IAEA International Atomic Energy Agency

Fuel Cycle and Waste Newsletter

A newsletter of the Division of Nuclear Fuel Cycle and Waste Technology
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http://www.iaea.org/OurWork/ST/NE/NEFW/index.html

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IAEA International Conference on Research Reactors

ARPANSA CEO, John Loy (centre); IAEA DDG NE Yury Sokolov (2nd from left) and IAEA Scientific Secretaries open the IAEA International Conference on Research Reactors

The latest in a series of IAEA conferences on management and use of research reactors was held from 5 to 9 November in Sydney, Australia, with the focus on sharing the latest scientific, technical and safety information related to research reactors. This exchange of information also included projects on design, construction and commissioning of new research reactor facilities.

The International Conference on Research Reactors: Safe Management and Effective Utilization was hosted by Australia through the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Approximately 220 delegates from around the world attended the week-long meeting.

The principal objective was to foster the exchange of information and provide a forum for research reactor operators, designers, managers, users and regulators to share experience, exchange opinions and discuss options and priorities.

A number of significant issues related to safety and security, operation and utilization, the fuel cycle, decommissioning, and waste management were addressed during the meeting. The conference produced a list of recommendations emphasizing continued or expanded IAEA support for several Research Reactor Group activities such as fostering efforts to reduce proliferation risk including the minimization of highly enriched uranium, the development of international coalitions and peer-group networks; high capability, shared regional facilities; and feasibility studies for future reactors.

The IAEA organizes conferences on this topic once every four years; the last such meeting was held in Santiago, Chile, in November 2003.

Pablo Adelfang (P.Adelfang@iaea.org)

Message from the Director

Dear Reader,

2007 has been a very interesting and active year for all of us involved in nuclear and waste management activities. Several signs point to an increased use of nuclear energy in the future. New reactor projects are being considered and new initiatives have been taken concerning the nuclear fuel cycle such as the establishment of the Global Nuclear Energy Partnership and the International Uranium Enrichment Centre. The importance of research reactors for radioisotope production has been highlighted by the recent problems with the Molybdenum-99 production in Canada and the potentially very severe consequences for medical examinations and treatments. In the field of radioactive waste management and decommissioning, the need for support and development is seen in many countries to ensure that operations are performed in a technically sound and safe way.

In this issue of the Newsletter you will find short reports about some of the activities performed by the Division of Nuclear Fuel Cycle and Waste Technology in 2007. To get a more complete view of our activities I recommend you to visit our website http://www.iaea.org/OurWork/ST/NE/NEFW/index.html. You will find a wide spectrum of activities ranging from taking care of legacies to preparing for the future nuclear developments.

Finally, I would like to take this opportunity to send Season's Greetings from all of us in the Division, and wish you and your families a very interesting and successful 2008.

Hans Forsström (H.Forsstrom@iaea.org)

Upgrading Radioactive Waste Management Facilities

Many of the existing waste management facilities were developed and began operation long before current regulatory standards took effect and before the IAEA requirements and guidance, safety assessment methodologies and recommendations for quality management systems became available. New developments in addressing safety issues of disposal facilities, both operational and long-term, have called for corrective actions at those facilities that for various reasons do not comply with the current standards.

Retrieval operations at Püspökszilágy repository, Hungary

The term 'corrective action', comprises all activities and measures undertaken to (a) achieve compliance with updated regulatory requirements; (b) rectify an existing unsafe condition; (c) prevent an unsafe condition from occurring in the future; and (d) respond to societal demands.

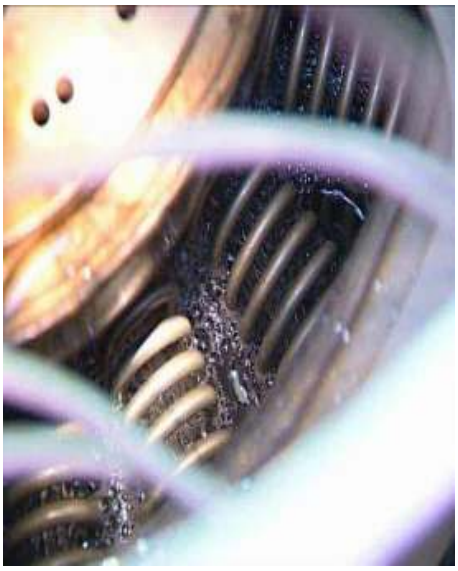
To support upgrading of older facilities in Member States, a Coordinated Research Programme has been initiated to collect practical experience, and provide guidance on assessment of efficiency of performed actions. Nine participants will develop methods for assessing the need for the rehabilitation of current facilities, planning administrative and technical measures, selecting appropriate measuring techniques and remediation technologies and demonstrating the improvements achieved.

L. Nachmilner (L.Nachmilner@iaea.org)

Aqueous Homogeneous Reactors for Isotope Production

There is an increasing worldwide demand for radioisotopes, particularly for ^{99}Mo – the most utilized medical radioisotope at an estimated 20-25 million annual procedures globally. Fulfilling this need is challenged by the complexity of current reactor-, target- and processing system technology as well as the current reliance on highly enriched uranium (HEU).

The use of low enriched uranium (LEU) fuelled aqueous homogeneous reactors (AHRs) or solution reactors presents an interesting alternative to the conventional target irradiation method of producing ^{99}Mo. Solution reactors eliminate the need for targets and can operate at much lower power than required for a target reactor to produce the same amount of ^{99}Mo.



Bubbles from fission induced radiolysis in a Chinese solution reactor

Approximately 30 solution reactors have been built worldwide and operated over many years since the beginning of modern nuclear programmes in the 1940s and 1950s. Most of these reactors are no longer in service. However, in the 1990s a renewed interest in solution reactors for the production of medical isotopes has prompted several countries, including the USA, Russia and China to initiate programmes to assess the feasibility of utilizing AHR technology for medical isotope production applications on commercial basis.

In June the IAEA organized a meeting with experts on solution reactors, isotope production and radiopharmaceutical product development. Participants included experts from China, France, the Netherlands, the Russian Federation, and the USA.

Participants collected information on the state of the art of the relevant technologies, design and operating experience with AHRs and relevant ^{99}Mo and other radioisotope separation and production systems. They further identified principal challenges related to future development and deployment of LEU fuelled AHR systems for the production of radioisotopes. Advantages of solution reactors include low temperature, pressure and power operation (~200 kW); smaller, simplified reactor and control systems; large negative temperature coefficients of reactivity; improved process efficiency through target elimination; and less waste generation per unit product. Challenges to the commercial deployment of solution reactors include the need to further optimize the fuel base, complete the analysis of fission product effects on the process and final products, and determine long term operational effects including corrosion.

SILENE solution reactor, France

The information is planned for publication in an IAEA TECDOC. Included in the meeting outputs is a detailed list of recommendations such as the initiation of an IAEA Coordinated Research Project as well as several specific research activities to further assist in relevant technology development.

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Activities of the Contact Experts Group in 2007

The Contact Experts Group (CEG) was established in 1996 to provide points-of-contact to facilitate cooperation between donor countries and the Russian Federation on environmental remediation of waste arising from earlier military activities in the Russian Federation. In 2007 the CEG organised and conducted two workshops and one plenary meeting.

Nuclear Submarines involved in severe accidents have been stored afloat for more than 20 years in the Far East of Russia. (Source: www.a-submarine.ru)

The first workshop was devoted to discuss the results of the Strategic Master Plan (SMP) for the Nuclear Legacy remediation activities in North West Russia. It was organised in cooperation with the Nuclear Operating Committee of the Northern Dimension Environmental Partnership (NDEP) which is administered by EBRD. The workshop was held on 12 April 2007 at EBRD Headquarters in London, UK. The SMP has been developed

under EBRD funding by a team of Russian experts under the lead of Academician Ashot Sarkisov, IBRAE, Moscow. The SMP presents a comprehensive strategy and a programme for elimination of the Nuclear Legacy in NW Russia and formulates all major tasks that have to be carried out in the area of nuclear submarine dismantlement, management of legacy waste and spent nuclear fuel (SNF), and remediation of contaminated sites and former waste storage facilities. Development of the SMP was based on a sophisticated methodology and systematic approach that enabled developers to identify priorities and take into account interrelations between different tasks and projects, including those that are already being implemented.

To date, 233 projects have been identified by the SMP for a total cost estimate of about €2B. The SMP will form the basis for further development of short- and long-term programmes of Rosatom dealing with radioactive waste management and remediation of contaminated sites and facilities in the NW Region of Russia, and also for planning of international cooperative efforts.

The second workshop was devoted to nuclear legacy problems in the Far East of Russia and was held in Vladivostok, Russia (23-25 May 2007). This workshop provided a clear picture of the region's specifics and the scale of its problems. With momentum gained in NW Russia, the situation and problems of the nuclear legacy in Far East Russia became more crucial, since the work there is performed mainly under Russian funding, which is currently rather limited. International involvement is also limited to the USA and Japan, which is now focused on submarine dismantlement (Japan) and security and safety of radioisotope thermoelectric generators (RTGs) (USA). Some funding for nuclear submarine dismantlement was provided by Australia through the Japanese-Russian programme. The gap between the clean-up activities in the North West and those in the Far East are ever increasing, thus increasing the urgency of Far East nuclear legacy issues.

These include inter alia dismantlement of nuclear vessels and RTGs, isolation of submarines that experienced severe accidents, and management of SNF and radioactive waste. Many projects are similar to those in NW Russia (e.g. construction of the coastal storage for reactor compartments, establishment of the regional centre for radioactive waste management and storage, remediation of the SNF and waste storage facilities, etc.). Therefore, exchange of technical information and lessons learned between the regions is very important and should be supported.

The CEG recognized the good progress of Russian activities in several projects. However, additional international assistance is required to overcome some major obstacles foreseen. In addition, Canada's plans to expand from 2008 its assistance to Russia in this region covering the NPS dismantlement and related activities have been highly appreciated.

Because of the success of the SMP for NW Russia, the CEG is currently supporting the development of a SMP for the Far East of Russia.

Sergey Bocharov (S.Bocharov@iaea.org)

Current Activities Related to HEU Minimization

Several examples of IAEA support of international efforts to eliminate or reduce the use of highly enriched uranium (HEU) in civilian commerce were contained in an article in the July issue of the NEFW Newsletter. Since then several significant projects have been completed in different Member States and other, notable support has been provided toward other HEU minimization goals.

In September the Portuguese Government announced the successful conversion of the Portuguese research reactor at the Instituto Tecnologico e Nuclear in Sacavem, Portugal from HEU to low enriched uranium (LEU). The conversion was completed through an IAEA Technical Cooperation (TC) project, supported by NEFW staff. The scope of the project, begun in 2006, included the supply of engineering services, standard fuel assemblies and control fuel assemblies.

Also in September, 3.97 kg of fresh, Russian origin HEU fuel was safely and securely returned to the Russian Federation from Vietnam through a separate IAEA TC project, again supported by NEFW staff. Earlier in August, 8.79 kg of HEU uranium dioxide powder was successfully returned from Poland to the Russian Federation through the same project.

In December, 360 kg of spent HEU and LEU fuel was returned to the Russian Federation from the NRI Rez facility in Prague, Czech Republic. This transport marked the first use of 10 SKODA VPRM/M dual purpose, spent fuel casks purchased with IAEA assistance specifically to support shipments of research reactor fuel to the Russian Federation.

The IAEA supported the 29th International Meeting on Reduced Enrichment for Research and Test Reactors (RERTR) held in Prague, Czech Republic in September. Over the past years the RERTR series of International Meetings has been held in co-operation with the IAEA,

where the IAEA has provided a number of travel grants for participants from developing Member States.

The meeting reported progress in the conversion of research and test reactors from HEU to LEU and the development of high-density LEU fuels and LEU based processes for radioisotope production. High-density fuels will allow the conversion of the high performance research reactors. The meeting also included several sessions on the backend of the RR fuel cycle especially on the return of foreign research reactor spent fuel to the country where it was originally enriched.

Since May 2004, GTRI has accelerated permanent threat reduction efforts. To date the GTRI has:

- Converted 55 RRs from HEU to LEU fuel
- Removed 1,749 kg of HEU and Pu (enough to make 70 crude nuclear bombs)
- Removed more than 15,500 radiological sources in the US (enough to make over 1,500 dirty bombs)
- Protected over 590 radiological sites around the world

Pablo Adelfang (P.Adelfang@iaea.org)

Repatriation of Radioactive Sources in Nigeria – A Difficult Task

The Nigerian Nuclear Regulatory Authority (NNRA) has asked the IAEA for assistance with the repatriation of seven high-activity (^{60}Co and ^{137}Cs) disused radioactive sources. The NNRA was concerned about the safety and security of the sources, which were distributed between hospitals in Lagos and Ibadan, and a Research Centre in Vom, about 700 km north-east of Lagos.

NEFW staff organised an operation to transfer the sources to a safe and secure environment. Two of the sources should be repatriated to Canada, their country of origin, and licensed transport packages were provided by the original supplier, MS Nordion. The other sources were transferred to the Waste Processing Facility at the Centre of Energy Research and Technology (CERT) in Zaria in the north of Nigeria. The work was performed by a team of the South African company Necsa and the Canadian company MDS Nordion.

Dismantled Russian teletherapy head

The overall operation proved to be extremely difficult. A number of problems had to be overcome during the operation. With a team of experts contracted by the Agency, the mission started in Lagos where two teletherapy units were located.

One source was housed in an old Russian teletherapy unit. Dismantling proved difficult due to a lack of drawings for the equipment, but the work was accomplished successfully. The teletherapy head was packed into a steel overpack and a truck was ordered to transport the package to Zaria, via Ibadan, where three additional brachytherapy sources were taken on board. The next stop was Abuja, but due to terrible traffic, poor road conditions, and constant vehicle breakdowns, the truck was severely delayed and arrived two days late in Abuja. At Abuja airport the transport container for one of the sources to be repatriated was picked up.

The mission continued to Vom to collect two irradiators

Crane in front of burned building housing sources at Vom

containing very high activity sources. The building containing the irradiators had burned down in 2002 leaving them exposed to the weather and surrounded by burnt debris from the collapsed roof. Both units were loaded onto the truck with great difficulty as the crane ordered for the work arrived very late and it was already dark when the loading started; the work was finished just before midnight.

The transport of the six collected sources to Zaria was carried out without major problems and five of them were unloaded and put in a safe storage at the CERT Centre, while the sixth source in its transport container was transported to Lagos for the return shipment. The

final operation took place at the Lagos Hospital, where the remaining teletherapy head was dismantled and the

Two irradiators in the burned building at Vom

source transferred to a second transport container for subsequent repatriation.

All transport of the sources within Nigeria required a high degree of coordination with both the national and local government authorities. The sources were at all times escorted by police, by members of the Nuclear Security Committee (bomb squad), and also by members of NNRA as well as IAEA staff and contractors. Due to the problems described, the operation took twice as long as originally planned, but the mission was finally accomplished with the help of the Nigerian authorities and two sources have been successfully returned to Canada.

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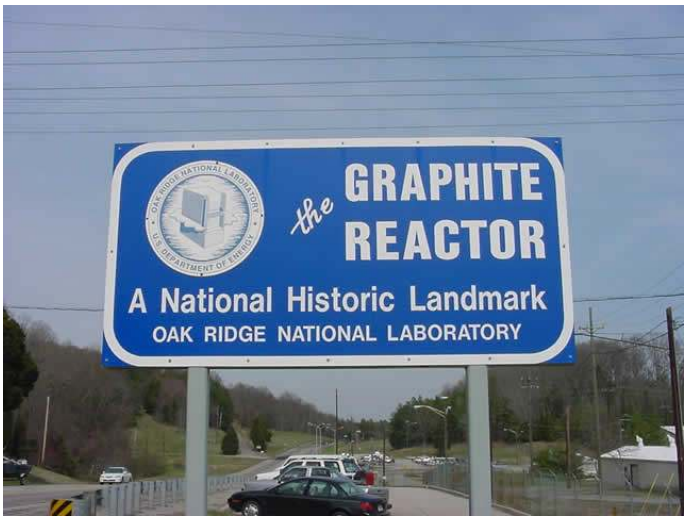
2007 TWGNFCO Meeting

The sixth meeting of the Technical Working Group on Nuclear Fuel Cycle Options and Spent Fuel Management (TWGNFCO) was convened in Vienna 9-11 October 2007. 28 participants from 15 Member States contributed to four panel sessions and reviewed IAEA work and plans in these areas.

Session one on policies and options for national approaches highlighted ambitious plans for expansion of nuclear power, with national security/self-sufficiency providing some motivation. Since no significant fast reactor contribution is expected before ~2050, advanced LWRs are needed to bridge the gap. Increasing attention is being paid to proliferation resistance.

Session two on spent fuel storage confirmed that wet and dry technologies are mature, but noted that more work is needed for long storage durations (e.g. 100 years and beyond).



Session three addressed recycling over the next 20 years, while session four looked ahead to longer term options. Reprocessing was recognized as a long term commitment involving a long time lag between decision and implementation. Reprocessing is limited to only a few countries and is becoming more dedicated to domestic users. Trends highlighted in sessions above (e.g. higher uranium prices and increasing spent fuel storage durations and quantities) are increasing interest in reprocessing. Current reprocessing technologies were confirmed to be technically mature.

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Stakeholder Involvement in Decommissioning – A Draft Technical Report in Preparation

Over the past decade, radioactive waste management institutions have become progressively more aware that technical expertise and technical confidence are insufficient on their own, to justify waste management solutions to a wider audience, or to see them through to successful implementation. Because of changes in society's decision-making environment and heightened public sensitivity to all matters connected to nuclear power, radioactivity, and especially radioactive waste, any decision regarding whether, when and how to implement waste management solutions will typically require thorough public examination and the involvement of many relevant stakeholders. The latter include waste management agencies, safety authorities, local communities, elected representatives, and technical intermediaries between the general public and decision-makers. In particular, the decision-making process is highly dependent on stakeholder involvement when risks and benefits are largely separated in time. As a major radioactive waste generating activity, decommissioning of nuclear facilities is fully subject to the above-mentioned considerations.

Decommissioning also includes aspects in addition to waste management, which are of interest to a wider range of stakeholders. The way in which local communities and the public in general are engaged in dialogue about decommissioning of nuclear facilities is likely to become an increasingly important issue as the scale of the activity grows. A technical report on this subject is in preparation.

The main objective of this report is to gather information on stakeholder impacts from/on decommissioning and related issues in Agency Member States. The report addresses the worldwide experiences related to stakeholder interactions associated with decommissioning of nuclear facilities, taking account of the work of other organisations, in particular the OECD Nuclear Energy Agency. It is expected that the report will improve awareness of the range of issues that may be of concern to stakeholders and approaches that have been used to reconcile them. To begin with, technological progress needs to be adequately communicated to the general and professional non-nuclear public who are displaying increasing interest in economic and environmental issues of industrial activities, nuclear in particular.

It should be noted that the term 'stakeholders' in the context of nuclear activities is often used to designate the public and specific segments of it. However, this report takes a broader interpretation beyond public opinion groups and those living in the vicinity of a nuclear facility being decommissioned. In a world which is rapidly becoming a 'global village', a major decommissioning project has a much broader audience. The picture shows an 'unlikely' group of potential stakeholders, i.e. those who consider decommissioning sites as landmarks of industrial heritage.

Finally, this report aims to identify a broad spectrum of stakeholders, and concrete or perceived interactions with them vis-a-vis the decommissioning process.

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International Decommissioning Network (IDN) - Initial Activities

The IDN was launched at a side event at the General Conference in September with over 40 delegates attending. The Directors of NEFW, NSRW, and TC-Europe jointly presented their views on the importance of the Network to the IAEA and to the organizations from Member States expected to participate, emphasizing in particular the intent that the IDN would facilitate the sharing of practical and user-oriented decommissioning experience.

Following this successful launch, experts from 35 countries gathered at a Technical Meeting in Vienna at the end of October to confirm their intention to participate, adopt the Terms of Reference, define priorities and develop the initial work programme for the Network. As part of the Terms of Reference, it was agreed to recognize organizations that possess a demonstrated breadth of decommissioning experience, a record of excellence in a wide range of areas, facilities suitable for demonstration or training, and a willingness to share their experience through the IDN as **'Centres of Excellence in Decommissioning'**. The participants indicated their preferences for additional training events and hands-on demonstrations focussed on decommissioning of research reactors, fuel-cycle facilities, and other small facilities such as medical or research labs. Drawing on the input received at the meeting, a consultants group met during and after the meeting to outline the most important course areas identified. These included:

- facility (radiological) characterization
- cutting and decontamination techniques
- management and clearance of decommissioning waste
- 'general training' on decommissioning to enable managers to develop decommissioning strategies and plans based on appropriate technologies
- cost estimation for small facilities

Several countries indicated their interest in hosting specific events, including Australia, Canada, France, Rep. of Korea, Spain, Slovakia, South Africa, the UK, and the USA. Furthermore, a number of countries offered experts to participate in these events (i.e. Belgium, Germany, Japan, the Philippines, and the Russian Federation). The delegate from China offered their recently shut down heavy water research reactor as a potential additional decommissioning project within the frame of the Research Reactor Decommissioning Demonstration (R2D2) project, which is managed by the IAEA. The delegate from India offered to host an event on Radiation Protection and related waste management topics. Meeting participants from three training centres (INSTN in France, KAERI in the Rep. of Korea, and Vuje in Slovakia) noted that they also had facilities available that could be used for training. Pursuit of such offers is intended, as it would be consistent with the IDN's objective to create regional 'nodes' for on-site training and demonstrations.

Finally, the participants expressed interest in a web-based decommissioning forum to support the exchange of experience amongst IDN practitioners, and the consultants group came up with valuable suggestions to make the web-based initiative a 'living experience'. For more information, please see the workshop summary and participants' contributions at www.iaea.org.

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Spent Fuel Publications

The spent fuel management unit at the IAEA has been heavily involved in completing technical publications in 2007. Since status was reported in the second NEFW newsletter this year, the following publications have been produced.

STI/PUB/1295

A report of the proceedings at the 2006 International Conference on management of spent fuel from nuclear power reactors was issued in 2007. The conference was attended by 150 representatives from 40 countries and international organizations. As highlighted at the conference and in the latest IAEA Annual Report, spent fuel management is one of the more important factors influencing the future of nuclear energy. A CD containing contributed technical papers is enclosed at the back of the 491-page proceedings

TECDOC-1547

The proceedings of the fourth major meeting held by the IAEA on burnup credit applications was issued in 2007 as a 453-page technical document entitled Advances in Applications of Burnup Credit to Enhance Spent Fuel Transportation, Storage, Reprocessing, and Disposition. Sixty participants from 18 countries met in London for intensive sessions on calculation methodology, validation and criticality, safety criteria, procedural compliance with safety criteria, benefits of burnup credit applications, and associated regulatory aspects.

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The Thorium Fuel Cycle

Thorium is nearly three times more abundant in nature compared to uranium and occurs mainly as 'fertile' ^{232}Th isotope. Historically thorium fuels have not been commercially developed because the estimated uranium resources were thought to be sufficient. However, in recent years, there has been renewed interest in thorium because of:

- the intrinsic proliferation resistance of the thorium fuel cycle due to the presence of ^{232}U and its strong gamma emitting daughter products;
- better thermo-physical properties and chemical stability of ThO_2, as compared to UO_2, which ensures better in-pile performance and a more stable waste form;
- lesser production of long lived minor actinides than the traditional uranium fuel cycle;
- superior plutonium incineration in (Th, Pu)O_2 fuel as compared to (U, Pu)O_2;
- attractive features of thorium related to accelerator driven system (ADS) and energy amplifier (EA);
- dramatic increase in price of uranium raw material and easy availability of thorium ores in several beaches and river banks all over the world.

The IAEA has been conducting several activities related to the thorium fuel cycle and publishing technical documents on the subject (including: IAEA-TECDOC-1155 (May 2000), IAEA-TECDOC-1319 (November 2002) and IAEA-TECDOC-1450 (May 2005).

A Technical Meeting on 'Thorium–based fuels and fuel cycle options for PHWR, LWR and HTGR' was held in Cekmece Nuclear Research and Training Centre in Istanbul, Turkey from 22 to 25 October, 2007 with participation of 22 international experts from Australia, Brazil, Canada, China, Germany, India, Indonesia, Norway, Qatar, Russian Federation, UAE, and USA and 47 local experts from Turkey. Topics covered in the meeting included: worldwide thorium deposits; processing of thorium ores; manufacturing experience and properties of different thorium based fuels and their irradiation experience in water-, gas- and liquid metal-cooled reactors; and non-proliferation issues related to the thorium fuel cycle.

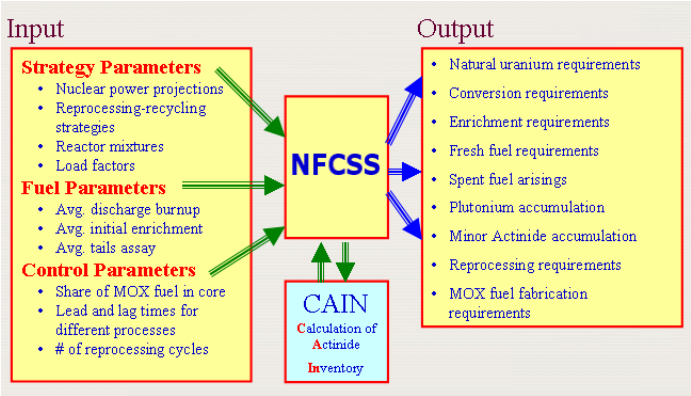
Mehmet Ceyhan (M.Ceyhan@iaea.org)

Nuclear Fuel Cycle Simulation System (NFCSS)

The Nuclear Fuel Cycle Simulation System (NFCSS, formerly called VISTA) is a scenario based simulation tool for the estimation of fuel cycle service requirements. It was developed by the IAEA in the 1990s to support an International Symposium on "Nuclear Fuel Cycle and Reactors Strategies: Adjusting to New Realities" in 1997. The system has been designed to estimate long-term fuel cycle requirements and actinide challenges.

The NFCSS uses simplified approaches to calculate the

fuel cycle requirements. These simplified approaches enable the code to estimate the long term fuel cycle service requirements for both open and closed fuel cycle strategies without complex modelling and data entry.

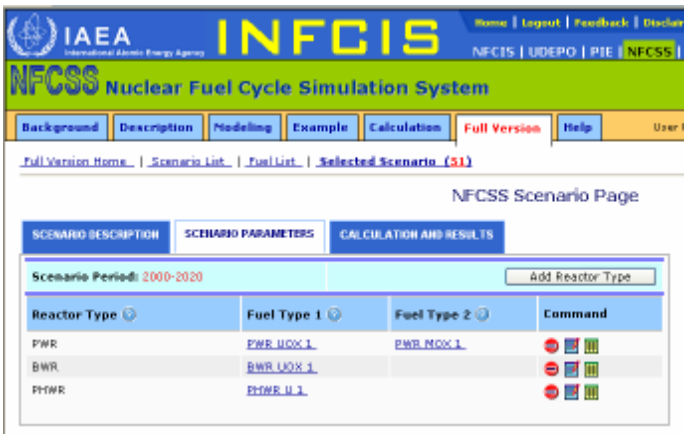


NFCSS input and output parameters

NFCSS consists of two modules. The main module (NFCSS) calculates the overall material flow for a given nuclear fuel cycle option, defined by the input parameters. The second module is the reactor depletion module which calculates the isotopic composition of spent fuel during the discharge time or after some storage period. The second module is called Calculation of Actinide Inventory (CAIN).

A web site which describes the structure and capabilities of NFCSS has been available online since 2005 for registered users at http://www-nfcis.iaea.org. The existing web site contains a simple web tool to calculate annual requirements for a specific fuel cycle option and given parameters. The users can change the parameters and then get the new results from the system quickly. The result is displayed in graphical form to illustrate the material flow in the selected option.

The development of the web based full version of the NFCSS tool has been completed and test operations have been performed successfully. The preparation of user guides and training materials are ongoing. The NFCSS full version will soon be available on the same web site. Users will be able to utilize the full capabilities of the NFCSS tool including defining a scenario for a virtually unlimited time period with practically unlimited number of reactor types; defining scenario parameters changing by year; displaying the results in table or chart form; and exporting and importing the scenario data and its results to or from MS Excel. The users will be able to define their own scenarios and run the scenario on the server. There is no need to store the data or the results in the local PC. There is no need to install anything to a user's PC.



The NFCSS has a database for several existing and new reactor types in its library. The users can use those built-in reactor and fuel types in their scenario. The users can also define their own reactor and fuel types. The NFCSS will be continuously upgraded and expanded to include new reactor and fuel types in its library.

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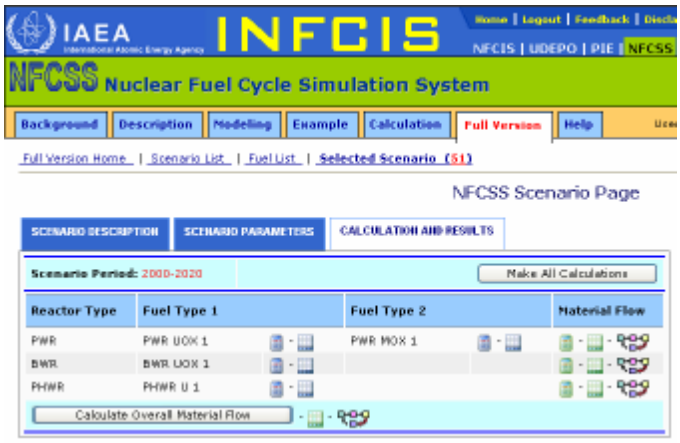
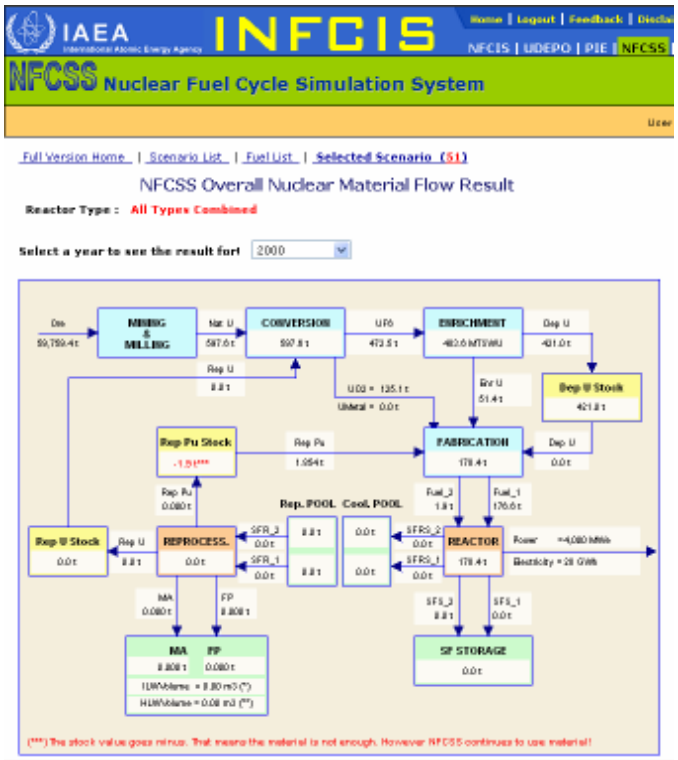




Recent Publications

Technical Reports Series No. 444
Redevelopment of Nuclear Facilities after Decommissioning (2006)

Technical Reports Series No. 445
Applicability of Monitored Natural Attenuation at Radioactively Contaminated Sites (2006)

Technical Reports Series No. 446
Decommissioning of Research Reactors: Evolution, State of the Art, Open Issues (2006)

Technical Reports Series No. 450
Management of Long Term Radiological Liabilities: Stewardship Challenges (2006)

Technical Reports Series No. 456
Retrieval and Conditioning of Solid Radioactive Waste from Old Facilities (2007)

STI/PUB/1295
Proceedings of June 2006 International Conference on Management of Spent Fuel from Nuclear Power Reactors (2007) **NEW!**

IAEA-TECDOC-1563
Characterization, Treatment and Conditioning of Radioactive Graphite from Decommissioning of Nuclear Reactors (2007) **NEW!**

IAEA-TECDOC-1523
Optimization Strategies for Cask Design and Container Loading in Long Term Spent Fuel Storage (2006)

IAEA-TECDOC-1527
Application of Thermal Technologies for Processing of Radioactive Waste (2006)

IAEA-TECDOC-1529
Management of Reprocessed Uranium – Current Status and Future Prospects (2007)

IAEA-TECDOC-1532
Operation and Maintenance of Spent Fuel Storage and Transportation Casks/Containers (2007)

IAEA-TECDOC-1534
Radioactive Sodium Waste Treatment and Conditioning: Review of Main Aspects (2007)

IAEA-TECDOC-1535
Nuclear Fuel Cycle Simulation System (VISTA) (2007)

IAEA-TECDOC-1537
Strategy and Methodology for Radioactive Waste Characterization (2007)

IAEA-TECDOC-1538
Categorizing Operational Radioactive Waste (2007)

IAEA-TECDOC-1547
Advances in Applications of Burnup Credit to Enhance Spent Fuel Transportation, Storage, Reprocessing and Disposition (2007)

IAEA-TECDOC-1548
Retrieval, Restoration and Maintenance of Old Radioactive Waste Inventory Records (2007)

IAEA-TECDOC-1553
Low and Intermediate Level Waste Repositories: Socioeconomic Aspects and Public Involvement (2007)

IAEA-TECDOC-1558
Selection of away from reactor facilities for spent fuel storage (2007) **NEW!**

IAEA-TECDOC-1566
Factors Affecting Public and Political Acceptance for the Implementation of Geological Disposal (2007) **NEW!**

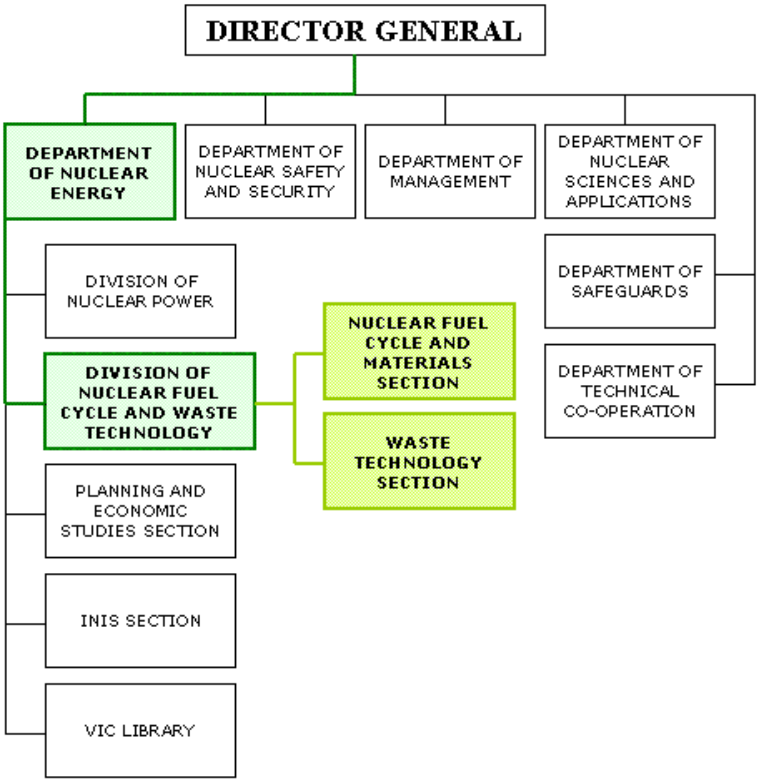
Radioactive Waste Management Profiles No. 8
A Compilation of Data from the Net Enabled Waste Management Database (NEWMDB) (2007)

STI/PUB/1259
Uranium Production and Raw Materials for the Nuclear Fuel Cycle - Supply and Demand, Economics, the Environment and Energy Security (2006)

Meetings in 2008

Date	Title	Place	Contact
21-25 January	Technical Meeting on Benchmarking of Liquid and Solid Waste Generated by WWER Reactors	Vienna Austria	Z.Drace@iaea.org
5-7 February	Technical Meeting of the International Working Group on Research Reactors	Vienna Austria	P.Adelfang@iaea.org
11-14 March	Annual WATEC Meeting	Vienna Austria	J.-M.Potier@iaea.org
23-25 April	Technical Meeting on Training in and Demonstration of Waste Disposal Technologies in Underground Research Facilities—an IAEA Centre of Excellence	Wettingen Switzerland	B.Neerdael@iaea.org
28-29 April	Annual Meeting of the Technical Working Group on Fuel Performance and Technology (TWGFPT)	Vienna Austria	V.Inozemtsev@iaea.org
12-16 May	Technical Meeting to Prepare a Technical Document on Spent Fuel Data Management	Vienna, Austria	Z.Lovasicr@iaea.org
19-23 May	Technical Meeting to Prepare a Technical Document on Management of Equipment Containing Radioactive Sources	Vienna Austria	J.Balla@iaea.org
19-29 May	Technical Meeting to Prepare a Technical Document on Discussing the Use of Underground Caverns for Long Term Radioactive Waste Management	Vienna Austria	B.Neerdael@iaea.org
26-30 May	Technical Meeting on PHWR Fuel Design, Fabrication and Performance	Argentina	J.Killeen@iaea.org
26-30 May	Workshop to Maintain and Update the Nuclear Fuel Cycle Simulation System (NFCSS) to Model Whole Nuclear Fuel Cycle Including Innovative and Future Systems	Vienna Austria	M.Ceyhan@iaea.org
13-19 June	42nd Joint OECD/NEA-IAEA Uranium Group Meeting	Adelaide Australia	J.Slezak@iaea.org
1-5 September	Technical Meeting on Accelerator Simulation and Theoretical Modelling of Radiation Effects	Kharkov Ukraine	V.Inozemtsev@iaea.org
8-12 September	Technical Meeting to Prepare a Technical Document on Benchmarking of Liquid and Solid Waste Generated by WWER and CANDU Reactors	Vienna Austria	Z.Drace@iaea.org
9-11 September	Technical Meeting to Prepare a Technical Document on Borehole Repositories for the Disposal of Disused Radioactive Sources: Technical and Institutional Considerations	Vienna Austria	L.Nachmilner@iaea.org
13-16 October	Technical Meeting to Prepare a Technical Document on Storage Facility Operations and Lessons Learned	Vienna Austria	W.Danker@iaea.org
13-17 October	Technical Meeting to Prepare a Technical Document on Best Practices in Uranium Mining, Milling and Production	Vienna Austria	J.Slezak@iaea.org
12-14 November	Technical Meeting to Maintain and Update the Nuclear Fuel Cycle Information System	Vienna Austria	M.Ceyhan@iaea.org
10-15 November	Technical Meeting to Prepare a Technical Document on Reference Design for Storage Facility for Low-level Radioactive Waste from Nuclear Applications and/or Disused Sealed Radioactive Sources	Vienna Austria	Z.Drace@iaea.org
10-21 November	Workshop on Training in Basic Radiation Materials Science and its Applications to Radiation Effects Studies and Development of Advanced Radiation Resistant Materials	ICTP Italy	V.Inozemtsev@iaea.org
17-21 November	Technical Meeting on Uranium Exploration and Mining Methods	Brazil	J.Slezak@iaea.org
November	Technical Meeting to Prepare a Technical Report on Planning and Design of Geological Repositories	Vienna Austria	B.Neerdael@iaea.org

Division of Nuclear Fuel Cycle and Waste Technology Web Site Links
Division Introduction - NEFW Home: http://www.iaea.org/OurWork/ST/NE/NEFW/index.html



Nuclear Fuel Cycle and Materials Section (NFCMS)

- Main activities
  http://www.iaea.org/OurWork/ST/NE/NEFW/nfcms_home.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_infcis.html

Waste Technology Section (WTS)

- Main activities
  http://www.iaea.org/OurWork/ST/NE/NEFW/wts_home.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_information.html

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