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Fuel Cycle and Waste Newsletter

A newsletter of the Division of Nuclear Fuel Cycle and Waste Technology
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WATRP Mission to assess Korean programme on siting LILW repository

In response to a request from Korea Hydro and Nuclear Power (KHNP) in July 2005 the IAEA assembled a team of four international experts whose task it was, to assess the appropriateness of the processes, procedures applied and preliminary investigation results with regard to the siting of a disposal facility for low and intermediate level waste (LILW) generated in the Republic of Korea. The mission was performed within the Radioactive Waste Management Technical Review Programme (WATRP) established by NEFW in the early 1990s (see box on p. 3). To date ten WATRP missions have been carried out in eight Member States, covering different aspects of radioactive waste disposal at both, near surface and deep geological facilities.

The Team, consisting of experts from the Czech Republic, France, and the United Kingdom, along with two IAEA experts, reviewed background material provided by KHNP. From 31 October to 5 November 2005, the Team held a review meeting in Seoul with KHNP staff, the Ministry of Commerce, Industry & Energy (MOCIE), and members of the Korean Siting Committee. The Team also visited the Gyeongju candidate site, met local authority representatives and took part in a press conference.

A Siting Committee reviewed nine regions on the basis of preliminary geological investigations performed by KHNP and its subcontractors. From these nine regions four were selected as potentially suitable for the siting of a disposal facility based on IAEA recommendations and in compliance with Korean legislation. The results of the preselection process were communicated to MOCIE and to the local governments at the areas concerned. The latter then were invited to volunteer to have their site listed as candidate site. At all volunteering candidate sites the Ministry (MOCIE) organized a public poll. The region with the highest support by voters (provided that the turn-out of legitimate voters was above 30%) was selected as the final candidate site. A number of factors contributed to the surge in interest to host the repository. The government promised support for the regional economy in the form of a state subsidy of Won

Site	Voter turn-out [%]	Support [%]
Gyeongju	79.3	89.5
Gunsan	70.1	84.4
Yeongdeok	80.2	79.3
Pohang	47.2	67.5

300 billion (about US$ 288 million), vowed to relocate there the headquarters of the state-run KHNP and to build a multi-billion Won subatomic particle accelerator in the area. These pledges were legally guaranteed.. In addition, the municipalities will receive about Won 8.5 billion a year in taxes and fees from the disposal of the waste. All these incentives are believed to provide some 20 000 new jobs in the region. Some estimates place the benefits at up to Won 20 trillion and 200 000 new jobs over the long term. Based on this process the Government decided on the site at Yangbuk on the east coast of Korea, 28 km southeast of Gyeongju city, near the existing Wolsong Nuclear Power Plant Complex.

The review team focused their investigations on the following aspects:

- regulations related to siting;
- the Korean siting approach;
- relevance and adequacy of the site investigation programme;
- compliance of candidate sites with the siting criteria.

The mission of the WATRP Team resulted in a number of observations and recommendations, but did not find any technical reason to disqualify the pre-selected site.

KHNP now plans to investigate the site suitability, to design an appropriate disposal facility and to demonstrate its safety. The facility is planned to be commissioned by late 2008.

Message from the Director

Dear Reader,

In this issue of the Newsletter from the Division of **Nuclear Fuel Cycle and Waste Technology (NEFW)** you will find information about the wide variety of work done during the last three months. Our remit spans all parts of the nuclear fuel cycle from uranium exploration and mining to the management and disposal of radioactive waste. Our task is to bring together experts from around the world to produce reports on the state of science and technology and other reports, to stimulate cooperative R&D, and to provide technical services and advice as requested by Member States.

The activities described mainly concern the work under the regular budget. An important part of our activities, that is not prominent in this issue, concern technical support and advice to individual Member States within the Technical Cooperation (TC) programme. This includes, among other things, support for conversion of research reactors from High Enriched Uranium (HEU) to Low Enriched Uranium (LEU) and repatriation of the HEU fuel to the US and Russia and recovering and conditioning of spent sealed radioactive sources. Other examples are to give advice on uranium exploration techniques, on management and treatment of different types of radioactive waste and on decommissioning. In total staff from the division is involved in about 70 TC projects for 2005-2006. Discussions have just started for the next biennium, 2007-2008. More information about these activities will be given in a coming issue.

It is also now time to look ahead of what the Division should do in a longer time perspective. The development of the budget for 2008-2009 is starting now. An important issue to be considered is what actions we should undertake in support of the increased expectations on the use of nuclear energy, not the least to convey lessons learnt to countries that have not used nuclear energy before. Input from the readers would be appreciated.

I am very pleased with the many positive reactions on our first newsletter and the good suggestions for improvements. We will try hard to continue making the newsletter interesting, taking your comments into account, and we appreciate further suggestions. Some have been introduced already in this issue. Finally I would like to send Season's Greetings from all of us in the Division. We are looking forward to a continued successful cooperation in 2006. It is only with the help of many of you that the good results are achieved.

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The Norwegian Nobel Committee awarded the

2005 Nobel Peace Prize

to the IAEA and its Director General, Mohamed ElBaradei for

"their efforts to prevent nuclear energy from being used for military purposes and to ensure that nuclear energy for peaceful purposes is used in the safest possible way"

DEN NORSKE NOBELKOMITE

THE NORWEGIAN NOBEL COMMITTEE

WASTE MANAGEMENT ASSESSMENT AND TECHNICAL REVIEW PROGRAMME (WATRP)

Upon request from a Member State, or an organization within a Member State, the Agency undertakes the responsibility of convening an international panel of experts and performing an independent peer review according to the terms of reference established by the requesting Member state or organization. The mechanisms used for this purpose are (a) review of source material, (b) technical exchange with experts of the requesting Member State or organization in a WATRP meeting, and (c) preparation of a review report with findings, conclusions and recommendations.

The advantage of such a peer review for the requesting Member State or organization is the obtaining of independent international experts' opinions and advice on (a) proposed or ongoing radioactive waste management programmes, (b) planning, operation or decommissioning of facilities, or (c) regulatory matters. WATRP can contribute to improv-ing the confidence level of waste management systems planned or in operation, and help to ensure that the systems perform in a safe and reliable manner. WATRP can also assist in improving public acceptability of national programmes.

Recent WATRP reviews that have been performed are:

- Czech Republic (2004), to review the programme of a deep geological repository development;
- Republic of Korea (2002), to review the R&D programme for the disposal of HLW in Korea;
- Hungarian Atomic Energy Commission (1999), to review Hungarian work on selecting a site for Low and Intermediate Level Waste Disposal;
- France (1996), to review the Management of short lived waste in France as seen through the Centre de l'Aube Experience.

A WATRP report is the property of the requesting organization, for use at its own discretion, and will be kept confidential by the Agency and the WATRP team. Publication of the report must have the permission of the requesting organization. The WATRP service has been established in such a way that Member States pay for the costs involved. Requests for WATRP services are initiated by a formal request from Member States or an organization within a Member State to the Director General of the IAEA.

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Nuclear Fuel Cycle and Materials Section (NFCMS)

Fuel Performance and Technology

Nuclear Fuel Behaviour Modelling at High Burn-Up and its Experimental Support was the subject of a Technical Meeting held at Kendal in the UK on 5-8 September 2005. There were around 40 participants from 21 countries and the EU and 20 papers were presented.

The meeting comprised three sessions, covering materials properties, sub-models for code development and integrated fuel models. Discussions focused on the development and effects of the High Burn-up Structure (HBS). The observations of high porosity at the rim of high burn-up pellets has led to a lot of work trying to understand the effect of swelling and the influence there might be on PCI and fast transients. There was also discussion on fuel failure mechanisms in general. There was significant input from the CANDU community in the third session describing their fuel modelling. The conclusions of the meeting emphasized the need to better understand the HBS and the effect (if any) on increasing fission gas release at high burn-up. The meeting included a technical visit to Springfields site to see THORP and the new hot cells and laboratory scale MOX fuel production line in the R&D facility that is currently being commissioned. A consultancy was also held at Kendal, finishing on 9 September, to prepare for the final Research Co-ordination Meeting (RCM) of the FUMEX-2 Co-ordinated Research Project (CRP).

The 6th WWER Fuel Modelling Conference was held in Albena, Bulgaria on September 19-23. This conference is held in cooperation with the IAEA, and the Scientific Secretary presented the opening paper and chaired several sessions, including the final summary session. A paper presenting the IFPE database was presented, jointly authored by the NEA, IAEA and a consultant. TC also presented a paper describing their work supporting nuclear power in Eastern Europe. There were around 120 participants from 19 countries and from the NEA and IAEA. There were 55 presented papers and a further 15 in the Poster session. This conference is very successful, and is the major meeting for WWER experts in fuel behaviour. Sessions covered fuel performance and operational experience; improvement of fuel design and operation; experimental support, PIE and databases; fuel modelling and codes; fuel modelling under LOCA and severe transients; fuel licensing and QA ; and spent fuel performance and management. The conference concluded that the regular conferences in this series needed to continue, and that attention needed to be given to fuel failure mechanisms, closer integration with the Western LWR community and storage issues, as well as fuel modelling.

A technical meeting on the Behaviour of **High Corrosion Resistant Zr-Based Alloys** was held in Buenos Aires, Argentina, from 24 to 27 October 2005. The meeting considered the properties and performance of both cladding and pressure tube materials and was attended by 35 experts from 10 countries. The development of zirconium-niobium alloys with up to 1%Nb, as cladding material for high burn-up use in LWRs was discussed. Pressure tube alloys with higher Nb content were considered, particularly in respect of hydrogen pickup and the effects of composition on alloy strength. The meeting noted that the minor alloying elements and detailed manufacturing processes were important in alloy properties, and that the influence of Sn, Fe and Si in the alloys could significantly affect the integrity of the protective oxide layer.

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Fuel Cycle Issues

A review meeting on **Current Status and Future Prospects of Gas Cooled Reactor Fuels** was held at the National Science Centre: Kharkov Institute of Physics and Technology (NSC-KIPT), Kharkov, Ukraine, from 27 to 30 June 2005. Twenty three experts from China, Germany, Japan, Republic of Korea, Russian Federation, South Africa, Switzerland, Turkey, Ukraine and UK and one expert from ITU/EC attended. The meeting reviewed the current development needs, the capabilities of coated particle fuel, status of models, characterization techniques, and recent international collaborations such as GIF and RAFEL. The meeting also reviewed the proceedings of the technical meeting that was held in 2004 on the same subject and suggested methods to incorporate new findings. A proceeding of this technical meeting that contains 25 detailed technical papers is under preparation. A panel discussion was held on "education and training addressing to the new generation of specialists required for the new HTR programmes This update meeting also working on an additional document viz., a booklet on "Basic fact book on coated particle fuel". There was very interesting site visit of NSC-KIPT on the final day of meeting which covered facilities for coated particle fuel and other types fuel element development, graphite materials for nuclear application and different types of accelerator developments including minor actinide transmutation and fusion research. The place of the photograph is a monument built in memory of their achievement in 1932 at this Institute on lithium fission.

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Spent Fuel Management

The IAEA held a technical meeting on **Burn-up Credit* Applications** in London 29 August – 2 September 2005. Over sixty representatives from eighteen countries participated in this meeting, the fourth major technical meeting held by the IAEA on this topic of emerging importance (attendance has increased steadily since 17 participants attended the initial 1997 meeting). Following the technical presentations and working group discussions, the Chair concluded that the 2005 meeting represented an encouraging step forward in application of burn-up credit among Member States.

* The most common assumption used in spent power reactor fuel criticality analyses is that spent fuel has the same reactivity as the unburned fuel ('fresh fuel' assumption), resulting in significant conservatism. 'Burn-up credit' approaches take credit for the reactivity reduction associated with fuel burn-up, hence reducing excessive conservatism while maintaining an adequate criticality safety margin.

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A Technical Meeting on **Spent Fuel Treatment Options and Applications** was held from 17 to 20 October 2005 on the KAERI premises of INTEC in Daejeon, Republic of Korea. It was attended by some 30 participants from 14 countries. The purpose of this TM was to review technologies for spent fuel treatment options and applications and discuss associated issues with a view to prepare a

technical document that could enhance information exchange and knowledge management for Member States.

After reviewieng the background information, including IAEA-TECDOC-1467 on Status and Trends in Spent Fuel Reprocessing, country reports were presented by Argentina, Czech Republic, France, India, Japan, Pakistan, Russian Federation, Switzerland, Ukraine, and the USA, followed by seven presentations of local participants. The review was followed by group sessions to identify technical options and applications, cross-cut with a few selected issues of technical, economic, and proliferation resistance, among others, with a view to provide associated methodologies and tools in the TECDOC to be made, resulting in a list of key points to work on and integrated later into the elaboration of the new TECDOC. The TM was wrapped up with a technical tour to several relevant facilities on KAERI site.

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Research Reactors

Fifteen participants representing 13 Member States attended the Technical Meeting on Use of Low Enriched Uranium (LEU) in Accelerators Driven Subcritical Assemblies (ADS). The Technical Meeting was held at the IAEA headquarters in Vienna, from 10 to 12 October, 2005.

The main purpose of the meeting was to address non-proliferation concerns related to the use of HEU in ADS systems, by exploring the technical feasibility of using Low Enriched Uranium (LEU) as an alternative fuel material. Another purpose was to exchange information on status and current plans for ADS projects.

Participants provided technical presentations describing ADS research activities in Member States and discussed the use of LEU in the sub-critical assemblies, including optimization studies for using LEU in new ADS projects; conversion of existing ADS from HEU to LEU; and future ADS plans.

Follow up recommended actions included organization of a CRP on the subject and preparation of a number of technical documents.

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Waste Technology Section (WTS)

Pre-disposal Technologies

The main advantage of thermal processing, including incineration, melting, or pyrolysis. is an Effective volume reduction, increased homogeneity and improved quality of the waste form. Considering the high overall costs of the waste disposal and increasing requirements for improved final waste form quality, the benefits of thermal processing are significant. A new technical report on **Application of Thermal Technologies for Processing of Radioactive Waste** will review the current status and existing experience with applying various thermal treatment technologies. The review will be based on a collection and analysis of relevant operational experience, of advanced research and development work in different countries, and it will provide a critical analysis of this information with a view to offer to Member States condensed information and references on the subject.

A Regional Workshop on **Waste Characteristics, Processing Methods and Type of Disposal Technologies** was held 26-30 September in Moldova under the auspices of the Regional TC project RER/3/002: Quality Management of Radioactive Waste in Central and Eastern Europe. Thirty waste management operators from 17 countries attended. The purpose of the workshop was to

- discuss interdependences between waste characteristics, processing method performance and disposal requirements;
- exchange information and experience on waste processing focusing on waste acceptance criteria;
- discuss long-term storage and disposal options, taking into account alternatives, advantages and limitations with respect to efficiency and quality of the whole waste management system.

Training of waste management staff in Member States is considered important for the dissemination of technical information and transfer of practical skills in various aspects of waste management. The Agency, in co-operation with national authorities, has organized and conducted a number of workshops, training courses and hands-on trainings. An essential part of these activities are lectures covering different aspects of waste management concepts, strategies, approaches and different waste management technologies.

The majority of the Agency's technical publications are in the English language. Recognizing the significance of technical assistance to the Russian-speaking countries, the Agency prepared a document (IAEA-TCS-27: *Technological and organizational aspects of radioactive waste management*) containing a set of lectures on radioactive waste processing technologies used at centralized waste processing facilities.

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Pre-disposal Technologies

A forthcoming technical document on the **Disposal Approaches for Long-Lived Low and Intermediate Level (LILW)** Waste will provide an overview of waste categories, types of facilities and of criteria and issues influencing the selection of an disposal approach. LILW arises from the operation and decommissioning of nuclear reactors; other examples are certain sealed sources; waste from research laboratories, from reprocessing plants, and certain types of NORM-containing waste may also fall into this category. It is widely accepted that long-lived waste should be disposed of in geological formations at depth, allowing for unrestricted use of the land above after closure of the disposal facility. Some existing subsurface repositories may accept a certain amount of such waste, but the WIPP facility (USA) is the only one that has been designed specifically for it. Considering the wide spectrum of long-lived nuclides present in the waste, a simplified division between near-surface and deep geological destinations does not seem to be practical. Therefore, alternative approaches to the disposal of non-heat generating waste are being considered. The technical requirements on these facilities may vary significantly according to characteristics of waste to be accepted in them.

Another document under preparation concerned the **Factors Affecting Public and Political Acceptance for the Implementation of Geological Disposal**. Even if properly developed, the scientific and technical evidence may not be convincing enough to gain general public acceptance for underground repositories. The decision-making process is highly dependent on stakeholder involvement, particularly, when risks and benefits are shifting in time. New perspectives with regard to risk governance are required in waste management that is facing a changing environment. The messages, and methods and channels of communication differ significantly depending on the target audience, the phase of the project and the cultural specificities. Debates still need to be stimulated to promote a common understanding of geological disposal in waste management.

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Stakeholder participation in decision-making is also an important aspect in the context of near surface repositories. Hence, a three-day workshop on **Socio-economic Issues and Public Involvement Practices and Approaches for Developing and Operating Repositories for Low and Intermediate Level Waste (LILW)** was organized 9-11 November 2005 at the Agency's Headquarters. Twenty six participants from 23 Member States shared their experience. The final discussion concentrated on various aspects of providing incentives for local communities to participate and on how to engage the general public when developing or operating a LILW disposal facility. The findings will be published as an IAEA-TECDOC in 2006.

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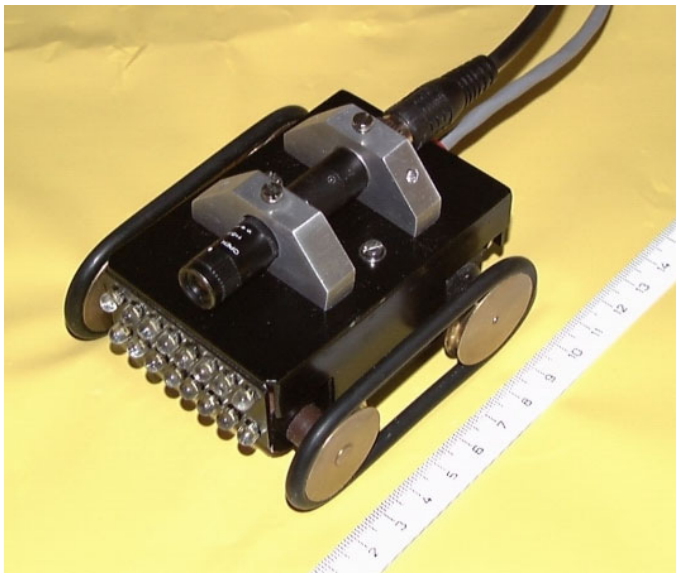
Decommissioning of Nuclear Installations

A technical report on **Decommissioning of Underground Components, Systems and Structures** is in the press at the time of writing. A large number of today's nuclear installations have underground components such as pipes or tanks. This practice has been in use for a long time when decommissioning was not perceived as a serious issue and was not much considered in plant design and construction. Underground components may present formidable decontamination and/or dismantling issues, which include difficult manned access and the possible need for remotely operated operation, uncontrolled leaks and resulting contamination of foundations and soil, difficult radiological characterization etc. Although cases of decommissioning of such components have been sporadically described in the technical literature, no systematic treatment of D&D strategies/technologies is available yet. It should be noted that this issue is quite common also in developing countries due to the ubiquitous presence of these components. The document addresses, among others, the following major points:

- design/construction aspects;
- issues related to long term storage or maintenance of underground components;
- structural and radiological characterization (below a robotic survey tool developed in the Czech Republic is shown);



- decontamination / dismantling strategies and their occupational / environmental impact;
- radiological and conventional safety aspects;
- entombment scenarios;
- waste management aspects;
- operating experience including lessons learned.

A technical report on **Decommissioning of Research Reactors: Evolution, State-of-the-art, and Open Issues** is also in the press. Several dozens of research reactors world-wide are ageing, many of which have already reached the stage of permanent shutdown and are candidates for decommissioning in the near term. Many of them are located in developing countries that do not have the expertise and technologies for planning and implementing state-of-the-art decommissioning projects. Often no decommissioning infrastructure is available and has to be set up for the purpose. The figure shows a cementation plant procured by the Agency for the Salaspils reactor decommissioning project in Latvia.

The last report having been published in the early 1990s, it was high time to provide an update on technological progress and experience gained since. The report provides a systematic coverage of the entire range of decommissioning aspects. The report addressing the issues in as 'solved', 'pending' or 'emerging', giving emphasis to:

- decommissioning planning;
- management of decommissioning projects;
- cost and financing;
- responsibilities and functions of parties, stakeholders' involvement;
- technologies applicable to all types of research reactors;
- considerations specific to different types of research reactors;
- waste management;
- quality assurance;
- operating experience and lessons learned.

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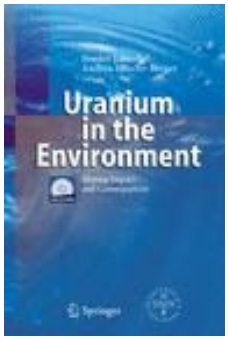
Environmental Remediation

In many less developed Member States remediation projects are not undertaken at all or have not been taken beyond an assessment step because those responsible claim the lack of necessary resources. It can be speculated that often the same high-tech solutions are envisaged that are common in more affluent countries. This disparity between aspirations and socio-economic realities seems to result in complacency, which can only be overcome developing methods and strategies to mobilize and utilize indigenous resources. A new report with the working title **Remediation Strategies for Managing Environmental Liabilities under Constraint Resources** is expected to facilitate the initiation of remediation projects.

In September the 4th conference in the series **Uranium Mining and Hydrogeology (UMH IV)** was held in Freiberg, Saxony, Germany together with the annual meeting of the **Uranium Mine Remediation Exchange Group (UMREG)**. The remediation programmes of many major problem holders, such as the USA or Germany, are maturing and drawing to a close. To the contrary, in some of the smaller countries programmes did not move much beyond the assessment or initial remediation stages. This situation was reflected in the attendance, both in term of numbers and geographical distribution. With the programmes maturing, long-term stewardship and site reuse issues become more important. It was also recognised that radioactivity is not only a problem in uranium mining, but also in other areas of mining and that the experience gained with uranium mining can be usefully applied elsewhere. A budding trend sparked by increasing uranium prices is the turn away from the safe closure of mines and mining residue management sites towards sustainable and environmentally benign mining.



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Management of Radioactive Sources

Reliable waste inventories for storage or disposal facilities are essential for the efficient execution of safety assessment studies and the planning and implementation of remedial activities. In order to facilitate their use, historical waste inventory data are often transferred into new record keeping systems. However, misprints and other errors, use of obsolete units, language problems, misinterpretation of hand-written records and similar problems can make the retrieval of historical waste inventory data unreliable. A technical document under preparation on **Retrieval of Historical Radioactive Waste Inventory Data** will provide general guidance and methods for addressing such problems. The document places particular emphasis on disused Sealed Radioactive Sources (SRS), that have been stored or disposed of long time ago and for which no reliable inventory information is available.

Radioactive Waste Management Registry (RWMR). A well-structured radioactive waste management QA programme would include recording of relevant information and the management of these records. Starting from

receiving the waste up to its disposal, all relevant information on its processing (pre-treatment, treatment, conditioning, etc.) and handling should be recorded in a systematic manner and this information should be kept secure and accessible to future generations. RWMR is a software application that provides a variety of options tailored to the users' needs for recording of radioactive waste management information, for data processing and the generation of user-defined reports. It has been developed by the Agency to assist its MSs in improving their radioactive waste management QA programmes.

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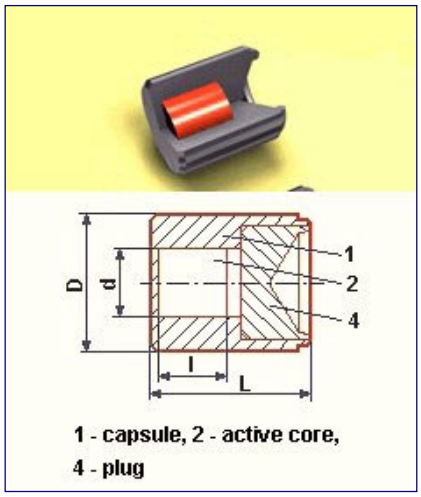
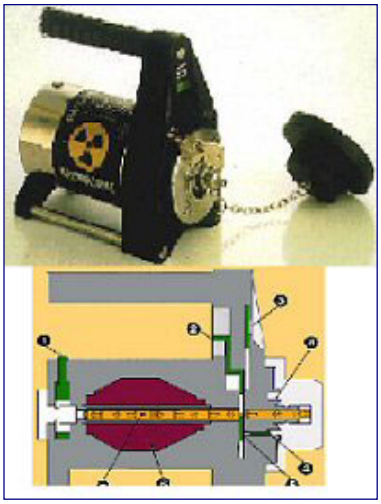
The **International Catalogue of Sealed Radioactive Sources and Devices** (in short Source Catalogue) has been developed since 1999 as part of the Agency's Action Plan for the Safety of Radiation Sources and Security of Radioactive Material (GOV/1999/46-GC(43)/10), which includes an activity "*to develop a repository of information on the characteristics of sources and of devices containing sources, including transport containers, and to disseminate the information, with consideration of the advisability of dissemination through the Internet*".



The Source Catalogue, which contains information on worldwide existing models of sealed radioactive sources and devices housing such sources, as well as information on the manufacturers and distributors of such sources and devices, was developed as a computer database. While being a useful tool to disseminate information to the MSs and the general public, maintains the necessary level of information security as defined in the Agency's Information Security Policy. The Catalogue has now reached a level of development that justifies its publication. Member States and Organisations have been invited to nominate a Country Coordinator in order to provide for access to the Catalogue. The Country Coordinator should act as contact point for the respective country. For security reasons only they have direct access to the computer database. To date 36 countries and as well as the European Commission and Europol responded, nominating 43 persons as coordinators. The Catalogue currently provides information on 8400 radioactive source models and 9400 devices. New data continue to be added and this will likely be maintained as long as sources and devices are being produced.



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Contact Expert Group (CEG)

The 19th meeting of the IAEA Contact Expert Group (CEG) for International Radioactive Waste Projects in the Russian Federation was held on 4-6 October 2005 in Ottawa – Kincardine, Ontario, Canada. The meeting was organized by the Foreign Affairs, Canada in cooperation with the CEG Secretariat. 63 participants from 11 countries and five international organizations attended the meeting. Five major topical issues were considered, namely:

1. State of remediation of the Andreeva Bay site and the Gremikha site.
2. Main outcomes and findings of the CEG workshops held in 2005.
3. State and perspectives of the Lepse project.
4. Lessons learned from cooperative projects.
5. CEG organizational and financial matters.

This meeting provided an open forum for detailed overview and discussion of the activities and plans in the area of the nuclear legacy clean-up in the Russian Federation. A number of recommendations were made at the meeting aimed on further facilitation of international assistance and coordination of efforts. On 6 October the participants visited Bruce NPP and the Radioactive Waste Management Centre operated by the Ontario Power Generation in Kincardine, Ontario. Facility for management and storage of spent fuel from Bruce plant was of particular interest. The next meeting will be held in Munich, Germany 11 to 13 October 2006.

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Waste Management Information Systems

Implementing the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management underlines the need for a coherent and consistent system of reporting on waste management. The IAEA has been developing for the past six years the Net Enabled Waste Management Database (NEWMDB) as a tool for data collection and dissemination. Recognizing the need for harmonization and consistency, both the European Commission and the OECD-Nuclear Energy Agency recently have expressed interest in NEWMDB data.

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Fissile Material Management Strategies for Sustainable Nuclear Energy

A Technical Meeting on **Fissile Material Management Strategies for Sustainable Nuclear Energy** was held in Vienna from 12 to 15 September 2005. The meeting was attended by 31 experts from ten Member States and two experts from international organizations (IIASA and OECD/NEA). The purpose of the meeting was to:

- identify fissile material management strategies for different nuclear fuel cycle options;
- clarify issues and challenges existing in fissile material management; and
- seek possible solutions for these issues and challenges, in particular, focusing on sustainability of nuclear power in different fuel cycle options.

This project has been initiated as an extra-budgetary project and has been financed since 2003 by voluntary contribution from the Japanese government.

The meeting had three technical sessions relating to:

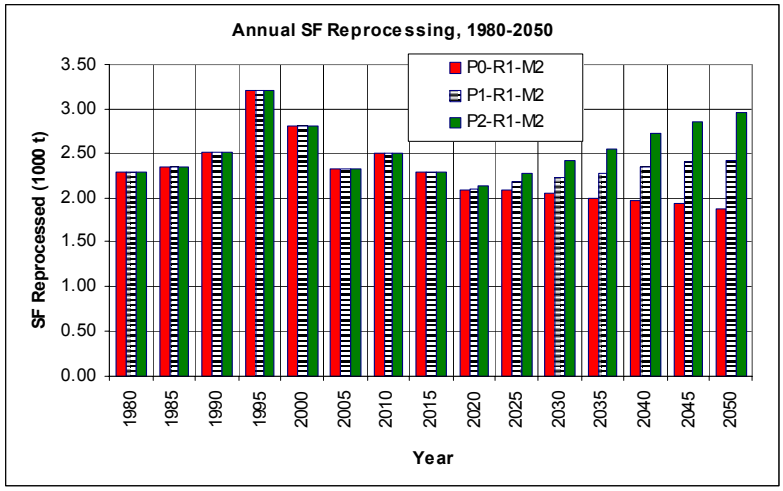
- Front-end Strategies;
- Back-end Strategies; and
- Future Sustainable Fuel Cycle Technology Options.

At the beginning of each session a key-note paper, prepared by groups of consultants, were given on

- Uranium demand and supply through 2050.
- Fissile material management strategies for sustainable nuclear energy: fuel cycle back-end options, and
- Sustainable nuclear energy beyond 2050: Cross-cutting issues

respectively. In addition there were 32 technical presentations of papers prepared by the participants in the respective technical sessions.

The meeting produced a comprehensive review of the relative merits of the different fuel cycle options and provided a forum for exchange of technical information on the current status and future direction of the fuel cycle in the Member States. The meeting also provided essential information to Member States for their policy making and strategic planning. The results of the meeting will be compiled in a proceedings volume for publication in 2006, and is deemed to be useful for strategic planning by Member States.



The above figure shows some result from the key-note paper on the Back-end Fuel Cycle Strategies concerning the long-term development of the annual amount of spent fuel being reprocessed. The Agency's Nuclear Fuel Cycle Simulation System (VISTA) was used to calculate the reprocessing requirements for three different nuclear power development scenarios that were based on the Agency's Energy, Electricity and Nuclear Power Estimates for the Period up to 2030 (2004 edition). In the high nuclear capacity case (designated as P2), the nuclear power is expected to increase from 353 GWe in 2002 to 730 GWe in 2050. In the medium (designated as P1) and low capacity (designated as P0) cases, the nuclear power grows to 565 GWe and 400 GWe respectively in the year 2050. The reprocessing scenario was assumed to keep the current trend at about 30% of LWR fuel to be reprocessed (designated as R1).

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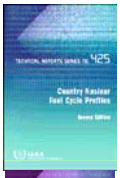
Nuclear fuel cycle simulation system (VISTA)

VISTA was developed to calculate nuclear fuel cycle material and service requirements, as well as other information related to the back-end of the nuclear fuel cycle. VISTA is a scenario-based simulation tool that can be used to generate estimates for the open fuel cycle as well as the closed cycle, where recycling of separated fuel materials is taken into account. VISTA was used in the preparation of two papers in this meeting as well as in Key-Note Paper II. More information on VISTA is available at http://www-nfcis.iaea.org/.

Contact: M.Ceyhan@iaea.org

Recent Publications



TRS No. 425

Country Nuclear Fuel Cycle Profiles - Second Edition (2005).

TRS No. 427

Predisposal Management of Organic Radioactive Waste (2004).

TRS No. 431

Application of Membrane Technologies for Liquid Radioactive Waste Processing (2005).

TRS No. 433

Upgrading of Near Surface Repositories for Radioactive Waste (2005).

TRS No. 434

Methods for Maintaining a Record of Waste Packages during Waste Processing and Storage (2005).

TRS No. 435

Implications of Partitioning and Transmutation in Radioactive Waste Management (2005).

TRS No. 436

Disposal Options for Disused Radioactive Sources (2005).

TECDOC-1425

Developments in uranium resources and production, demand and the environment (2005).

TECDOC-1428

Guidebook on environmental impact assessment for in situ leach mining projects (2005).

TECDOC-1433

Remote Technology Applications in Spent Fuel Management (2005).

TECDOC-1450

Thorium Fuel Cycle – Potential Benefits and Challenges (2005).

TECDOC-1452

Management of high enriched uranium for peaceful purposes: Status and trends (2005).

TECDOC-1454

Structural Behaviour of Fuel Assemblies for Water Cooled Reactors (2005).

TECDOC-1463

Recent Developments in Uranium Exploration, Production and Environmental Issues (2005).

TECDOC-1467

Status and Trends in Spent Fuel Reprocessing (2005).

TECDOC-1476

Financial Aspects of Decommissioning (2005).

TECDOC-1482

Technical, Economic and Institutional Aspects of Regional Spent Fuel Storage Facilities (2005).

IAEA-WMRA-29

Waste Management Research Abstracts, volume 29 (2004).

RWM Status and Trends

Radioactive Waste Management – Status and Trends, Report No. 4 (2005).

Radioactive Waste Management Profiles No. 6 A Compilation of Data from the Net Enabled Waste Management Database (NEWMDB) (2005).

STI/PUB/1212

Research Reactor Utilization, Safety, Decommissioning, Fuel and Waste Management. Proc. of an Internl. Conf., Santiago, Chile, November 2003 (2005).

STI/PUB/1228

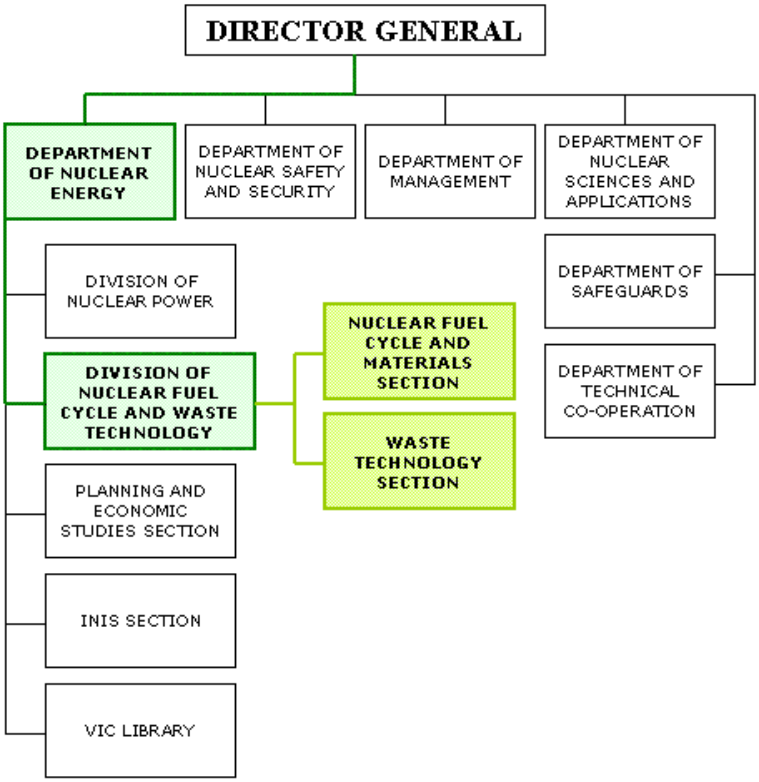
Environmental Contamination from Uranium Production Facilities and their Remediation Proceedings of an International Workshop, Lisbon, Portugal, February 2004 (2005).

Meetings in 2006

Date	Title	Place	Contact
26 February-2 March	WM'06, Waste Management Symposium	Tucson, USA	
20-23 March	TC seminar on Management of radioactive waste at NPP with VVER/PWR reactors	Paks NPP, Hungary	V.Efremenkov@iaea.org
3-7 April	WATEC	Vienna, Autria	J.M.Potier@iaea.org
26-27 April	CEG workshop on Strategic aspects on management of radioactive waste and remediation of contaminates sites	Stockholm, Sweden	S.Bocharov@iaea.org
21-26 May	6th International Conference on Nuclear Option in Countries with Small and Medium Electricity Grids	Dubrovnik, Croatia	M.Laraia@iaea.org
19-23 June	International Conference on Management of Spent Fuel from Nuclear Power Reactors	Vienna, Autria	W.Danker@iaea.org
28-30 June	CEG workshop on Isolation and Disposal of radioactive waste	Olkiluoto, Finland	S.Bocharov@iaea.org
11-13 October	20th plenary meeting of the Contact Expert Group (CEG)	Munich, Germany	S.Bocharov@iaea.org
11-15 December	International Conference on Lessons Learnt from the Decommissioning of Nuclear Facilities and the Safe Termination of Practices	Athens, Greece	M.Laraia@iaea.org

Division of Nuclear Fuel Cycle and Waste Technology WebSite Links

Division Introduction NEFW home: http://www.iaea.org/OurWork/ST/NE/NEFW/index.html



Nuclear Fuel Cycle and Materials Section (NFCMS)

http://www.iaea.org/OurWork/ST/NE/NEFW/nfcms_home.html

- Main activities http://www.iaea.org/OurWork/ST/NE/NEFW/nfcms_activities.html
- Technical Working Group on Nuclear Fuel Cycle Options (TWGNFCO) http://www.iaea.org/OurWork/ST/NE/NEFW/nfcms_twgnfco.html
- Technical Working Group on Water Reactor Fuel Performance and Technology (TWGFPT) http://www.iaea.org/OurWork/ST/NE/NEFW/nfcms_twgfpt.html
- Databases (NFCIS, UDEPO, VISTA, PIE) http://www.iaea.org/OurWork/ST/NE/NEFW/nfcms_databases.html

Waste Technology Section (WTS)

http://www.iaea.org/OurWork/ST/NE/NEFW/wts_home.html

- Main activities http://www.iaea.org/OurWork/ST/NE/NEFW/wts_activities.html
- International Radioactive Waste Technical Committee (WATEC) http://www.iaea.org/OurWork/ST/NE/NEFW/wts_watec.html
- Technical Group on Decommissioning (TEGDE) http://www.iaea.org/OurWork/ST/NE/NEFW/wts_tegde.html
- Databases (NEWMDB, DRCS) http://www.iaea.org/OurWork/ST/NE/NEFW/wts_l8_01_NEWMDB.html http://www.iaea.org/OurWork/ST/NE/NEFW/wts_l6_02_DRCS.html

IAEA International Atomic Energy Agency

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