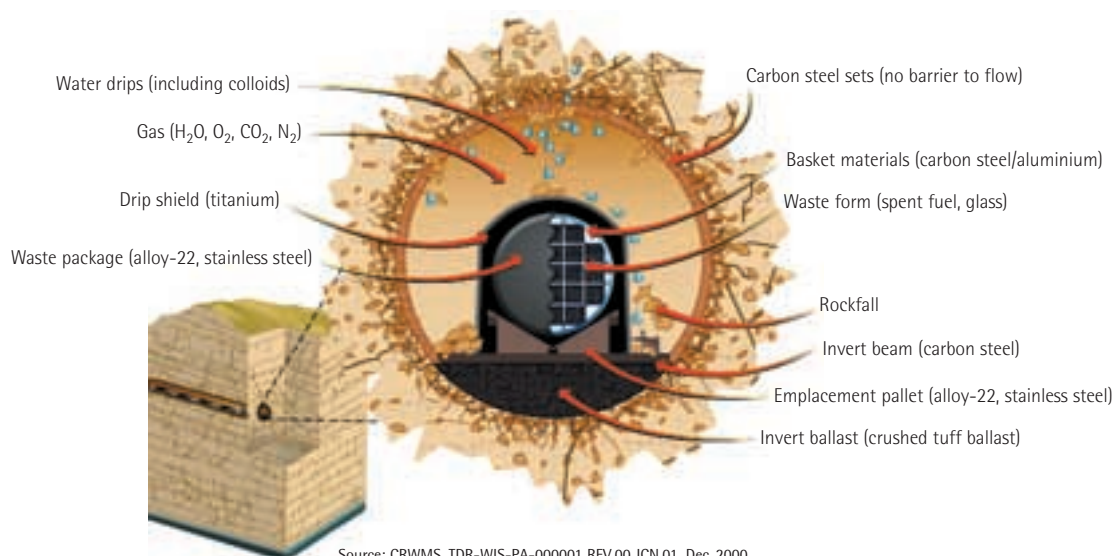
Reversibility of decisions is a substantial consideration in the step-wise decision-making process. The implications of favouring retrievability of the waste in disposal strategies and the methods to implement it are important for NEA Member countries. A booklet was released that reviews the concepts of reversibility and retrievability as they may apply to the planning and development of engineered geologic repositories.

Underground research laboratories (URLs) are essential to provide the scientific and technical information and practical experience needed for the design and construction of radioactive waste disposal

facilities, as well as for the development of the safety case that must be presented at various stages of repository development. The report produced in 2001 on this subject provides an overview of the purpose of URLs within national programmes; the range of URLs that have been developed or planned in NEA Member countries to date; the various contributions that such facilities can make to repository development programmes and the development of a safety case; considerations on the timing of developing a URL within a national programme; and the opportunities and benefits of international co-operation in relation to URLs.

A study on the evaluation of the approaches and arguments that have been used to establish and communicate technical confidence in the safety of deep geologic disposal was finalised, with publication planned for spring 2002. Using the results of this study, topical sessions and earlier RWMC documents, work continued on defining the processes, components, methodology and means of ensuring consistency that are required to build a safety case. The Agency pursued the development of a brochure describing the main elements

Modelling the Yucca Mountain Project:  
general engineered barrier design features, initial water movement and rock fall.



of the safety case and the approaches available for fulfilling the related objectives. This will help harmonise Member countries' general views on how to demonstrate confidence in the long-term safety of repositories.

The RWMC Regulators' Forum prepared a database on the structure of regulatory control in NEA Member countries, and is working on a document analysing commonalities and differences.

### Forum on Stakeholder Confidence

The Forum on Stakeholder Confidence (FSC) has taken up the challenge to improve understanding of the principles of stakeholder interaction and public participation in the field of radioactive waste management and to distil the lessons that can be learnt. In that context, a workshop was organised on "Stakeholder Involvement and Confidence in the Process of Decision Making for the Disposal of Spent Nuclear Fuel in Finland", in Turku, Finland on 14-16 November 2001. The workshop provided participants an opportunity to review the Finnish programme from the regulator, implementer and stakeholder viewpoints, and will help the FSC and the various stakeholders involved learn from the experience. Proceedings are under preparation and will be available by summer 2002. Further information on this activity is available in the section on "Nuclear Energy and Civil Society".

### Dismantling and decommissioning

The RWMC established the Working Party on Management of Materials from Decommissioning and Dismantling (WPDD) to monitor and review the policy, strategic, and regulatory aspects of the decommissioning and dismantling (D&D) of obsolete nuclear installations in view of the ultimate release of sites for other uses. The WPDD met twice in 2001 and is working on a database of information on D&D in NEA Member countries that should be made available in 2002 along with a booklet on status, approaches and issues in D&D. The NEA joint project on decommissioning, overseen by the RWMC, is described on page 29.

### Technical support

The five-year NEA GEOTRAP Project on radionuclide migration in geologic, heterogeneous media came to a close with its fifth workshop, hosted by SKB in Oskarshamn, Sweden in May. The GEOTRAP V proceedings are being published. The overall synthesis of the five workshops, which will be accessible to the interested non-technical public, is under preparation.

A proposal was made for a new technical activity named AMIGO (Approaches and Methods for Integrating Geologic Information in the Safety Case), and will be presented to the RWMC for approval in March 2002.

The "Clay Club" examines various argillaceous rocks (clays) being considered for deep geologic repositories of radioactive waste. During 2001, the catalogue of characteristics was updated and a new version

- An International Peer Review of the Yucca Mountain Project TSPA-SR was conducted by the US Department of Energy performance assessment concerning site recommendation of the Yucca Mountain underground repository for spent nuclear fuel and high-level waste, with publication of the review scheduled for early 2002.
- A workshop was organised as part of the Forum on Stakeholder Confidence (FSC) on Finnish experience with stakeholders in developing radioactive waste management solutions.
- The GEOTRAP Project on radionuclide migration in geologic, heterogeneous media came to a close with its fifth workshop and a synthesis report.
- A report was issued on *Reversibility and Retrievability in Geologic Disposal of Radioactive Waste*, describing and analysing the issues in the context of step-wise decision making in this domain.
- A report on underground research laboratories (URLs) was published, providing an overview of the roles of URLs within national programmes.

produced, while a database of bibliographic references on clay media created. Both will be available in 2002. A major study on self-healing capabilities of clays was prepared for its launch at the beginning of 2002.

### International peer review

An International Peer Review of the Yucca Mountain Project TSPA-SR was jointly organised by the NEA and the IAEA of an important USDOE study in support of the site recommendation process for the planned underground repository for US spent fuel and high-level waste at Yucca Mountain, Nevada. An international team of ten experts, including the NEA Secretariat, reviewed and critically analysed the Total System Performance Assessment for Site Recommendation (TSPA-SR) report using international recommendations, standards and practices as a basis. The review, which was conducted between June and September 2001, provides a positive statement regarding the adequacy of the overall performance assessment approach for supporting the site recommendation and gives detailed recommendations for further improvement.



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# Nuclear Science

## Nuclear Science Committee (NSC)

*The NSC helps to improve the basic scientific and technical knowledge needed for the safe, reliable and economic operation of current nuclear systems and the development of next generation technologies. Special emphasis is being placed on advanced calculation methods used in light water reactor stability investigations, advanced reactor fuel performance and behaviour, and the preservation of integral experiments data.*

### Reactor physics

The present reactor physics programme is focused on stability problems in light water reactors, with special emphasis on complex three-dimensional coupled neutronics/thermal-hydraulics calculations.

The boiling water reactor (BWR) stability calculation exercise, based on data from the Forsmark power plant in Sweden, was completed. The final report was issued in May.

A workshop on numerical and computational aspects of nuclear core/plant simulations was organised in the United States in June to discuss the final results of the international benchmark on a pressurised water reactor (PWR) main steam-line break. The results from the first phase related to point kinetics calculations were published and the two remaining volumes, covering three-dimensional kinetics and best-estimate solutions, are under preparation.

The specifications of the benchmark exercise dealing with a turbine trip transient in a BWR was issued in 2001. The objective of the benchmark is to examine the capability of codes to analyse complex transients by comparison with actual experimental data taken from the Peach Bottom-2 reactor in the United States. The final results are expected in 2002.

### Fuel cycle physics

The main emphasis of the fuel cycle physics programme is on mixed-oxide (MOX) and innovative fuels. A number of international problem exercises are being conducted, including on the feasibility of using weapons-grade plutonium as MOX fuel in power-producing reactors. The following benchmark exercises were under way or completed in 2001:

- An exercise to compare calculations for a modern BWR assembly containing MOX and UO<sub>2</sub>/gadolinium fuel rods was completed. The results, which are internally consistent, will be published in 2002.
- The KRITZ-2 experimental benchmark was launched with the main goal of testing the modelling capability of reactor physics

codes and the associated nuclear data for different reactor configurations from room temperature to about 250° C. Considerable discrepancies in the results were found using different evaluated data libraries, thus indicating a need for better basic data. The results will be published in 2002.

- The SCK•CEN in Mol, Belgium, provided three-dimensional experimental data for a benchmark with near-weapons-grade plutonium MOX fuel from the VENUS-2 reactor. The specification of this benchmark was distributed in June 2001 and the final results are expected in mid-2002.

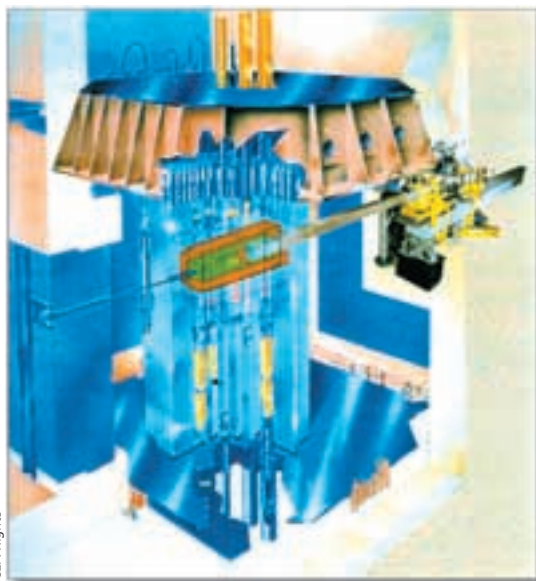
A workshop on "Advanced Reactors with Innovative Fuels" was held in the United Kingdom in October. The purpose of the workshop was to discuss the new generation of reactor designs and to exchange information on related R&D activities. The scope comprised reactor physics, fuel performance and fuel material technology, thermal-hydraulics, and core behaviour and the fuel cycle of advanced reactors with different types of fuels or fuel lattices. The proceedings of the workshop will be issued by the NEA in 2002.

The International Fuel Performance Experiments (IFPE) database, containing fuel data on temperatures, fission gas releases, fuel swelling, clad deformations and mechanical interactions at normal and off-normal operation conditions, continued to be updated. The database presently contains data for 416 rods and is mainly used for model development and code validation. A new edition of the database was issued on CD-ROM in January 2001.

### Partitioning and transmutation of nuclear waste

A benchmark to compare calculations of an accelerator-driven, minor actinide burner was completed and the final report will be published in early 2002. The results from this benchmark show significant discrepancies in important parameters, such as one-group microscopic cross-sections, initial keff, burn-up reactivity swing and flux distribution. These results have prompted the NEA to launch a new benchmark exercise based on data from the MUSE-4 experiment

at the MASURCA installation at CEA Cadarache, France to study hybrid (accelerator-reactor) systems. The benchmark specifications were sent out in December 2001.



CEA Rights

The MASURCA reactor at the CEA Cadarache, France, coupled with the deuteron accelerator GENEPI, being used in the MUSE experiments.

An expert group on chemical partitioning was established to review separation processes relevant to partitioning and transmutation (P&T) systems. The group will make a technical assessment of separation processes for a limited set of P&T operating scenarios and will identify important research, development and demonstration necessary to bring preferred technologies to a deployable stage. In addition, it will recommend collaborative international efforts to further technology development.

### Nuclear criticality safety

The primary purpose of the International Criticality Safety Benchmark Evaluation Project (ICSBEP) is to compile critical and sub-critical benchmark experiment data into a standardised format that allows criticality safety analysts to easily use the data to validate calculation tools and cross-sections libraries. A relational database, named DICE, was developed in order to make the data collection more user-friendly, allowing the user to perform specific searches and to generate summary descriptions for each experimental configuration. A new version of the data collection was issued on CD-ROM in September 2001. The new edition contains 307 evaluations describing data for 2 642 experimental configurations.

An expert group on criticality accidents was set up to provide knowledge on criticality excursions to scientists involved in the analysis of such accidents. The group will compile and evaluate criticality transient data from experimental programmes and from accidents data. In addition, the group will identify available models and computer codes for transient analyses and define suitable test exercises.

- A workshop on "Advanced Reactors with Innovative Fuels" was organised in Chester, United Kingdom in October.
- A benchmark exercise based on the MUSE-4 hybrid reactor-accelerator experiment at the CEA Cadarache, France, was launched.
- A new database, DICE, containing data from the International Criticality Safety Benchmark Evaluation Project (ICSBEP), was developed and disseminated.
- A workshop on "Basic Studies in the Field of High-temperature Engineering" was organised in Paris, France in October.
- A report on a BWR stability benchmark, based on experimental data from the Forsmark 1 and 2 reactors in Sweden, was published.

### Radiation shielding

The Shielding Integral Benchmark Archive Database (SINBAD) continued to be updated. At the end of 2001, the database contained 31 reactor shielding experiments, with special emphasis on pressure vessel dosimetry, ten fusion neutronics experiments and three accelerator shielding experiments.

An expert group studying computational methods used to model radiation transport through materials launched a new benchmark on deterministic 2- and 3-dimensional calculations of MOX fuel assemblies without spatial homogenisation. The specifications were distributed in April 2001 and the final results are expected for the beginning of 2002.

### High-temperature engineering

The Second Information Exchange Meeting on Basic Studies in the Field of High-temperature Engineering was held in Paris, France in October. The meeting reviewed the latest activities in the field of high-temperature engineering, including irradiation effects on advanced materials and reactor in-core material characterisation methods. Possibilities for co-operative studies in the field of high-temperature engineering within the framework of international organisations were discussed.



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# Data Bank

***The Data Bank serves as a centre of reference for computer programs, basic nuclear data and chemical thermodynamic data by providing scientists with a reliable, up-to-date and rapid computer program and nuclear data service. It continues the effort to preserve data from integral experiments and to develop user-friendly tools for handling nuclear data.***

## Computer program services

The Data Bank collection contains more than 2 000 computer programs covering a wide range of nuclear energy and technology applications. Seventy-five new or new versions of programs were added to the collection in 2001. Special efforts have been devoted to developing tools that facilitate the geometrical modelling of complex systems.

Demand for Data Bank computer program services remained very high in 2001. More than 2 200 programs were dispatched on request. About 150 of these programs were sent to non-OECD countries according to a special co-operative agreement with the IAEA.

The most requested programs in 2001 were in the field of radiation transport and shielding, in particular the two Monte Carlo codes MCNP and PENELOPE. About 50 per cent of the requests for computer programs originated from national laboratories, 25 per cent from universities and the remaining 25 per cent from industry and consulting firms.

The project to transfer all the computer program manuals and documentation to electronic form by scanning the printed material continued in 2001. About 85 per cent of the material had been transferred at the end of the year, allowing the Data Bank to distribute almost all computer program packages on CD-ROM or via the Internet.

Detailed information about material available from the computer program services can be accessed via the NEA website at [www.nea.fr/html/dbprog/](http://www.nea.fr/html/dbprog/). This section is updated weekly. Additional information is provided in a bimonthly, electronic newsletter and in a regularly distributed CD-ROM containing a catalogue of computer-searchable abstracts.

## Data from integral experiments

The Data Bank and the NEA Nuclear Science section work closely together on the preservation of data from integral experiments to increase their uses and benefits and to favour innovation, especially in the development of future nuclear energy systems. The Nuclear Science committee is responsible for overall guidance of the project, whereas the Data Bank provides the infrastructure for safeguarding information in databases and supplying services to Member countries.

The following databases were updated with new material in 2001:

- radiation shielding (SINBAD);
- reactor fuel performance (IFPE);
- criticality safety benchmark experiments (ICSBEP);
- code validation matrix of thermal-hydraulic codes for LWR LOCA and transients (CCVM);
- reactor physics experiments (IRPhE) – pilot project.

The demand for integral nuclear data services was in line with average distribution figures over the last three years. More than 1 800 data sets were distributed, of which about 290 went to non-OECD countries according to the co-operative agreement with the IAEA.

## Nuclear data services

The Data Bank maintains large databases containing bibliographic, experimental and evaluated nuclear data and makes these databases available to scientists in Member countries through the Internet. The databases are maintained in close co-operation with other nuclear data centres and cover all types of data needed in nuclear energy applications.

A CD-ROM version of the Computer Index of Neutron Data (CINDA) bibliographic database was produced by the Data Bank in 2001 and was distributed along with the book published by the IAEA. The CD-ROM was well-received and it is hoped that, as more users become accustomed to this format, the number of printed paper copies can be reduced.

The Exchange Format (EXFOR) database containing experimental nuclear reaction data was updated by the Data Bank in 2001 with data from approximately 150 new neutron and charged-particle experiments.

JANIS (Java-based Nuclear Information Software), the new platform-independent nuclear data display software developed by the Data Bank, was officially released in October 2001. The program is designed to facilitate the visualisation and handling of nuclear data. Its objective is to allow the user to access numerical values and graphical representations without prior knowledge of the storage format. More than 400 copies have so far been distributed upon request.

The Data Bank registered over 24 000 on-line accesses to the databases containing nuclear data. This was a 20 per cent increase compared with the previous year. The repartition between the databases was similar to former years, with about 40 per cent of requests for experimental data and 30 per cent each for bibliographic and evaluated nuclear data.

Screen capture of the JANIS program and CD-ROMs produced by the Data Bank.



### Evaluated nuclear data for fission and fusion applications

The co-ordination of the Joint Evaluated Fission and Fusion (JEFF) file project, which seeks to establish a reference data set for a vast range of nuclear energy applications, continued in 2001. An improved version of the general-purpose data library was compiled at the Data Bank for testing by participating laboratories in Member countries. The preliminary test results are very encouraging and it is foreseen that the data will be released to the public in the first half of 2002.

Enhanced versions of the JEFF radioactive decay and fission yield data libraries were also compiled in 2001. The data will be tested, in particular for reactor core decay heat calculations and the storage of spent fuel.

The JEFF project established a new working group on nuclear data measurement activities in May 2001. The aim of this group will be to help analyse the expressed needs for nuclear data measurements and to co-ordinate the subsequent experimental work.

### Chemical thermodynamic data

The NEA Data Bank acts as project co-ordinator for the NEA Thermochemical Database (TDB) Project. The work performed at the Data Bank comprises:

- The computer program service dispatched more than 2 200 computer programs and close to 1 850 data sets from integral experiments to scientists and engineers in Member countries.
- The nuclear data services registered more than 24 000 accesses to the databases containing bibliographic, experimental and evaluated nuclear data.
- The first official version of a new platform-independent display program for nuclear data (JANIS) was released.
- A book on recommended chemical thermodynamic data for neptunium and plutonium was published.

- co-ordination of the data review teams;
- editorial support for the review teams;
- validation of software for the TDB database;
- maintenance and updating of the TDB bibliographical database.

Progress made in 2001 is described under the heading "Joint and Other Co-operative Projects".

### Training courses

The Data Bank regularly organises training courses with the aim of contributing to an effective utilisation of widely used computer codes and improved communication between the users and the authors of the codes. The following courses were arranged in 2001:

- MCNP (Monte Carlo) training course held in April at Imperial College, London, UK.
- SAMMY (nuclear resonance analysis) training course held in April at the NEA, Paris, France.
- NJOY (nuclear data processing) workshop and users' group meeting held in May in Aix-en-Provence, France.
- PENELOPE (electron-photon transport) workshop and tutorial held in November at the NEA, Paris, France.
- TRIPOLI-3.5 (Monte Carlo) training course (in French), held in October at the NEA, Paris, France.
- MCNP (Monte Carlo) introductory training course held in September in Stuttgart, Germany.

More than 100 trainees participated in these training courses.



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# Legal Affairs

## Nuclear Law Committee (NLC)

**The NLC fosters the harmonisation of national legislation governing the peaceful uses of nuclear energy, and in particular contributes to the modernisation of the international nuclear liability regime and the strengthening of treaty relations among interested countries in the area of liability and compensation for nuclear damage. Under the supervision of the NLC, the NEA also compiles, analyses and disseminates information on nuclear law through regular publications and organises the International School of Nuclear Law educational programme.**

### Civil liability for nuclear damage

The NEA continues to serve as a forum for the examination of legal issues in the nuclear field with particular emphasis on civil liability and compensation for nuclear damage. Its strategic objective of modernising the international nuclear liability regime was met in 2001 through two activities.

The first activity was to provide support to the Contracting Parties to the Paris and Brussels Supplementary Conventions in their negotiations to revise both Conventions. Those negotiations advanced to the point where a final meeting to approve the texts of both amending Protocols was scheduled for early 2002, and it was expected that both amending protocols would be adopted by year-end. The revision of the Conventions will provide greater protection to victims of a nuclear incident and will ensure continued compatibility of the Conventions with other international nuclear liability instruments, including the 1988 Joint Protocol on the Application of the Vienna and Paris Conventions, the 1997 Protocol to Amend the Vienna Convention and the 1997 Convention on Supplementary Compensation for Nuclear Damage.

The second activity was the organisation with the French authorities of a three-day "Workshop on the Indemnification of Damage in the Event of a Nuclear Accident", held in November 2001 as part of the International Nuclear Emergency Exercise (INEX) 2000. For the first time, it was decided to incorporate third-party liability aspects into the INEX programme, which has been carried out by the NEA since 1993. The technical exercise, during which a nuclear accident was simulated, took place on 22 and 23 May 2001 at the Gravelines nuclear power plant, located near Dunkerque in the north of France. It was followed by this specialised workshop on third-party liability, which aimed to test the mechanisms that apply to the compensation of potential victims of such an accident, both in France and in neighbouring countries.

The workshop was organised in three main stages: the alert phase (grave and imminent danger of a nuclear accident); the accident phase (effective releases, possible danger); and the post-accident

### Contracting Parties to the Paris Convention on Third Party Liability in the Field of Nuclear Energy

Belgium	Greece	Slovenia
Denmark	Italy	Spain
Finland	Netherlands	Sweden
France	Norway	Turkey
Germany	Portugal	United Kingdom

### Contracting Parties to the Convention Supplementary to the Paris Convention (Brussels Supplementary Convention)

Belgium	Germany	Spain
Denmark	Italy	Sweden
Finland	Netherlands	United Kingdom
France	Norway	

phase (triggering of procedures to identify and compensate damage). The following aspects were examined in particular: intervention of the nuclear operator's insurer, dissemination of information concerning the rights of potential victims and compensation claims, emergency assistance payments, compensation claims handling, and the interface between the accident State and the international nuclear third-party liability regime, including the manner in which the Paris Convention on Third Party Liability in the Field of Nuclear Energy and the Brussels Supplementary Convention would be applied.



As a matter of interest, Slovenia acceded to the Paris Convention on 16 October 2001. This is the first time that a non-OECD member country has applied for accession to that Convention, raising the number of Contracting Parties to fifteen.

### Information on nuclear law

Issues No. 67 and 68 of the *Nuclear Law Bulletin* were published in June and December 2001, along with their respective Supplements which reproduced new nuclear legislation adopted in the Republic of Korea, Latvia, Norway and Poland. This periodical, issued twice a year, provides up-to-date information on recent developments in the field of nuclear law at the national and international levels. The Bulletin has proved to be an invaluable tool over the past thirty years for those in government, regulatory, academic, industry and international circles that work closely with nuclear law.

The 2001 Update to *Nuclear Legislation: Analytical Study – Regulatory and Institutional Framework for Nuclear Activities* in OECD Member countries was also prepared. This loose-leaf publication, which provides a systematic analysis of nuclear legislation and nuclear institutions in 30 countries, is a useful source of information for those interested in the regulation of nuclear activities. This year's update introduced amendments into nine of the existing country chapters and also includes a new chapter on the Slovak Republic, which became a Member of the OECD in December 2000.

Students and professors at the 2001 Session of the International School of Nuclear Law.



- The Contracting Parties to the Paris Convention on Third Party Liability in the Field of Nuclear Energy and to the Brussels Convention Supplementary to the Paris Convention advanced their negotiations on the revision of both Conventions, with a final meeting to approve the texts of both amending Protocols scheduled to take place in early 2002.
- The first session of the International School of Nuclear Law was held in the summer of 2001 at the University of Montpellier 1, with 50 participants from 33 countries in attendance.
- A "Workshop on the Indemnification of Damage in the Event of a Nuclear Accident" was co-organised by the NEA and the French authorities in order to explore the mechanisms that apply to the compensation of potential victims of a nuclear accident.

### International School of Nuclear Law

The first session of the International School of Nuclear Law (ISNL) was held at the University of Montpellier 1, France, in August/September 2001. The ISNL is jointly managed by the University of Montpellier 1 and the NEA. The International Nuclear Law Association, the European Commission and the International Atomic Energy Agency also provided sponsorship or support to the organisation of the first session.

Fifty law students and young professionals from 33 countries participated in this session, which covered all the essential aspects of the law governing the uses of nuclear energy: radiation protection, nuclear safety, radioactive waste management, transport of nuclear materials, physical protection, non-proliferation, regulation of trade and nuclear third-party liability and insurance. Further information on the 2002 session and application forms are available on the NEA website at [www.nea.fr/html/law/isnl/index.html](http://www.nea.fr/html/law/isnl/index.html).



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# Joint Projects and Other Co-operative Projects

## NUCLEAR SAFETY

### The Halden Reactor Project

The Halden Reactor Project has been in operation for more than 40 years and is the largest NEA project. It brings together an important international technical network in the areas of nuclear fuel reliability, integrity of reactor internals, plant control/monitoring and human factors. The programme is primarily based on experiments, product developments and analyses carried out at the Halden establishment in Norway, and is supported by approximately 100 organisations in 20 countries.

The 2001 programme of work in the fuel and materials area continued to focus on high burn-up fuel properties. The scope of work encompasses mixed-oxide and gadolinium fuels, in addition to  $UO_2$ , which are tested in a variety of reactor conditions. Both long-term fuel irradiations aimed at burn-up extension and short-term transients for safety assessments have been addressed. Investigations of embrittlement and cracking behaviour of reactor internals material have provided valuable data on water chemistry effects for highly irradiated materials. The programme on plant control and monitoring has provided verification and upgrades of systems for signal validation, performance monitoring and alarm handling. The latter has been investigated within the framework of the human factor programme, mainly by means of experiments in the Halden man-machine laboratory.

The Halden Project operates by way of three-year renewable mandates. The present mandate will expire at the end of 2002 and preparation for the new programme period (2003-2005) is under way. In a meeting hosted by the NEA in December 2001, all participants confirmed their strong interest in the project's technical results and their intention to continue participating in the next period.

The Project continued its summer school programme, which is supported by the NEA Nuclear Safety Division. This is in follow-up to a recommendation of the Halden Board to actively pursue the transfer of nuclear technology and know-how to the younger generation.

### The Cabri Water Loop Project

The Cabri Water Loop Project is investigating the ability of high burn-up fuel to withstand the sharp power peaks that can occur in power reactors due to rapid reactivity insertion in the core (RIA accidents). It involves substantial facility modifications and upgrades and consists of 12 experiments to be performed with fuel retrieved from

power reactors and refabricated to suitable length. The project began in 2000 and will run for eight years. The main lines of the programme of work and schedule have been defined, together with details of the scope and the experimental conditions for the first series of tests that will be carried out in 2002. The experimental work will be carried out at the *Institut de radioprotection et de sûreté nucléaire* (IRSN) in Cadarache, France, where the Cabri reactor is located. Programme execution also involves laboratories in participating organisations for fuel preparation, post-irradiation examinations and test channel instrumentation.

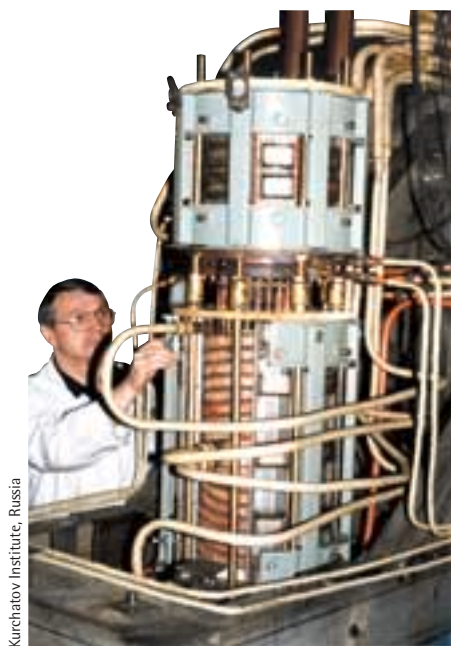
By the end of 2001, the Cabri Agreement had been signed by 14 organisations in 12 countries; considerable progress had also been made in finalising the project's bilateral agreements. Discussions were ongoing with additional potential participants.

Two meetings of the Technical Advisory Group (TAG) took place in 2001. The overall test frame, and in particular the details of the first test series, were defined. The first series will focus on very high burn-up fuels (~70 MWd/kg) having advanced cladding materials. Transportation to the Cabri site will be completed early in 2002, with the first two tests scheduled for spring and autumn. A first definition of instrumentation requirements and test channel specifications, as well as of complementary mechanical tests, has also been prepared. Two meetings of the project Steering Committee were also held in 2001 during which actions were identified for the subsequent phases of the project, especially in relation to specific test parameters that had been extensively discussed in the TAG meetings.

### The MASCA Project

The MASCA Project investigates the consequences of a severe accident involving core melt. It started in mid-2000 and will be completed in three years (July 2003). The programme, which is supported by organisations in 17 countries, is based on experiments that are mainly carried out at the Kurchatov Institute and that make use of a variety of facilities in which corium compositions prototypical of power reactors can be tested. The experiments aim to resolve remaining uncertainties on heat load to the reactor vessel and thus on the possibility of retaining the melt within the vessel. These uncertainties are primarily associated with scaling effects and coupling between thermal-hydraulic and chemical behaviour of the melt. To achieve this basic objective, supporting experiments and analyses are to be performed with a view to providing an understanding of the phenomena of interest, and producing a consistent interpretation of the results by means of mechanistic models.

The influence of the chemical composition of the molten corium on stratification was addressed in a series of tests carried out during 2001. Some of these tests revealed an unexpected stratification behaviour (where the liquid metal layer separated below the oxidised corium layer), which led the participants to partly re-assess the programme. Investigations on partitioning of different chemical elements – including fission products – were also initiated. These are



Kurchatov Institute, Russia

View of the Rasplav cylindrical wall facility during the preparation for the MASCA experimental programme.

important for determining the heat transfer to the pressure vessel environment as affected by stratification phenomena of the molten pool. Finally, in recent discussions the participants came to the conclusion that a large-scale confirmatory test should be run towards the end of the programme period.

### The Sandia Lower Head Failure Project

This project started in 1999 and was completed in 2001. It brought together eight Member countries for the purpose of studying the creep rupture behaviour of models of light water reactor lower heads. The information obtained is useful for the development of severe accident management strategies for coping with ex-vessel behaviour.

A total of four tests were carried out. A benchmark based on the results of the first test was also performed. The Project Committee decided to hold a seminar in June 2002, during which the overall project results would be reviewed together with participants' analyses.

### The MCCI Project

Following a recommendation by the CSNI, experts convened by the NEA advised that initiatives be taken to address molten core ex-vessel phenomena. The proposal for an experimental project, denominated the Melt Coolability and Concrete Interaction (MCCI) Project, set

forth by the USNRC and to be carried out at the Argonne National Laboratory (USA), was recommended.

The MCCI Project is to provide experimental data on relevant severe accident phenomena and to resolve two important accident management issues. The first one concerns the verification that the molten debris that has spread on the base of the containment can be stabilised and cooled by water flooding from the top. The second issue concerns the two-dimensional, long-term interaction of the molten mass with the concrete structure of the containment, as the kinetics of such interaction is essential for assessing the consequences of a severe accident. To achieve these basic objectives, supporting experiments and analyses will be performed, with a view to providing an understanding of the phenomena of interest, and to producing a consistent interpretation of the results relevant for accident management.

During 2001, a draft Agreement was circulated to CSNI members aimed at gathering sufficient support for the programme. This process is almost complete, with 12 countries having confirmed their interest. On these premises, the CSNI recommended to proceed with project implementation and execution starting from the beginning of 2002, while continuing the effort to expand project participation.

### The SETH Project

The SETH Project is supported by 14 NEA Member countries. It started in 2001 and will run for four years. It consists of thermal-hydraulic experiments in support of accident management, which are carried out at facilities identified by the CSNI as those requiring international collaboration to sponsor their continued operation.

The tests to be carried out at Framatome's *Primär Kreislauf* (PKL) in Germany will investigate two pressurised water reactor (PWR) safety issues: boron dilution accidents that can arise from a small-break loss-of-coolant accident (LOCA) and during mid-loop operation (shutdown conditions). The first category of tests will verify if conditions can arise for core reactivity insertion due to formation of low-borated water slugs during a small-break LOCA followed by natural circulation restart. The second test series will assess whether conditions exist for a boron dilution accident as a consequence of loss of heat removal during mid-loop operation. The experiments to be carried out at the Paul Scherrer Institute (PSI) PANDA facility in Switzerland are to provide data on containment three-dimensional gas flow and distribution issues that are important for code prediction capability improvements, accident management and design of mitigating measures.

The first phase of the SETH Project has focused on the PKL tests. An experiment run in mid-2001 did not show any significant boron dilution problem. The specifications of the second PKL test were modified according to participants' requirements, and was to be run at the beginning of 2002. The remaining test sequence has also been reviewed and modified by the project participants. In particular, a mid-loop operation test has been pushed forward, while the aim of the fourth test will be finalised depending on previous test results. The PANDA tests will begin receiving increasing attention in 2002, with the next meeting of the technical review group planned to take place at the PSI premises.

## The Bubbler Condenser Project

Following a CSNI recommendation in June 2001, the NEA has proceeded with the constitution of a project to resolve remaining issues on bubbler-condenser performance under accident conditions. The bubbler condenser is a system for VVER 440/213 reactors which is devised to reduce the pressure build-up in the reactor building during a loss-of-coolant accident. The project intends to provide answers to remaining issues by means of experiments carried out at the Electrogorsk Research Center (EREC) in Russia. The project should be completed in approximately one year. Experts from the Czech Republic, France, Germany, Hungary, the Slovak Republic and the USA participate in the project. The European Union is also participating. Czech, Hungarian and Slovak utilities are providing the financing for the test programme.

A first project meeting was held in December 2001 and addressed the current status of research on the subject, the preliminary plans of the experiments and the co-ordination of these plans with other initiatives, notably those taken by the European Union. During this meeting, participants also discussed and agreed upon the project objectives and the programme of work for the year ahead.

## The ICDE Project

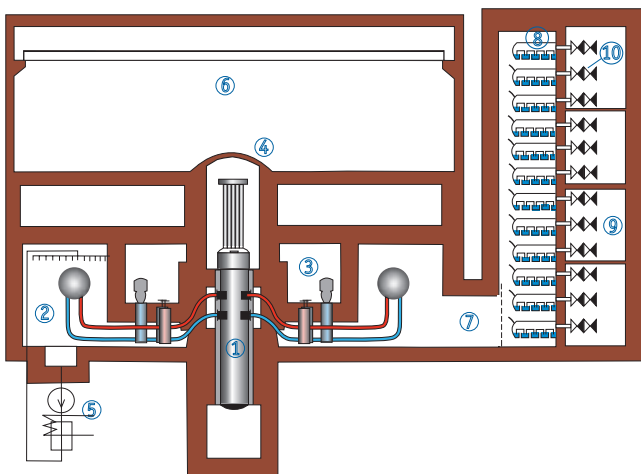
The International Common-cause Data Exchange (ICDE) Project collects and analyses operating data related to "common-cause" failures (CCF), which have the potential to affect several systems, including safety systems. The project has been in operation since 1998, and a new agreement covering the period 2002-2005 has been prepared.

The participating countries are Canada, Finland, France, Germany, Spain, Sweden, Switzerland, the United Kingdom and the United States. Other countries have recently expressed their interest to participate in the Project from 2002.

The ICDE Project is envisaged to include all possible events of interest, comprising complete, partial and incipient CCF events, called "ICDE events". The project covers the key components of the main safety systems, such as centrifugal pumps, diesel generators, motor-operated valves, power-operated relief valves, safety relief valves, check valves, reactor protection system circuit breakers, batteries and transmitters.

These components have been selected because probabilistic safety assessments have identified them as major risk contributors in the case of common-cause failures. Qualitative insights from analysis of the data will help reduce the number of CCF events that are risk contributors. In the long-term, the Project will provide a broad basis which would enable the quantification of CCF events.

Schematic diagram of a VVER 440/213 reactor and its bubbler condenser unit.



1. Reactor pressure vessel
2. Steam generator compartment (SG)
3. Main circulation pumps room
4. Removable hatch in the reactor hall
5. Emergency core cooling system and spray system
6. Reactor hall
7. Corridor
8. Bubbler condenser unit
9. Air trap
10. Check valve

## RADIATION PROTECTION

### ISOE: The Information System on Occupational Exposure

To facilitate a global approach to reducing operational radiation exposure through the exchange of techniques and experiences in exposure reduction, the NEA launched the Information System on Occupational Exposure (ISOE) in 1992. This programme is jointly sponsored by the IAEA, and supplies data to the European Commission and to UNSCEAR. At the end of 2001, data in the ISOE programme had grown to include 405 operating commercial nuclear reactors and 54 commercial nuclear reactors in cold-shutdown or some stage of decommissioning, representing 74 utilities from 29 countries. Regulatory authorities from 25 countries participate in



the ISOE programme. During 2001, the software used to manage and analyse the information in the three ISOE databases was improved and issued. An international "ALARA" (as low as reasonably achievable) Symposium was held in the United States to exchange operational dose reduction experience. The ISOE data, and the information exchanges made possible through the programme and its associated workshops and symposia, has contributed to the 50 per cent decline in occupational exposure since 1990.

## RADIOACTIVE WASTE MANAGEMENT

### Sorption Project

The NEA Sorption II Project was launched in October 2000 with the objective of demonstrating the applicability of different chemical thermodynamic modelling approaches to support the selection of sorption parameters for radioactive waste repository safety assessments. The project is taking the form of a "benchmarking" exercise for the different modelling approaches being pursued by the participating organisations. The overall aim is to interpret selected, well-characterised data sets for sorption in complex materials. By applying the various modelling approaches in a systematic way to the same measured data, an evaluation of the merits and limitations of the approaches will be possible and thus recommendations on their use.

In June 2001, the evaluation criteria, organisation of the exercise and data sets selected for the benchmarking exercise were finalised. Seven cases were selected for modelling in order to reduce the potential bias that could be introduced from a smaller number of examples.

The actual modelling exercise began at the end of 2001 and will continue for a period of six months. More than 20 teams supported by national waste management organisations are participating. It is expected that more than 50 cases will be presented and analysed during the second part of 2002.

### The Thermochemical Database (TDB) Project

The aim of the Thermochemical Database (TDB) Project is to critically review and to recommend chemical thermodynamic data needed in the safety assessment of radioactive waste repositories. The review leading to recommended data for neptunium and plutonium was completed and published by Elsevier North Holland in 2001. Five separate expert teams are presently working on the evaluation of the following data:

- updates of the existing reviews for inorganic species of U, Am, Tc, Np and Pu;
- simple organic compounds of U, Am, Tc, Np, Pu, Se, Ni and Zr;
- inorganic compounds of Se;
- inorganic compounds of Ni;
- inorganic compounds of Zr.

Among these five review efforts, it is expected that the updating of U, Am, Tc, Np and Pu data will be completed and sent for publication in 2002. The reviews of the inorganic compounds of Zr and the simple

organic compounds will be sent for peer-review in 2002 and published in early 2003. The two remaining reviews will be published later in 2003.

A workshop entitled "The Use of Thermodynamic Databases in Performance Assessment" was organised in Barcelona, Spain in May 2001. The objective of this workshop was to provide a forum where the producers (TDB review teams) and the users (performance assessment modellers) could discuss the thermodynamic data requirements and applications for radioactive waste management performance assessment. The proceedings will be published by the NEA in spring 2002.

### Decommissioning

The RWMC Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Projects (CPD) expanded its membership to 40 projects during 2001. At the end of the year, participants extended the Programme's mandate until 2005 and agreed on an approach for self-financing Programme co-ordination.

To assist in the development of high-level policy and regulations for decommissioning, the CPD provided decommissioning cost input to a sub-group of the Nuclear Development Committee (NDC), and technical, managerial and strategic experience in decommissioning to a sub-group of the Radioactive Waste Management Committee (RWMC). The CPD also pursued work on summarising experience from the first 15 years of the Programme, as well as developing other summary documents of experience, from the decommissioner's viewpoint, addressing policy and strategy, materials management, cost and safety.



SCK•CEN, Belgium

Decommissioning of large and heavy components by abrasive blasting.

# Information Programme

***Decision making and participation need to be based on understanding. The NEA Information Programme seeks to provide Member governments and other interested parties with a large array of information resulting from the Agency's activities, thereby enhancing awareness and understanding of the scientific, technical and economic aspects of the nuclear option.***

People are rarely indifferent to nuclear energy, with some in favour, and others against. These different views are reflected in government circles where decision making on energy policy takes place. Furthermore, civil society is looking to increase its role in this decision-making process. Providing factual information is a first step in helping that decision making take place in an informed and objective manner. Providing information in an effective way, at the right time and in the correct place is also important.

It is in this context that NEA activities related to civil society issues are being carried out in the fields of radioactive waste management; radiation protection; nuclear safety and regulation; and nuclear development. These activities are described in the section on "Nuclear Energy and Civil Society".

Various means are used at the NEA to inform both Member governments and other interested parties of the results of NEA activities. In addition to maintaining contacts with the media throughout the OECD area, considerable efforts are made to disseminate these results through the publications, Internet and international conference channels.

## Publications

The Agency produced 60 publications in 2001, of which 27 were on sale and 33 were distributed free of charge. The list of these publications is provided on page 34. In addition to standard distribution of free publications (some 50 000 copies), close to 500 individual requests were received involving the shipment of more than 2 300 reports.

In connection with the OECD Forum on Sustainable Development and the New Economy held in May, a special issue of *NEA News* was produced on this theme. In his lead article on "Sustainable energy for future generations", Donald Johnston, OECD Secretary-General, pointed out that "The future of energy is not the future of any one part of the globe: it is the future of the fragile planet Earth. To safeguard this future, we must mobilise scientific expertise and material resources in support of accelerated energy research in all areas." An article was also contributed from the Secretary-General of the World Energy Council. All of the articles contained in this special issue are available at [www.nea.fr/html/pub/welcome.html](http://www.nea.fr/html/pub/welcome.html).

A new NEA introductory brochure was printed in both English and French and distributed widely. It was intended, in the first instance,

to help familiarise government officials and academics with the extensive range of activities being carried out by the Agency and to raise public awareness of the NEA. Copies may be requested at [nea@nea.fr](mailto:nea@nea.fr).



Two collective opinions were produced in the area of nuclear safety. The first concerned "The Role of Research in a Nuclear Regulatory Context". The second collective opinion was on "Major Nuclear Safety Research Facilities and Programmes at Risk: Joint OECD Projects and Centres of Excellence". The collective opinions were widely disseminated in paper format and are also available on the NEA website.

Improvements to the publications programme database were implemented in 2001. These improvements will have a positive effect on programme management and the timely publication of reports.

## The NEA website

In addition to the systematic review and updating of the 25 000 html pages on the Agency's website, two new sections were added in 2001:

- "Facts and figures", which includes basic information on nuclear energy in OECD countries such as the number of nuclear units connected to the grid and the share of nuclear electricity generation in OECD countries ([www.nea.fr/html/general/facts.html](http://www.nea.fr/html/general/facts.html));
- "Sustainable development", which highlights some of the main points set out in the NEA publication *Nuclear Energy in a*

## Highlights

*Sustainable Development Perspective*, and provides links to related material ([www.nea.fr/html/sd](http://www.nea.fr/html/sd)).

A section on nuclear energy and civil society is also being developed.

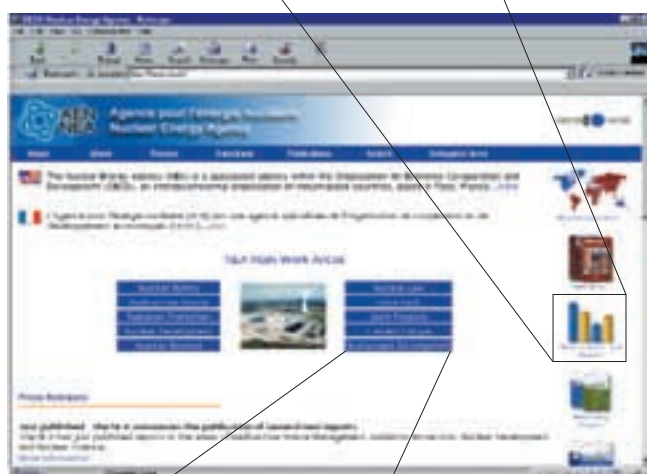
At the same time, preparations were made to launch the website's new graphical interface at the beginning of 2002. The Agency welcomes comments and feedback from visitors.

Individual subscriptions to the Agency's monthly electronic bulletin continued to grow, attaining 5006 in December 2001. The bulletin provides monthly updates on the major milestones achieved in the Agency's scientific, technological and economic programmes of work, as well as on all new publications and reports. Links are provided to the OECD online bookshop for publications on sale; free reports are made available for immediate download. Subscriptions to the bulletin are free of charge and can be made at [www.nea.fr/html/signon.html](http://www.nea.fr/html/signon.html).

The number of visitors to the website also continued to rise, reaching a half a million total for the year. *Chernobyl – Ten Years On: Radiological and Health Impact* (OECD/NEA, 1996) continued to be the most often downloaded report, followed by the *Nuclear Waste Bulletin and Nuclear Energy in a Sustainable Development Perspective* (some 9 000 downloads during 2001). By the end of the year, over 2 000 reports were available in full.

- The NEA developed several activities on nuclear energy and civil society, focusing on stakeholder confidence and involvement in nuclear energy decision making, and more generally, ways to improve the overall process of governance in this field (see page 33 for further details).
- A total of 60 publications were produced in 2001 covering the full range of NEA activities.
- The NEA website was reviewed and updated in detail, while preparations were made for introducing a new graphical interface at the beginning of 2002.
- NEA information and publications stands were organised at five major international conferences.
- The NEA co-sponsored nine international conferences during 2001.

New developments on the NEA website.



Sustainable Development

### NEA visibility in international fora

NEA information and publications stands were organised at five major international conferences in 2001:

- The OECD Forum 2001 on Sustainable Development and the New Economy, Paris, France, 14-16 May;
- Global 2001 International Conference on the "Back-end of the Fuel Cycle: From Research to Solution", Paris, France, 9-13 September;
- The 8<sup>th</sup> International Conference on Radioactive Waste Management and Environmental Remediation (ICEM '01), Brugge, Belgium, 30 September-4 October;
- The International Conference on Nuclear Data for Science and Technology (ND2001), Tsukuba, Japan, 7-12 October;
- The ANS Winter meeting, Reno, Nevada, 11-15 November.

The NEA co-sponsored nine international conferences.



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# Nuclear Energy and Civil Society

Since 1999, the OECD has been conducting a broad-ranging programme on governance issues ultimately aimed at strengthening pluralistic democracy, promoting economic prosperity and social cohesion, and maintaining confidence in public administration. This programme stems from the view expressed at the 1999 OECD Council Meeting at Ministerial Level that: *"The political, economic and social challenges of the next century require informed and actively participating citizens. Ministers recognise their heightened responsibility to ensure transparency and clarity in policy making, and look to the Organisation to assist governments in the important task of improving communication and consultation with civil society."*

Faced with the complexity of the relationship between government and citizens, and a perceived loss of direct influence over national and local policy decisions, many citizens are looking for ways to make wider use of participatory democracy. For their part, governments increasingly realise that they will not be able to conduct and effectively implement policies if their citizens do not understand and support them. Governments are thus looking to new or improved models and approaches for better informing and involving citizens in the policy-making process.

Nuclear energy is among those industrial activities that are particularly challenged to show transparency and accountability in decision making. Care must be taken to address citizens' concerns over its potential implications, particularly for public health and safety, including in respect of future generations. The NEA began studying specific aspects of the issue of nuclear energy and civil society two decades ago, and more recently several of the Agency's standing technical committees have launched activities that aim to analyse national and local experience and to communicate lessons learnt. NEA activities currently under way are briefly described below.

## **Society and nuclear energy: towards a better understanding**

As the social dimension is playing an increasingly important role in the nuclear energy policies of Member countries, the NEA Nuclear Development Committee (NDC) initiated a study on society and nuclear



energy, examining in particular public perception of the related risks and benefits. The first phase of the study, an in-depth review of authoritative literature and expert opinions on the topic, was completed in 2001. It covered nuclear-specific issues, the decision-making process and communication issues. The outcomes compiled in this desk study highlight a number of issues that need further analysis to better assess ways and means of improving communication with various stakeholders on nuclear energy matters and broadening public participation in the decision-making process. Preliminary conclusions include:

- Various changing conditions may influence the future of nuclear energy, while nuclear energy itself should also be considered dynamic.
- Risk perception involves not only quantitative assessments, but also variable subjective criteria.
- Potential exists for increasing democratic legitimacy of decisions through enhancing public involvement.
- Intuitive judgements should complement formal methods to support complex decision making.
- In addition, opinion polls show that public involvement in policy and decision-making processes concerning the nuclear energy sector is probably insufficient. People are interested in acquiring information, indicating that confidence in nuclear energy would increase if people were better informed. Building trust through nuclear information sharing may be a prerequisite for the future use and development of nuclear energy.

It is planned to publish the study by the end of 2002.



The NDC will continue to work on this topic in order to identify driving factors and eventually provide help in developing policy and decision-making processes in the field of nuclear energy better adapted to the needs and expectations of society.

### **Nuclear regulators and the public**

Regulatory bodies, in fulfilling their responsibilities to inform the public about their role in contributing to nuclear safety, face increasing communication needs. At the same time, good governance and efficiency in decision making by government authorities are increasingly dependent upon mutual trust and confidence between those authorities and the public. Indeed, as pointed out by Richard A. Meserve, Chairman of the US Nuclear Regulatory Commission, "Trust is a fragile commodity. Governmental organisations and their relations with the public they serve can be strengthened by trust – or paralysed by a lack of it." It was in this context and based on the outcome of a workshop on "Investing in Trust: Nuclear Regulators and the Public" organised in 2000 that the CNRA established a Working Group on Public Communication of Nuclear Regulatory Organisations in June 2001.

The Working Group will seek to share information, documents and experiences related to new developments, techniques and achievements in public communication. Among the items addressed at its first meeting in November, the Group exchanged information on the way the participating organisations reacted to the September 11 events in the United States. It also explored various networking possibilities. The Group is currently developing an action plan in the area of nuclear regulatory communication to guide its future activities.

### **Radioactive waste management**

The NEA Radioactive Waste Management Committee (RWMC) established the Forum on Stakeholder Confidence (FSC) in 2000, the overall purpose of which is to outline ways of integrating waste management programmes and socio-political considerations, and analyse successful and unsuccessful experiences in interacting with stakeholders. The FSC acts as a centre for informal exchanges on these experiences and for distilling lessons learnt in a form accessible to policy makers and other interested parties. It is intended to alternate regular meetings of the FSC with workshops held in national contexts, at which the representation of civil society will feature prominently.

A workshop was organised on "Stakeholder Involvement and Confidence in the Process of Decision Making for the Disposal of Spent Nuclear Fuel in Finland", in Turku, Finland on 14-16 November 2001. The workshop helped the FSC and the various stakeholders involved to learn from the Finnish experience. It analysed stakeholder involvement in the particular context of a parliamentary "decision in principle" and was a well-received opportunity for the different Finnish groups involved to review their role in the process. Some of the conclusions of the workshop were that:

- Differences between risk perception by experts and lay people have to be understood and public concerns need to be taken into account.
- Stakeholders feel that more attention should be paid to informing people, as well as to listening to them and responding to their concerns.
- Openness, honesty, and early and continuous participation of a variety of stakeholders are key factors in improving confidence and trust.
- Public interest in participation can be maintained only if stakeholders believe that they can have an influence on key decisions.

An executive summary will be issued in February 2002; the proceedings are under preparation and will be available by summer 2002. The next FSC workshop is planned to take place in October 2002 in Canada.

### **Stakeholder involvement in radiation protection decision making**

Starting from the recognition that decision making in several areas of radiation protection can less and less be made in isolation from its social dimension, a first workshop was organised in Villigen (Switzerland) in 1998 to examine societal aspects of decision making in complex radiological situations. A "Second Villigen Workshop" took place in 2001 to investigate the better integration of radiation protection in modern society. Lessons learnt on stakeholder involvement are intended to be incorporated into the improvements to the International Commission on Radiological Protection (ICRP) Recommendations. A policy-level summary report of the workshop discussions has been published, and proceedings will be issued in early 2002. It may be noted from the summary report that:

- Perhaps the clearest lesson to emerge from the workshop is the need to foster mutual trust between the radiation protection community and society as a whole.
- Openness, inclusiveness, and a focus on developing procedures in common will help so that even if there is ultimately an agreement to disagree, all outcomes will merit respect.
- Any engagement with stakeholders cannot be a once-and-for-all exercise but must envisage a future in which circumstances will change, whether in terms of the state of scientific knowledge or of societal attitudes and expectations.
- If an approach to radiation protection, which involves stakeholders, is to fulfil its potential, it must be established in such a way as to encourage mutual learning where all concerned are able to learn from their interactions. This new information must then be factored into ongoing development of common solutions that enjoy general approval.

To facilitate national-level use of the wealth of information developed during the first and second workshops, good practice in the procedural aspects of how stakeholders are involved in the decision-making processes will be studied using regional analyses for North America, Europe and Asia. This will also serve as input for a third workshop which is planned to be held in 2003.

# NEA Publications Produced in 2001

## Publications of General Interest

**2000 Annual Report** – 40 pages – Free: paper or web versions.

**NEA News** – Volumes 19.1 and 19.2

2001 Subscription (2 issues): ISSN 1605-9581 – Price: € 37, US\$ 45, £ 26, ¥ 4 800.

**NEA Brochure** – 24 pages – Free: paper or web versions.

## Economic and Technical Aspects of the Nuclear Fuel Cycle

### **Actinide and Fission Product Partitioning and Transmutation**

Sixth Information Exchange Meeting, Madrid, Spain, 11-13 December 2000

ISBN 92-64-18466-X – 128 pages – Free: paper or web versions.

### **Management of Depleted Uranium**

ISBN 92-64-19525-4 – 68 pages – Price: € 20, US\$ 19, £ 12, ¥ 1 900.

### **Nuclear Energy Data – 2001**

Bilingual – ISBN 92-64-08707-9 – 50 pages – Price: € 20, US\$ 19, £ 12, ¥ 1 900.

## Nuclear Safety

### **Collective Statement on Major Nuclear Safety Research Facilities and Programmes at Risk**

Bilingual – ISBN 92-64-08476-2 – 16 pages – Free: paper or web versions.

### **Nuclear Fuel Safety Criteria Technical Review**

ISBN 92-64-19687-0 – 68 pages – Price: € 20, US\$ 19, £ 12, ¥ 1 900.

### **Nuclear Safety Research in OECD Countries – Major Facilities and Programmes at Risk**

ISBN 92-64-18468-6 – 158 pages – Free: paper or web versions.

### **Nuclear Safety Research in OECD Countries – Summary Report of Major Facilities and Programmes at Risk**

ISBN 92-64-18463-5 – 60 pages – Free: paper or web versions.

## Nuclear Regulation

### **Assuring Future Nuclear Safety Competencies – Specific Actions**

ISBN 92-64-18462-7 – 68 pages – Free: paper or web versions.

### **Collective Statement on the Role of Research in a Nuclear Regulatory Context**

Bilingual – 16 pages – Free: paper or web versions.

### **Improving Nuclear Regulatory Effectiveness**

ISBN 92-64-18465-1 – 48 pages – Free: paper or web versions.

### **Investing in Trust: Nuclear Regulators and the Public**

Workshop Proceedings, Paris, France, 29 November-1 December 2000

ISBN 92-64-19314-6 – 324 pages – Price: € 60, US\$ 54, £ 37, ¥ 6 050.

### **Nuclear Regulatory Challenges Arising from Competition in Electricity Markets**

Bilingual – ISBN 92-64-08460-6 – 34 pages – Free: paper or web versions.

## Radiation Protection

### **Experience from International Nuclear Emergency Exercises**

The INEX 2 Series

ISBN 92-64-18464-3 – 42 pages – Free: paper or web versions.

### **Occupational Exposures at Nuclear Power Plants**

Tenth Annual Report of the ISOE Programme, 2000

ISBN 92-64-18473-2 – 104 pages – Free: paper or web versions.

### **Policy Issues in Radiological Protection Decision Making**

Summary of the 2<sup>nd</sup> Villigen (Switzerland) Workshop, January 2001

ISBN 92-64-18474-0 – 28 pages – Free: paper or web versions.

### **Second International Nuclear Emergency Exercise INEX 2**

Final Report of the Hungarian Regional Exercise

Bilingual – ISBN 92-64-08640-4 – 82 pages – Price: € 28, US\$ 24, £ 17, ¥ 2 670.

### **Second International Nuclear Emergency Exercise INEX 2**

Final Report of the Canadian Regional Exercise

Bilingual – ISBN 92-64-09532-2 – 80 pages – Price: € 23, US\$ 21, £ 14, ¥ 2 300.

## Radioactive Waste Management

### **Confidence in Models of Radionuclide Transport for Site-specific Assessments**

Workshop Proceedings, Carlsbad, New Mexico, USA, 14-17 June 1999

ISBN 92-64-18620-4 – 312 pages – Price: € 96, US\$ 84, £ 58, ¥ 9 100.

### **Gas Generation and Migration of Radioactive Waste Disposal – Safety-relevant Issues**

Workshop Proceedings, Reims, France, 26-28 June 2000

ISBN 92-64-18672-7 – 190 pages – Price: € 45, US\$ 39, £ 27, ¥ 4 300.

### **Nuclear Waste Bulletin – Update on Waste Management Policies and Programmes, No. 14, 2000 Edition**

ISBN 92-64-18461-9 – 136 pages – Free: paper or web versions.

### **Reversibility and Retrieval in Geologic Disposal of Radioactive Waste**

Reflections at the International Level

ISBN 92-64-18471-6 – 52 pages – Free: paper or web versions.

### **The Role of Underground Laboratories in Nuclear Waste Disposal Programmes**

ISBN 92-64-18472-4 – 48 pages – Free: paper or web versions.

### **Using Thermodynamic Sorption Models for Guiding Radioelement Distribution Coefficient (K<sub>d</sub>) Investigations – A Status Report**

ISBN 92-64-18679-4 – 190 pages – Price: € 50, US\$ 45, £ 31, ¥ 5 050.

### **Scenario Development Methods and Practices**

An Evaluation Based on the NEA Workshop on Scenario Development, Madrid, Spain, May 1999

ISBN 92-64-18722-7 – 244 pages – Price: € 65, US\$ 58, £ 40, ¥ 6 550.

## Nuclear Legislation

**Nuclear Law Bulletin** No. 67 & Supplement (Volume 2001/1)

**Nuclear Law Bulletin** No. 68 & Supplement (Volume 2001/2)

2001 Subscription (2 issues + supplements): ISSN 0304-341X – Price: € 71, US\$ 80, £ 48, ¥ 9 550.

## Nuclear Science

### **Evaluation of Speciation Technology**

Workshop Proceedings, Tokai-mura, Ibaraki, Japan, 26-28 October 1999

ISBN 92-64-18667-0 – 436 pages – Price: € 80, US\$ 70, £ 49, ¥ 7 600.

### **Shielding Aspects of Accelerators, Targets and Irradiation Facilities – SATIF 5**

Workshop Proceedings, Paris, France, 18-21 July 2000

ISBN 92-64-18691-3 – 426 pages – Price: € 84, US\$ 75, £ 52, ¥ 8 450.

### **Pyrochemical Separations**

Workshop Proceedings, Avignon, France, 14-16 March 2000

ISBN 92-64-18443-0 – 332 pages – Price: € 77, US\$ 66, £ 46, ¥ 7 230.

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

Volume I: Final Specifications

ISBN 92-64-18470-8 – 96 pages – Free: paper or web versions.

### **Nuclear Production of Hydrogen**

First Information Exchange Meeting, Paris, France, 2-3 October 2000

ISBN 92-64-18696-4 – 244 pages – Price: € 55, US\$ 49, £ 34, ¥ 5 550.

### **Forsmark 1 & 2 Boiling Water Reactor Stability Benchmark**

Time Series Analysis Methods for Oscillations During BWR Operation: Final Report

ISBN 92-64-18469-4 – 150 pages – Free: paper or web versions.

### **Evaluation Method of Inelastic Scattering Cross-sections for Weakly Absorbing Fission-product Nuclides**

International Evaluation Co-operation, Volume 10

100 pages – Free: paper or web versions.

### **Utilisation and Reliability of High Power Proton Accelerators**

Workshop Proceedings, Aix-en-Provence, France, 22-24 November 1999

ISBN 92-64-18749-9 – 476 pages – Price: € 130, US\$ 116, £ 80, ¥ 13 100.

### **International Handbook of Evaluated Criticality Safety Benchmark Experiments**

A Project by the NEA Nuclear Science Committee

CD-ROM – Free on request.

### **International Nuclear Data Evaluation Co-operation**

Complete Collection of Published Reports as of October 2001

CD-ROM – Free on request.

## The Data Bank

**JANIS** – A New Java-based Nuclear Data Display Program

CD-ROM – Free on request.

**JEFF Reports** – Complete Collection of JEFF Reports, Numbers 1-18

CD-ROM – Free on request.

**NEA Nuclear Model and Code Comparisons** – Complete Collection of the Reports, 1982-1998

CD-ROM – Free on request.

**PENELOPE – A Code System for Monte Carlo Simulation of Electron and Photon Transport**

Workshop Proceedings, Issy-les-Moulineaux, France, 5-7 November 2001

ISBN 92-64-18475-9 – 250 pages – Free: paper or web versions.

Where to buy NEA publications: [www.oecd.org/bookshop](http://www.oecd.org/bookshop)

Where to order free NEA publications: [neapub@nea.fr](mailto:neapub@nea.fr)

# Main Workshops and Seminars Held in 2001

## January

- 23-25** Second Villigen Workshop: Better Integration of Radiation Protection in Modern Society – Villigen, Switzerland.

## February

- 04-07** 2001 International ISOE ALARA Symposium – Anaheim, California, USA.

## March

- 12-14** Workshop on Operator Training for Severe Accident Management and Instrumentation Capabilities During Severe Accidents – Lyon, France.
- 26-27** Workshop on the Seismic Re-evaluation of All Nuclear Facilities – Ispra, Italy.

## April

- 28-30** Workshop on Precursor Analysis – Brussels, Belgium.

## May

- 07-09** GEOTRAP V Workshop – Oskarshamn, Sweden.
- 07-11** Workshop on Building the New Human Reliability Analysis (HRA): Errors of Commission from Research to Application – Washington DC, USA.
- 29-30** Workshop on the Use of Thermodynamic Databases in Performance Assessment – Barcelona, Spain.

## June

- 12-15** International Common Cause Data Exchange (ICDE) Workshop – Stockholm, Sweden.
- 19-20** Workshop on the Role of Research in a Nuclear Regulatory Context – Paris, France.

## July

- 03-04** Final Workshop on the International Standard Problem 44 (KAEVER Tests) Exercise – Cologne, Germany.

## September

- 10-12** Workshop on the Implementation of Severe Accident Management Measures – Villigen, Switzerland.
- 10-14** Workshop on Human and Organisational Factors: Management of Change – Chester, United Kingdom.
- 24-26** Workshop on Licensing and Operating Experience of Computer-based Instrumentation and Control (I&C) Systems – Hluboka nad Vltava, Czech Republic.

## October

- 07-12** International Conference on Nuclear Data for Science and Technology – Tsukuba, Japan.
- 10-12** Second Information Exchange Meeting on Basic Studies in the Field of High-temperature Engineering – Paris, France.
- 22-24** Second Workshop on Advanced Reactors with Innovative Fuel Cycles (ARWIF-2001) – Chester, United Kingdom.

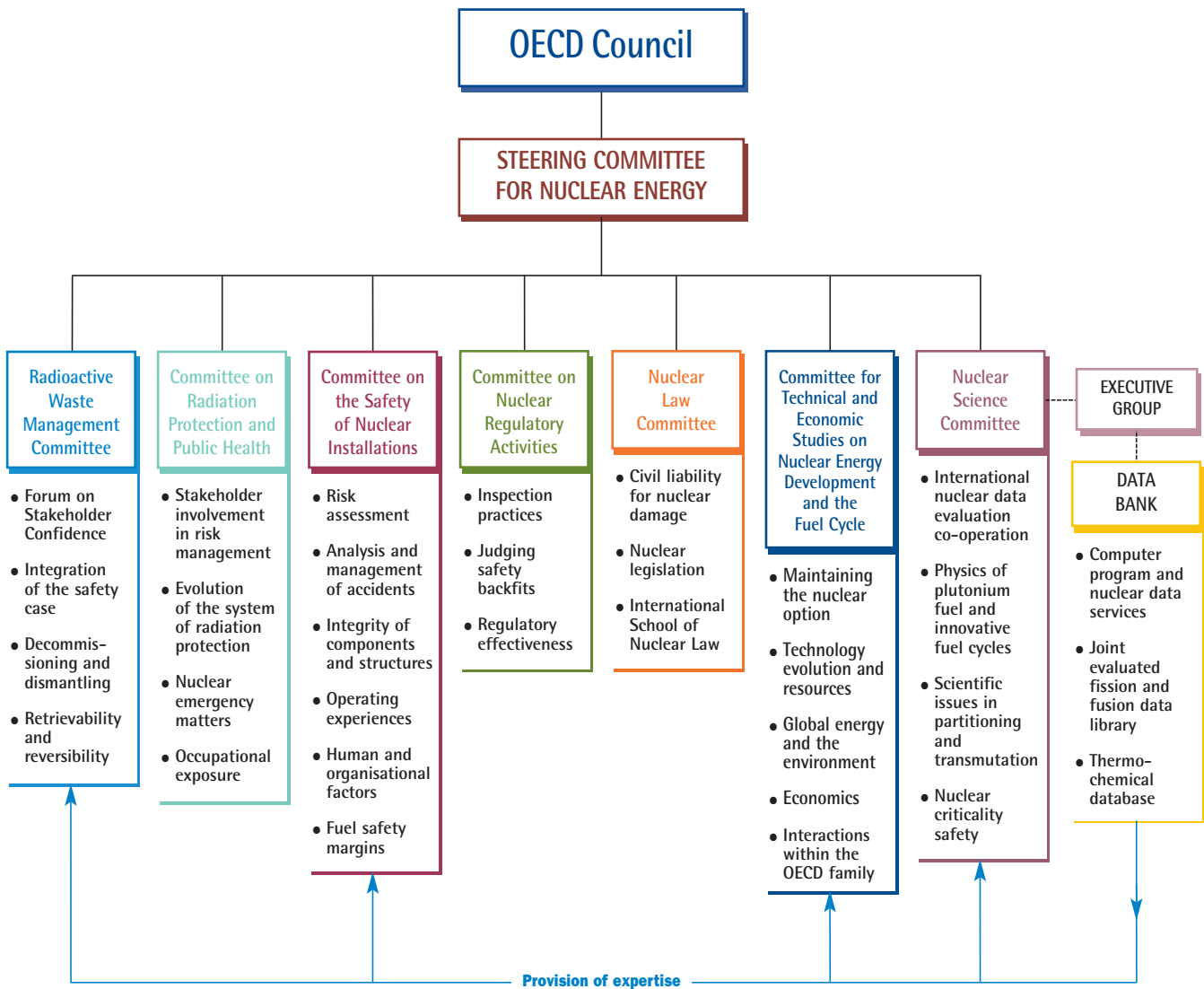
## November

- 15-16** NEA/IEA Workshop on Externalities and Energy Policy: The Life Cycle Analysis Approach – Paris, France.
- 15-16** Second Workshop of the Forum on Stakeholder Confidence (FSC): Stakeholder Involvement and Confidence in the Process of Decision-making for the Disposal of Spent Nuclear Fuel in Finland – Turku, Finland.
- 19-21** Final Workshop on the International Standard Problem 42 (PANDA Tests) Exercise – Villigen, Switzerland.
- 26-28** Workshop on the Identification of Damage in the Event of a Nuclear Accident – Paris, France.

## December

- 13-14** Final Workshop on the International Standard Problem 45 (QUENCH-06 Test) Exercise – Karlsruhe, Germany.

# Organisation Charts of the NEA



# NEA Secretariat Structure in 2001



**Director-General**  
Luis Echávarri



**Deputy  
Director-General**  
Carol Kessler



**Safety and  
Regulation**  
Kazuo Shimomura  
*Deputy Director*



**Science and  
Development**  
Thierry Dujardin  
*Deputy Director*



**Central Secretariat,  
Information and  
Publications**  
Jacques de la Ferté  
*Head*



**Legal  
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Patrick Reyners  
*Head*



**Management  
Support Unit**  
John Hembury  
*Head*



**Radiation  
Protection and  
Radioactive Waste  
Management**  
Hans Riotte  
*Head of Division*



**Nuclear  
Safety**  
Gianni Frescura  
*Head of Division*



**Nuclear  
Development**  
Peter Wilmer  
*Head of Division*



**Nuclear  
Science and  
Data Bank**  
Claes Nordborg  
*Principal Administrator*

## ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original Member countries of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries became Members subsequently through accession at the dates indicated hereafter: Japan (28th April 1964), Finland (28th January 1969), Australia (7th June 1971), New Zealand (29th May 1973), Mexico (18th May 1994), the Czech Republic (21st December 1995), Hungary (7th May 1996), Poland (22nd November 1996), Korea (12th December 1996) and the Slovak Republic (14 December 2000). The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

### NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1st February 1958 under the name of the OEEC European Nuclear Energy Agency. It received its present designation on 20th April 1972, when Japan became its first non-European full Member. NEA membership today consists of 27 OECD Member countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Republic of Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities also takes part in the work of the Agency.

The mission of the NEA is:

- to assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
- to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

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