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Fuel Cycle and Waste Newsletter

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International Atomic Energy Agency Scientific Forum

RADIOACTIVE WASTE: MEETING THE CHALLENGE

Science and Technology for Safe and Sustainable Solutions

23–24 September 2014, Vienna, Austria

Scientific Forum 2014 to focus on Radioactive Waste

Amano: "Safe, Sustainable, Viable Waste Management"

Director General Yukiya Amano announced at the IAEA Board of Governors meeting on 3 March 2014 that the next Scientific Forum would focus on the technology of radioactive waste management. NEFW Newsletter interviewed him on the Forum, which will be held on 23 and 24 September 2014 during the 58th General Conference.

Why have you chosen radioactive waste as the theme of the next Scientific Forum?
Radioactive waste management must be addressed by all Member States that use nuclear technologies for agriculture, food, health, industry, research, water management or the generation of nuclear power.

Safe and sustainable management of different classes of radioactive waste – and of spent nuclear fuel – requires the use of a range of tried-and-proven as well as innovative technologies. That's why I decided to focus the next Scientific Forum on the technologies for the management of all types of radioactive waste. More specifically, I wanted to provide a platform for experts to discuss both the challenges and solutions to radioactive waste and spent nuclear fuel management.

Is this Scientific Forum focused on waste from nuclear power plants or from other uses of nuclear technology?
Both. Nuclear technologies are widely used in food and agriculture, medicine, industry and research. So the Forum will be interesting for all IAEA Member States that have to manage such institutional radioactive waste. ...

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Focusing on Waste

Since the last issue of our Newsletter, we have had quite important meetings and missions. We thank all the participants at and followers of our side events at the 57th General Conference.

As you will be reading from the detailed interview with the IAEA Director General Yukiya Amano, we have taken up an important assignment for the next General Conference in September 2014: As the Department taking the lead on the technology of the fuel cycle, we are also asked to take the lead for the Scientific Forum that will focus on the technical aspects of radioactive waste management. We will do our best, working in a one-house approach with colleagues from across the Agency, to offer you an interesting Forum that will discuss the latest developments as well as the challenges for the safe management of radioactive waste. Following up on our coverage in the September 2012 issue of this Newsletter, we want to highlight that there are indeed technical solutions to it.

In this issue, you will read about our continued engagement with Japan's intensive environmental remediation work off-site the Fukushima Daiichi nuclear power plant and the decommissioning work at the facility. As Director General Amano told the IAEA Board of Governors on 3 March, "the situation remains complex, and challenging issues must be resolved to ensure the plant's long-term stability."

I hope you also find the articles on the many aspects of waste management, research reactors and uranium mining interesting.

Competent staff is our biggest asset. I thank all the colleagues, our experts in missions, meeting participants who contribute to a safe, secure, sustainable nuclear fuel cycle. Along the way, we had to bid farewell to Julie Whitworth from the Source Management Unit of the Waste Technology Section and we welcomed Martin Fairclough to the Nuclear Fuel Cycle and Materials Section.

We look forward to your feedback on our *website*, the *NE News App*, which, in addition to iPad and iPhone, is now available for Android devices from the Google store, and our *Twitter* account, to help us improve.

Juan Carlos Lentijo, Director (j.c.lentijo@iaea.org)

Fukushima: Decommissioning & Remediating

Much progress, but challenges remain

The IAEA dispatched two international peer review missions to Japan in the last quarter of 2013. Acknowledging significant accomplishments since the March 2011 accident, the missions encouraged Japan to continue with its current efforts and gave advice for future activities in off-site remediation and on-site decommissioning.

Remediation of Large Contaminated Off-site Areas

The accident at the Fukushima Daiichi nuclear power plant led to the radioactive contamination of large areas. The Government of Japan formulated a programme for the recovery of these areas, in coordination with reconstruction activities. It developed a strategy and plans for implementing remediation activities to minimize the impacts caused by the contamination. The Government requested the IAEA to evaluate the progress of remediation works since the first IAEA International Mission on Remediation of October 2011. Hence, the *Follow-up IAEA International Mission on Remediation of Large Contaminated Areas Off-site the Fukushima Daiichi Nuclear Power Station* was conducted from 14 to 21 October 2013. Juan Carlos Lentijo (Director, NEFW) led the 16-member mission team that included three experts in charge of preparing the IAEA Fukushima Report.

The mission assessed information provided to the team through professional and open discussions with representatives of the national, prefectural and local institutions that deal with the remediation of the affected areas. The authorities provided comprehensive information on their programmes.

The mission team visited the affected areas, including several sites where remediation activities were under way.

They also visited some temporary storage sites for radioactive waste and soil generated during the remediation activities, a survey area for a facility for their interim storage, and a demonstration facility for incineration of sewage sludge.

The team recognized that Japan was allocating enormous resources for both planning and implementing remediation activities, with the aim of enhancing the living conditions of the people affected by the nuclear accident and enabling evacuated people to return to their homes. They also noted that these efforts resulted in good progress in the remediation activities and that the advice provided by the 2011 mission was, in general, appropriately taken into account. The team was impressed to see good progress in the coordination between the remediation activities and the reconstruction and revitalisation efforts.

Acknowledgement of progress

The Mission Report acknowledged important progress in various areas, such as:

- Good progress has been made in remediating affected farmland in the Intensive Contamination Survey Area. Intensive monitoring of foodstuffs has also shown that much of the land can produce food below the reference level for permissible radioactivity, and that the application of potassium fertilizer was an effective remediation measure.
- Comprehensive food safety measures protect consumers and improve consumer confidence in farm produce, as reflected in the recovery of the economic value of crops.
- Significant progress has been made by municipalities and the national government in establishing temporary sites for storing materials generated by on-going remediation activities. The mission team also noted the progress made by the government, in cooperation with municipalities and local communities, in securing suitable sites for establishing interim storage facilities.

Remediation of forests around residential areas, farmland and public spaces. (Photo: G.Tudor/IAEA)

- A new approach for comprehensive monitoring and data management is coordinated by the Nuclear Regulation Authority (NRA). This approach will lead to enhancing the assessment of the status of the environmental conditions in the affected areas vis-à-vis the radioactive levels.

A temporary storage site in Date city. (Photo: G.Tudor/IAEA)

Further advice

The Mission Report also offered advice for further improvement on eight points, such as:

- Japanese institutions are encouraged to increase efforts to communicate that in remediation situations, any level of individual radiation dose in the range of 1 to 20 mSv per year is acceptable and in line with the international standards and the recommendations from the relevant international organisations, e.g. ICRP, IAEA, UNSCEAR and WHO.
- The Government should strengthen its efforts to explain to the public that an additional individual dose of 1 mSv per year is a long-term goal, and that it cannot be achieved in a short time, e.g. solely by decontamination work. A step-by-step approach should be taken towards achieving this long-term goal.
- Communicating more the entire remediation and reconstruction programmes and how the various components interact (for example, trade-offs between reducing exposure and increasing waste volumes) could reduce some uncertainties and provide greater confidence in the decisions being made.

Decommissioning of Fukushima Daiichi NPS

The decommissioning of the Fukushima Daiichi NPS is a very challenging task that requires the allocation of enormous resources, as well as the development and use of innovative technologies. Upon request from the Government of Japan, the IAEA organized an *International Peer Review on Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4*.

The review was conducted in two stages. The first mission to Japan was conducted from 15 to 22 April 2013 (as reported in the September 2013 NEFW Newsletter).

The second mission was organized from 25 November to 4 December 2013. This mission examined a variety of issues related to decommissioning the power plant, but the focus was on the removal of fuel assemblies from the spent fuel pool of Reactor Unit 4 and on contaminated water management issues. It also considered Japan's efforts to

monitor radiation conditions in the marine environment, including seawater, sediments, and biota.

Juan Carlos Lentijo led the team of 16 international experts. Three experts in charge of preparing the *IAEA Fukushima Report* accompanied the mission as observers. The team held extensive discussions with officials from the Ministry of Economy, Trade and Industry (METI), the International Research Institute for Nuclear Decommissioning (IRID) and TEPCO. The team exchanged views on the contaminated water issue with members of the Committee on Countermeasures for Contaminated Water Treatment and discussed marine monitoring with officials from the NRA.

IAEA mission members on the Common Spent Fuel Pool. (Photo: G.Webb/IAEA)

The team also visited the nuclear accident site to observe progress on the Roadmap activities and to gain first-hand information about current plant conditions. The team recognized that Japan developed its Roadmap towards decommissioning the plant promptly after the accident, and since then, has achieved good progress in improving its strategy and the associated plans, as well as in allocating the necessary resources for this final goal.

The team observed that, since the first mission in April 2013, the Government and TEPCO revised the Roadmap based on more-realistic assumptions, reflecting the current knowledge of the condition of each specific unit, and the feedback and opinions from stakeholders. The advice provided by the first mission in April 2013 was also taken into account. In particular, the team noted that the Government and TEPCO have increasingly been more proactive in addressing the many difficulties at the site. The situation, however, remains very complex, and there will continue to be very challenging issues that must be resolved to ensure the plant's long-term stability.

Progress made

The Mission Report acknowledged a number of accomplishments in preparing for the decommissioning of the NPS, such as:

- TEPCO has successfully begun to remove fuel assemblies from the Spent Fuel Pool of Reactor Unit 4, a task that is essential to ensuring the long-term stability of the accident site;
- While many challenges remain, the Government and TEPCO have developed a comprehensive set of well-defined measures to manage the contaminated water issues;
- The NRA and other institutions have established a comprehensive monitoring programme to track radiation levels in the environment around the accident site, including the marine environment; and
- TEPCO and METI have pressed forward with developing innovative tools to address key technical problems. For example, the development of remote technology to identify the location of reactor leaks has seen initial success and should serve as a significant step towards repairing the containment vessels.

To improve

The Mission also suggested that current practices could be improved in some areas, such as:

- The Government and TEPCO are encouraged to continue their efforts to address water issues at the site, including preventing groundwater from entering the reactor buildings and monitoring the effectiveness of all such measures;
- Regarding the growing amounts of contaminated water at the site, TEPCO should bolster its efforts to treat this water and then examine all options for its further management. This could include resuming controlled discharges in compliance with authorized limits. To pursue this option, TEPCO should prepare appropriate safety and environmental impact assessments and submit them for regulatory review;
- Japan needs to continue its transition to long-term stability of the site and to develop waste management solutions. Waste facilities should be planned to support the decommissioning process for its lifetime, and a laboratory should be established for waste characterization; and
- The NRA should enhance the seawater monitoring programme by coordinating inter-laboratory comparisons to ensure good harmonization of the environmental data.

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IAEA mission members near the contaminated water tanks. (Photo: G.Webb/IAEA)

Continued from p. 1

Amano on Waste Management

… And of course, technological developments in waste management, including in the geological disposal of high level waste and spent nuclear fuel, will be of direct interest to the 30 Member States operating nuclear power plants today, as well as to the similar number of countries that have decided to launch nuclear power programmes or are considering doing so.

What do you want to achieve through this Scientific Forum?

The objective is to take stock of technological developments related to the management of all types of radioactive waste worldwide and to show that solutions exist in many cases and that challenges are being handled.

Many people outside the nuclear field think that no safe solutions exist for managing their radioactive waste and spent nuclear fuel. This general perception is not correct, but it cannot be ignored and requires attention from multiple angles. One angle needs to focus on promoting the sound governance of any project involving a nuclear installation or the handling of radioactive material. Another one needs to maintain focus on providing solutions "that work".

Available solutions can be readily illustrated when reviewing the successive steps of radioactive waste management. Waste characterization, treatment and conditioning are well mastered and are carried out safely, using tried and proven technologies. Radioactive waste and spent nuclear fuel have been transported by road, rail or sea, as warranted. They have been safely stored in dedicated facilities for decades.

Furthermore, disposal programmes have been successfully implemented for very low level, low level, and intermediate level waste, which make up most of the world's radioactive waste. Safe disposal of the first two can be achieved with near-surface disposal facilities. As their name indicates, these are located at or near ground level and rely on the use of engineered barriers, such as waste forms and containers, vaults or silos, liners and covers. As far as intermediate level waste is concerned, safe disposal requires a geological disposal facility.

Geological disposal of high level waste and spent nuclear fuel declared as waste has not yet been licensed. We can't say that this is a tried-and-proven solution. However, there has been substantial work and development on its safety, as well as on the technical feasibility of construction, operation and closure. Several Member States are at or near the licensing stage.

How does the IAEA assist Member States?

Our goal is to support Member States in adopting technically sound and safe solutions for managing all types of radioactive waste. Technical experts from the Departments of Nuclear Energy, Nuclear Safety and Security, Nuclear Sciences and Applications, as well as Technical Cooperation, implement IAEA support in many ways. We develop safety standards and guidance, we publish technical reports, and we organize training courses, workshops and technical meetings to assist with safe and sustainable implementation of national radioactive waste management.

The IAEA Network of Underground Research Facilities for Geological Disposal (URF) and the International Low Level Waste Disposal Network (DISPONET) are examples of the tools we have put in place to share information on state-of-the-art approaches to radioactive waste disposal. The IAEA's projects on Demonstrating the Safety of Geological Disposal (GEOSAF) and on Practical Illustration and Use of the Safety Case Concept in the Management of Near-Surface Disposal (PRISM) are also key parts of our toolbox.

What is the biggest concern when dealing with radioactive waste?

Director General Yukiya Amano at the 2013 Scientific Forum. (Photo: D.Calma/IAEA)

For radioactive waste and spent fuel management to be effective, it must address safety, security and technical feasibility and involve stakeholders. It should be clearly understood that responsible use of nuclear technology includes the safe and responsible management of the radioactive waste generated. There should be clear frameworks allocating responsibilities. Comprehensive national strategies should cover disposal solutions for the entire national inventory of radioactive waste. There should be adequate, sustained human and financial resources. Stakeholders should be involved and it should be demonstrated that disposal is a safe solution.

What results do you expect from the Scientific Forum?

I expect the Scientific Forum to contribute to the sharing of knowledge and experience among all Member States on how to manage radioactive waste, adapted to their national circumstances. I hope participants will gain a better understanding of the challenges involved and possible solutions. Renowned experts and organizations in waste management will share their specific expertise through presentations, discussion panels and exhibits. We will also use the opportunity to emphasize how the IAEA can support Member States in developing and implementing safe, sustainable, viable waste management solutions.

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Managing Spent Fuel and Radioactive Waste

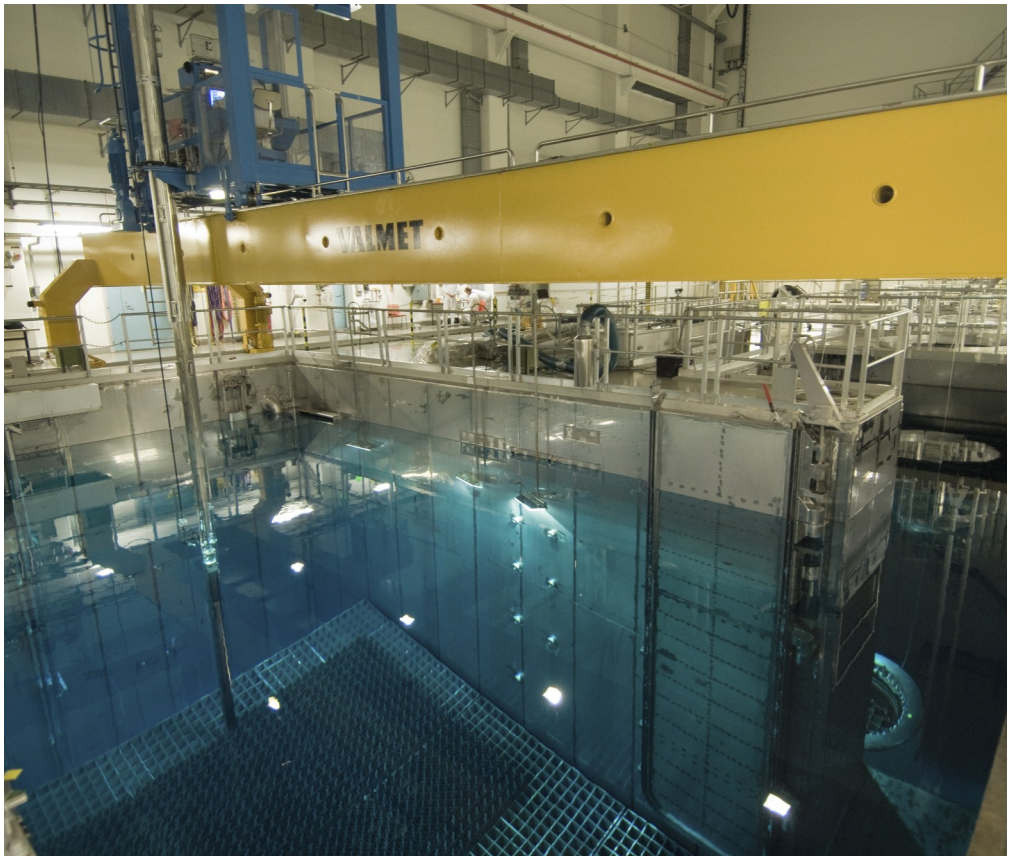
How Should Nuclear Newcomers handle it?

A recent IAEA publication on establishing a sound management structure for radioactive waste and spent fuel provides a concise summary of key issues to be addressed by countries embarking on a nuclear power programme.

Today, 30 countries use nuclear power in energy production and about the same number consider introducing it in their energy mix. Many of these so-called "newcomer" countries have limited experience in managing radioactive waste and spent nuclear fuel.

They often have limited information about available technologies and approaches for safe and long-term management of radioactive waste and spent nuclear fuel arising from power reactors.

The lack of basic know-how and of a credible waste management strategy could present major challenges or even obstacles for countries wishing to start a nuclear power programme.



Interim fuel storage facility at Olkiluoto, Finland. Water cools the fuel assemblies and attenuates the radiation from them. (Photo: TVO)

To help its Member States, the IAEA has to date published many documents advising on radioactive waste and spent fuel management, such as establishing nuclear technical and regulatory infrastructures, relevant financing schemes, national policy and strategies. However, no single document summarized all the important aspects of spent fuel and radioactive waste management.

The new publication, *Options for Management of Spent Fuel and Radioactive Waste for Countries Developing New Nuclear Power Programmes*, is aimed at filling this gap. It will serve as a credible source of initial information for those who are involved in decision-making and planning of introducing nuclear power into a national energy programme.

It is designed to brief countries with new or small nuclear programmes about the challenges, and to describe current and potential alternatives for managing reactor waste and spent fuel arising from the operation and decommissioning of nuclear power plants.

The publication deals primarily with current technical options for management of spent fuel and radioactive waste but also considers possible future developments, and discusses relevant legal, political, technical and safety issues. It covers spent nuclear fuel, waste from reactor operation, waste from decommissioning and waste from reprocessing and recycling of nuclear fuel and addresses current management practices required for their storage and disposal.

Although it deals with all waste categories, more weight is placed on long lived wastes and spent fuel, since the timescales, the technological challenges and the financial resources required for the safe management of these are larger than for other waste types.

The document is short, concise and provides key messages and recommendations, whose serious consideration will help countries introducing or expanding a small nuclear programme address the challenges associated with spent nuclear fuel and radioactive waste.

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Developing Strategic Plans

for Effective Utilization of Research Reactors

Strategic plans are indispensable documents for research reactors (RRs) to ensure their efficient, optimized and well managed utilization.

The IAEA TECDOC 1212 (2001), entitled *Strategic Planning for Research Reactors: Guidance for Reactor Managers*, emphasizes its importance: "A strategic plan provides a framework for increasing utilization, while helping to create a positive safety culture, a motivated staff, a clear understanding of real costs and a balanced budget."

The document goes on to explain why: "A strategic plan should be seen as an essential tool for a responsible manager of any RR, from the smallest critical facility to the largest reactor. In fact, not only is it a document that can provide justification for the operational funding required for the facility, but it is also a powerful means of management control for all activities relating to the facility."

A well prepared strategic plan will also provide on-going benefits to the facility management. However, due to its evolutionary nature, a strategic plan is a dynamic process, and hence requires monitoring and regular revision to be successful.

In conjunction with this year's planned revision of TECDOC 1212 and in order to reflect the current status and trends in RR utilization and management, a group of international experts has reviewed 31 strategic plans submitted by RR managers around the world.

The resulting suggestions and recommendations were communicated to the originators for their consideration.

Each strategic plan document was reviewed against the requirements of TECDOC 1212. Results were tabulated for each document individually.

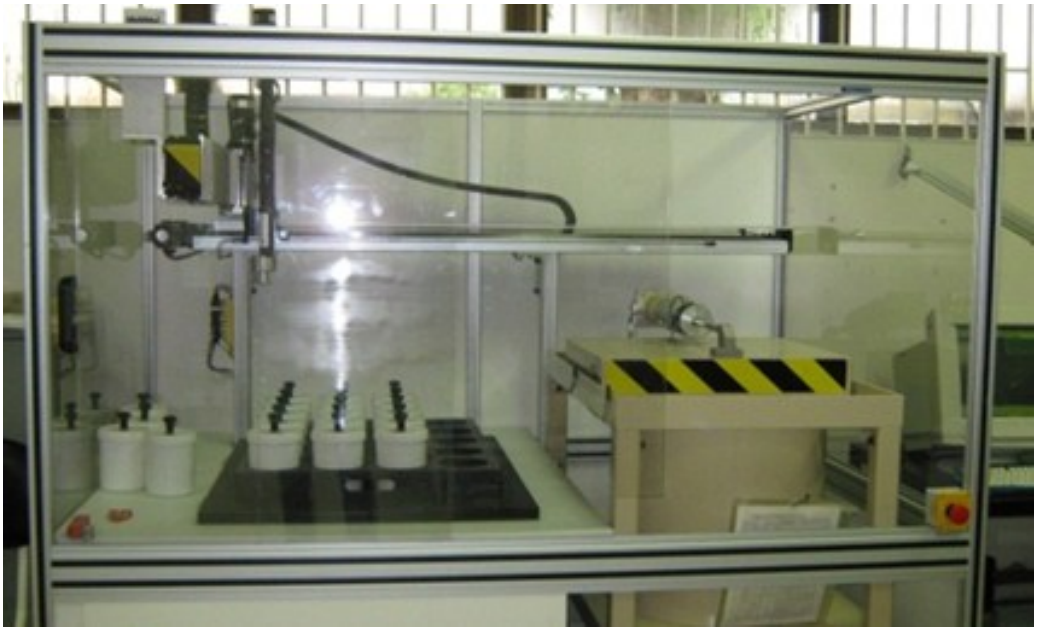
The detailed review also indicated a scoring range from well-prepared strategic plans that required only a limited amount of attention to others which were notably insufficient in their preparation.

As a follow up to the review, an interregional workshop was organized in July 2013, under four regional technical cooperation projects RAS1018, RAF4022, RER1007 and RLA0037. It gave the 27 participating RR facility managers from 20 Member States and two international experts the chance to share experiences, lessons learned and good practices in developing and implementing strategic plans at their facilities.

The lively meeting, packed with experts' lectures, country presentations and roundtable discussions, resulted in tangible suggestions and recommendations regarding how strategic plans should be prepared, revised and implemented. The concrete examples and case studies also provided additional input to how the TECDOC 1212, presently under revision, needs to be improved.

The participants also recommended organizing a dedicated training workshop on Development of Research Reactor User Community and Industrial Partnership. Already scheduled for October 2014, this meeting will address initiatives and efforts towards a greater self-reliance of RR facilities, including the provision of RR products and services on a commercial basis, market surveys and marketing plans, business plans and performance monitoring.

The October workshop will serve as a venue to highlight concrete examples from well operated and managed facilities on successful development of RR user community and commercial partnership.



Automatic sample changer at the Neutron Activation Analysis Laboratory of the 20kW SLOWPOKE research reactor at ICENS in Kingston, Jamaica, whose strategic plan topped the list among those evaluated in 2013. (Photo: ICENS)

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Becoming HEU–free

Hungary ships all its HEU fuel to Russia

Closing the transport package for air shipment containing the last HEU SNF assemblies irradiated in the core of the BRR.

Hungary completed transferring its high enriched uranium (HEU) research reactor fuel to the Russian Federation and became the ninth nation to completely remove such fuel from its territory since the Tripartite (IAEA-US-Russian Federation) Initiative, known as the Russian Research Reactor Fuel Return (RRRFR) Programme, was launched in 2002.

The latest batch of 49.2 kilograms of HEU contained in spent nuclear fuel (SNF) that was irradiated in the Budapest Research Reactor (BRR) was flown to the Russian Federation in three air-shipment operations in October and November 2013. Earlier, 154.5 kg of HEU SNF had been transferred in October 2008, and 35.4 kg of fresh HEU fuel were taken back in 2009 and 2012. The three recent shipments bring the total amount of HEU removed from Hungary to 239.1 kg.

The BRR is a Russian-origin research reactor that went into operation in 1959 with a power of 2 MW. It went through two upgrades, increasing the nominal power to its current 10 MW. The reactor upgrades resulted also that the

Measuring dose rate on the surface of transport package.

original low-enriched uranium (LEU) fuel was changed to HEU fuel.

Following the commitment to join the RRRFR Programme, the BRR has been converted back to use LEU fuel again.

The BRR, since its initial criticality, has been utilized as a neutron source for research and industrial applications on material science and education and for training proposes in the nuclear field, as well as for isotope production.

The IAEA was one of the parties participating in the arrangements for the fresh HEU fuel removal from Hungary, and provided advice on safety and security for the SNF shipment operations.

In addition, the VPVR/M casks used during the 2008 and 2013 SNF removals were the dual-purpose (storage and shipping) casks procured by the IAEA in 2006, with support from the U.S. Department of Energy.

During the recent three SNF shipment operations, six Skoda VPVR/M casks containing the SNF assemblies were placed in TUK-145/C transport packages at the BRR site.

They were then transported via public road to the Budapest International Airport where they were loaded on board an Antonov-124 cargo plane to be flown ”home”.

RRRFR: 2 tonnes of HEU

Under the RRRFR Programme launched in 2002 by the IAEA, the United States of America and the Russian Federation, a total of 2,060 kilograms of Russian-supplied HEU has been transferred back to Russia from 14 countries in 56 shipment operations. According to the regional HEU fuel inventory, the Programme’s goal was to remove 2,241 kilograms by 2016. Thus, with the accomplishment of the Hungarian HEU fuel removal, the Programme has already achieved 85% of its final goal. The IAEA actively supports the RRRFR Programme through a broad range of technical advice and organizational support, and by providing training in research reactor conversion from high to low enriched uranium fuel.

Fitting the upper lid of the TUK-145/C transport package.

Text & Photos: Sandor Tozser
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A hard night’s work: Pulling the last container to the compartment part of the AN-124 cargo plane.

Closing Distances

using an Internet Reactor Laboratory

The IAEA has been working with Member States around the world to develop a variety of nuclear education and training opportunities. One of these projects is the Internet Reactor Laboratory (IRL), a cost-effective way to add a laboratory or experimental component to university level nuclear courses where otherwise such an opportunity might not exist. Broadly, the IRL is intended to increase the global supply of nuclear education taking benefit of the operating research reactors around the world.

It provides an opportunity for countries that are interested in educating human capital for future nuclear reactor projects, and for countries that may want to pursue non-power applications of nuclear technology such as nuclear medicine or nuclear scientific research.

The IRL links a host reactor with university classrooms across the world via the internet. Using data acquisition hardware and software installed in the host research reactor, real-time signals are sent over the internet to the participating classroom, where students can see a real-time display of the reactor's control panel.

Using a video conference link, students in the classroom can interact with operators in the reactor control room. They can "conduct experiments" by asking the reactor operators to change reactor settings, thus seeing the real-time output of the reactor change accordingly.

The IRL was pioneered internationally in 2010 through a link from North Carolina State University's PULSTAR research reactor to classes at the Jordan University of Science and Technology. Since that time, the IAEA has begun developing regional IRLs, with one host reactor and several guest universities taking part in each region.

These projects are under development in Latin America, Europe, Africa and Asia. While the experiments may initially slightly vary from one region to the next, they are generally aimed at advanced undergraduate or masters level physics or engineering students.

The IAEA will work with Member States to assist in integrating the experiments into a university's existing nuclear physics or nuclear engineering curriculum.

Examples of experiments that may be run in the IRL project include introduction to nuclear instrumentation in a research reactor, approach to criticality, control rod calibration, control rod reactivity measurement, temperature reactivity coefficient and calculation of void coefficient.

The potential of the IRL project was illustrated during a side event of the 57th IAEA General Conference in September 2013 by a live demonstration of experiments performed at the ISIS Research Reactor of the CEA-INSTN in Saclay, France.

During the event, the audience in Vienna witnessed two experiments. The first was a reactor start up and stabilization at 50W power level, with the reactor control panel data displayed live to the audience together with the image of the reactor core and control room.

The second experiment was a study of the fuel temperature effect with self-stabilization of the reactor power. A reactor scram, or rapid shutdown, achieved by inserting all the control rods into the reactor core, concluded the demonstration.

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North Carolina State University demonstrated the ability to establish an internet data link to deliver practical experiments from its PULSTAR reactor to students at the Jordanian University of Science and Technology, February 2014. (Photo: Gig House Films)

Integrating Management Systems

at Research Reactors

A management system is a set of interacting elements that establishes policies and objectives and which enables those objectives to be achieved in a safe, efficient and effective manner. It includes the concept of 'quality control' (controlling the quality of products), its evolution through quality assurance (the system to ensure the quality of products), and 'quality management' (the system to manage quality).

IAEA Safety Standards NS-R-4 and GS-R-3 require a management system for the whole life cycle of research reactors, from siting through operation to decommissioning. An Integrated Management System (IMS) is aimed at fulfilling the requirements that all elements of safety, health, environment, security and economics are integrated. Safety Guides GS-G-3.1 and GS-G-3.5 provide generic and specific guidance for research reactor operating organizations to that end.

The global research reactor community has very diverse facility designs, organizational structures and technical missions. Some large, high-power research reactors have teams of operators, maintenance technicians, safety and radiation control officers, managers, and licensing and other support staff. Other low power ones are operated by teams of less than 10 permanent staff. Hence, the scope, extent and details of the management system should be established and implemented using a graded approach.

The IAEA supports Member States in implementing IMS in research reactors. During an IAEA workshop, organized in 2013 jointly by the Department of Nuclear Energy and the Department of Nuclear Safety and Security, experts from 28 Member States discussed key issues and trends in the management of a research reactor, the transition from a quality assurance system to an IMS, continuous improvement of IMS and safety culture.

A recent IAEA Safety Report (SRS No. 75, 'Implementation of a Management System for Operating Organizations of Research Reactors'), intended to be a guide for Member States, was presented during the workshop.

Participants emphasized the value of IAEA missions in helping research reactor organizations to improve their management systems, noting significant differences in implementing the GS-R-3. Some organizations implemented an IMS, while others a quality management system (some based on ISO 9001) or a quality assurance system. Several recommendations on good practices were made in establishing an IMS, transitioning a quality assurance programme to an IMS, as well as enhancing safety culture.

The experts also suggested the IAEA could enhance its assistance to Member States by providing training for senior managers and through an international conference on the implementation and benefits of an IMS. Developing dedicated programmes to assist those countries facing challenges with the implementation of the GS-R-3 was proposed.

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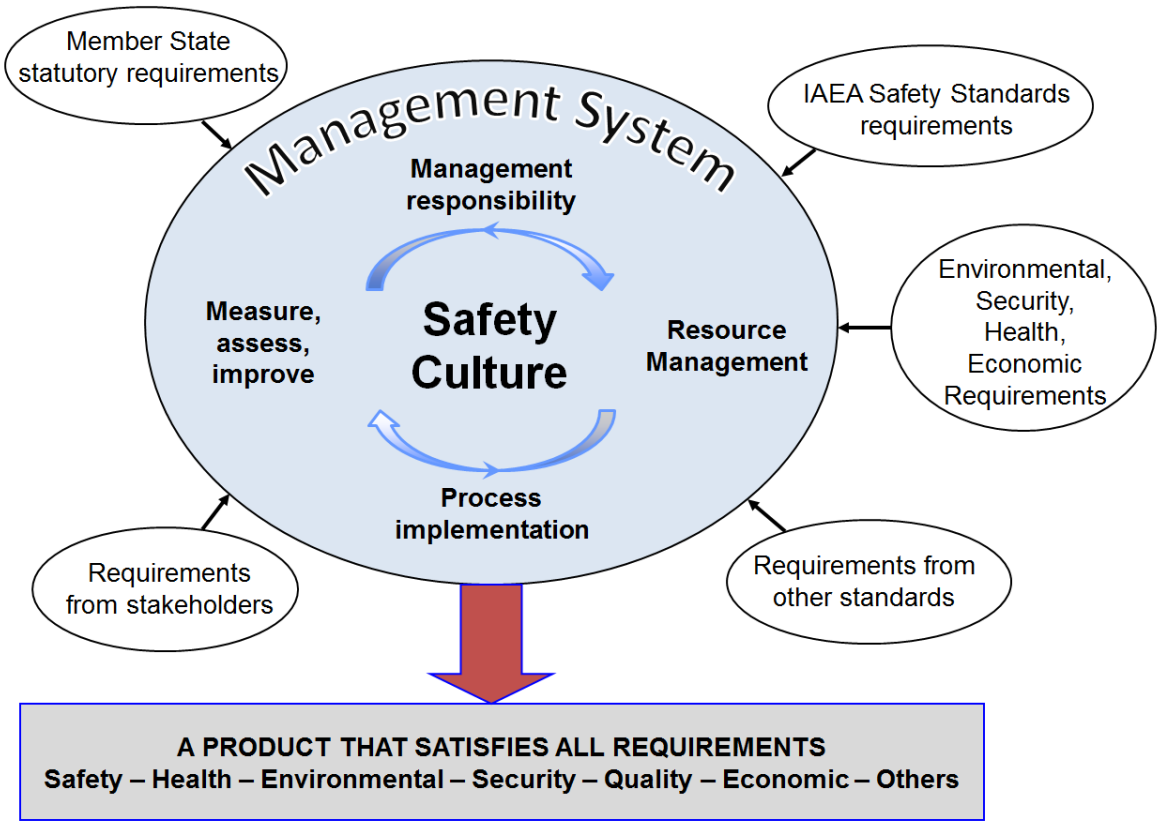
IAEA GS-R-3: Comprehensive Management System



Breaking New Ground

Istanbul Workshop zooms in on Social Licence for Uranium Exploration and Mining

In 2002 the global mining industry introduced the concept of seeking a "social licence to operate". Since then, the concept has become an accepted good practice for any major mining project.

But what is a social licence, and how do you get one? Can a social licence be obtained after a mine has been open for a long time? An IAEA event in Istanbul helped find the answers: Transparent, participative stakeholder engagement is critical to the future of uranium exploration and mining.

Held from 10 to 14 February 2014 under the inter-regional Technical Co-operation Project INT/2/015, the workshop on "Social Licensing and Stakeholder Communication in the Uranium Exploration and Mining Industry" attracted participants from more than 30 Member States.

Screenshot of a Facebook post on the Istanbul workshop. (Photo:Numan Bodur)

This pioneering meeting in Turkey was hosted by ETI Mine Company, one of the leading mine operators of the country. Exploration geologists and mining experts made up the majority of the participants, but project managers, regulators, engineers, communication specialists and operators were all well represented.

The aim was to share with each other good practices and review case studies of what has worked well, and what has not, in the social licensing process.

The participants agreed that while mining projects need permits and licences from governments and regulators, the social licence is granted informally by stakeholders, starting with the communities most directly affected. It is not a piece of paper be obtain through official applications, it means becoming a part of the communities in which the projects will operate.

Obtaining, and keeping, this licence can be a lengthy and complex process. For any new project, it begins from the earliest stage of exploration when geologists and drilling companies first appear in a community where mineral resources are thought to be found. This puts the exploration geologist very much in the front line, not just for technical skills and knowledge, but also as the face and voice of the project.

These early encounters can greatly influence the stakeholders' perception of the proposed project, its benefits and risks to themselves, to the operator or to the government. This could vary widely from community to community.

As the meeting heard from actual case studies, while for some it may mean investment in schools, healthcare and infrastructure, others may think it will influence their way of life and cultural values.

Because the social licence is intangible and may not take written form at all, much depends on mutual trust, understanding and credibility. Any misinformation or misunderstanding may cloud the relationship between stakeholders and the operator, or even irreparably damage it. Even an economically viable project with all the necessary permits may not proceed.

"This is the first major meeting on social licensing held by the IAEA since 2009," said Hari Tulsidas, Technical Officer of the project.

"The level of interest from the member states and the quality of presentations and discussions show this issue is now high on everyone's agenda."

To show how using social media could foster transparency and participation, the presentations, discussions and photos posted on a dedicated *Facebook page* throughout the meeting attracted a growing number of followers from around the world.

But social media are no substitute for personal engagement. Willingness to meet face to face and to be accountable in person is still at the heart of the successful social licensing process.

For all the differences in the experience of member states, one issue unites all – stakeholder attitudes to radiological risk. Many stakeholders fear from uranium mining, some

states even ban it. A number of presentations showed that having a clear recognition of stakeholders and how to best communicate with them on equal terms can yield excellent results, especially regarding risk perception.

Accurate information from trustworthy, independently verifiable sources is paramount. Equally, showing evidence of the benefits of uranium mining and wider nuclear technologies, such as in agriculture and health, can help with social acceptance.

Stakeholders want to know that the projects affecting them are safe, sustainable and can provide them with a fair return – what some call the community dividend, said NEFW's Hari Tulsidas.

"It is very encouraging to see that there is now little disagreement between all parties, governments, operators and stakeholders that the social licence is here to stay," he added. "It covers the entire project life-cycle from the moment the first geologist's boot is on the ground."

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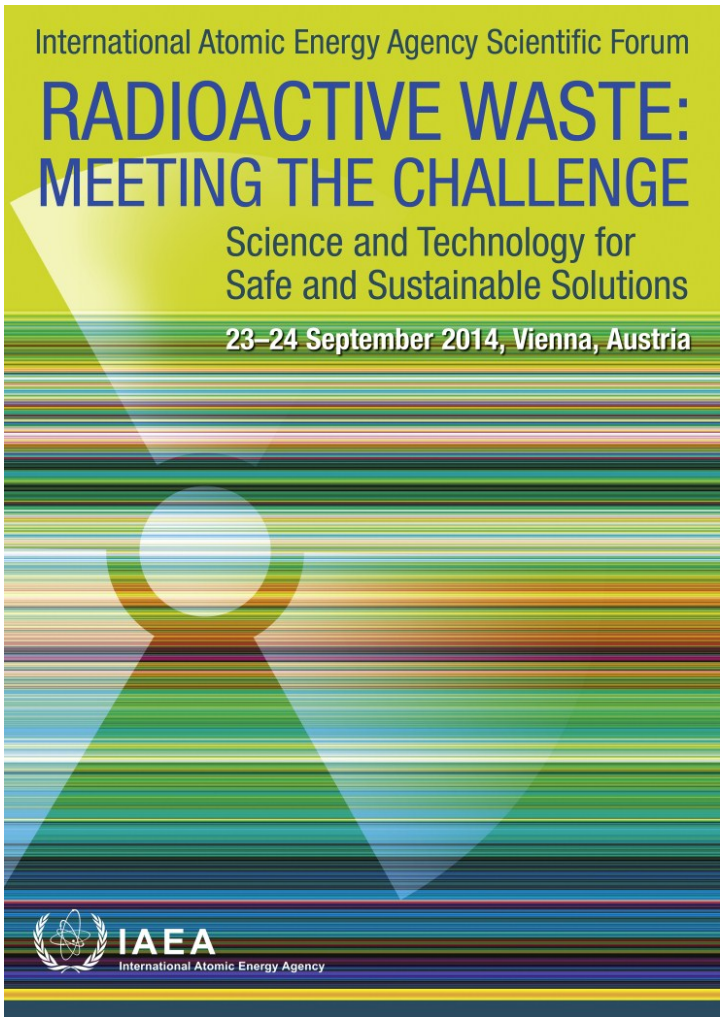
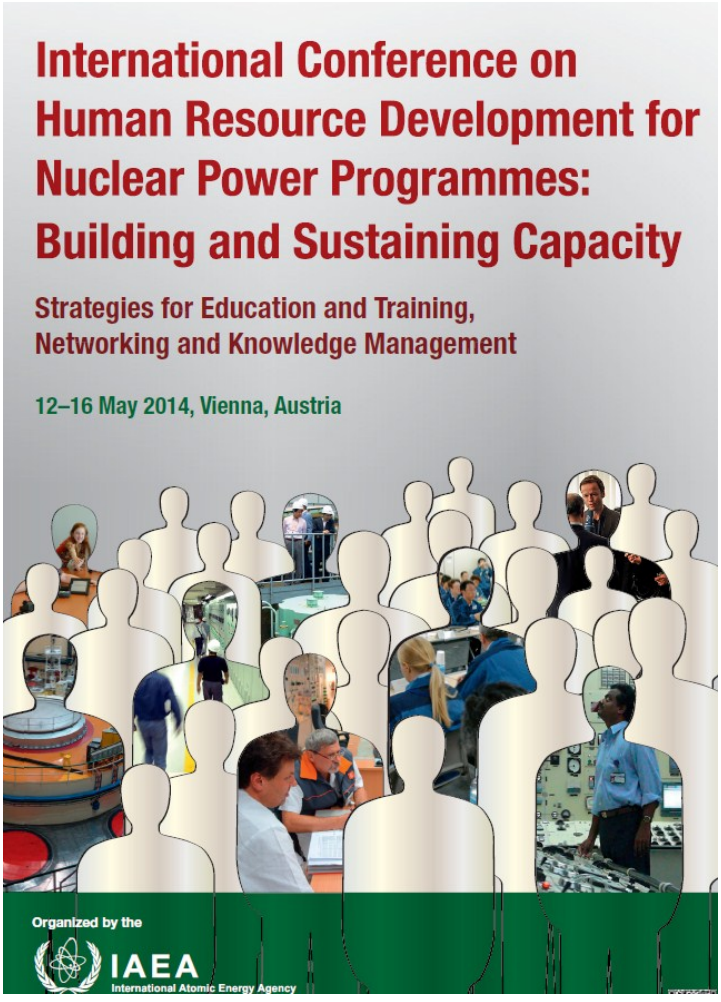
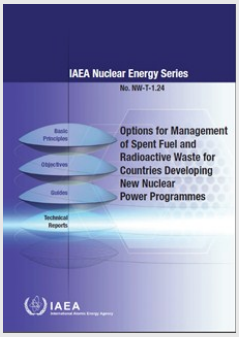
Mark your Diary!



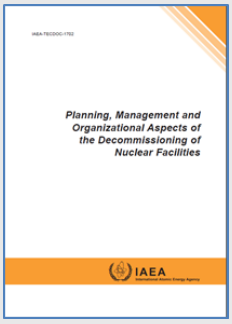


Recent Publications

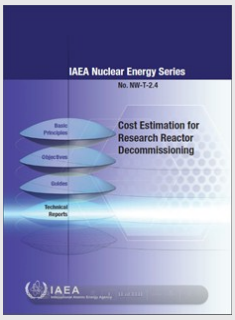
IAEA TECDOC 1724
Applications of Research Reactor towards Research on Materials for Nuclear Fusion Technology
http://www-pub.iaea.org/MTCD/Publications/PDF/TE-1724_web.pdf



IAEA Nuclear Energy Series NW-T-1.24
Options for Management of Spent Fuel and Radioactive Waste for Countries Developing New Nuclear Power Programmes
http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1601_web.pdf

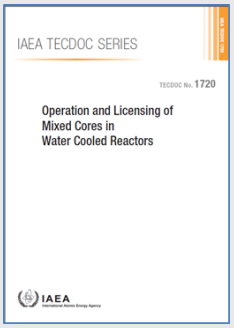


IAEA TECDOC 1702
Planning, Management and Organizational Aspects of the Decommissioning of Nuclear Facilities
http://www-pub.iaea.org/MTCD/Publications/PDF/TE-1702_web.pdf

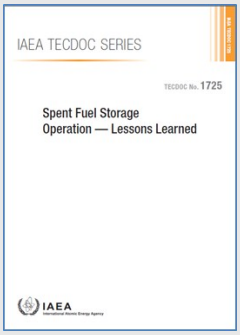


IAEA Nuclear Energy Series NW-T-2.4
Cost Estimation for Research Reactor Decommissioning
http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1596_web.pdf

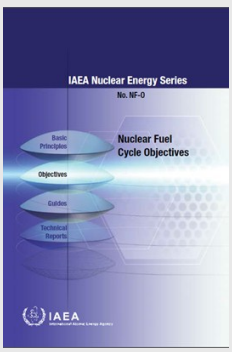
IAEA TECDOC (CD-ROM) 1726
In-pile Testing and Instrumentation for Development of Generation-IV Fuels and Materials
http://www-pub.iaea.org/MTCD/Publications/PDF/TE-CD-1726/Start.pdf



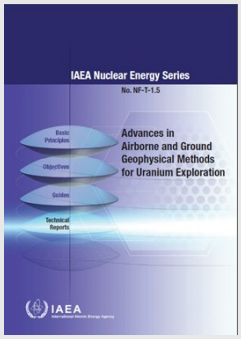
IAEA TECDOC 1720
Operation and Licensing of Mixed Cores in Water Cooled Reactors
http://www-pub.iaea.org/MTCD/Publications/PDF/TE-1720_web.pdf



IAEA TECDOC 1725
Spent Fuel Storage Operation-Lessons Learned
http://www-pub.iaea.org/MTCD/Publications/PDF/TE-1725_web.pdf



IAEA Nuclear Energy Series NF-O
Nuclear Fuel Cycle Objectives
http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1622_web.pdf



IAEA Nuclear Energy Series NF-T-1.5
Advances in Airborne and Ground Geophysical Methods for Uranium Exploration
http://www-pub.iaea.org/MTCD/publications/PDF/Pub1558_web.pdf

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Introducing the Authors

Stefan Joerg Mayer is the Team Leader for radioactive waste disposal in the Waste Technology Section. The focus is on informing Members States on viable approaches to implement waste disposal solutions, as well as on the wide-ranging technical and societal topics involved in developing such solutions.

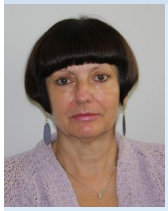
Danas Ridikas is a Research Reactor Specialist at the Physics Section of the Department of Nuclear Sciences and Applications. He manages and implements the project on "Enhancement of utilization and applications of research reactors" and acts as a cross-cutting NA representative for research reactor matters in the IAEA.

Andrea Borio di Tigliole is a Nuclear Engineer at the Research Reactor Section. He provides support to Member States embarking on a research reactor project, including assistance in developing its justification and infrastructure.

Jeannot Boogaard is a Senior Expert at the Nuclear Power Engineering Section, Division of Nuclear Power. He assists Member States in establishing and implementing Integrated Management Systems for operating organizations of nuclear facilities and in the management of NPP projects.

Zhang Jing is the Head of the Europe Section 1 at the Department of Technical Cooperation.

Akira Izumo is a Public Information Specialist in the Waste Technology Section and is involved in activities aimed at improving public communication in the field of nuclear fuel cycle. He coordinates the overall activities of Japan-funded Expanded Programme of Public Understanding of Nuclear Energy (EPPUNE).



Irena Mele is a Special Adviser to the Director of the Nuclear Fuel Cycle and Waste Technology Division. She advises on cross-cutting issues related to nuclear fuel cycle and waste management, education and training in these areas, and review services to the Member States.

Sandor Tozser works in the Research Reactor Section on matters related to the Global Threat Reduction Initiative (GTRI). His focus is on the Russian Research Reactor Fuel Return Programme, core conversion, spent fuel back end solution, as well as on enhancement of research reactor utilization.

Judy Vyshniauskas-Gomez is a consultant at the Research Reactor Section. Most of her work focuses on nuclear science and technology related capacity building in Member States through the strategic application of existing research reactors.

Tulsidas Harikrishnan is a Nuclear Technology Specialist in the Nuclear Fuel Cycle and Materials Section. He provides support to Member States on sustainable development of uranium and thorium resources. He is also a coordinator of the integrated Nuclear Fuel Cycle Management System (iNFCIS).

Ayhan Evrensel is the Communication Adviser of the NE Department. He coordinates the Department's internal and external communication, and is also the editor of the NEFW Newsletter.

IAEA
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Nuclear Fuel Cycle and Waste Technology

Upcoming Meetings in 2014

Date	Title	Place	Contact
8-10 Apr	TM of the Uranium Production Network for Education and Training (UPNET 2014)	Vienna, Austria	P.Woods@iaea.org
12-16 Apr	TR/WS on Specific Considerations and Milestones for a Research Reactor Project	Vienna, Austria	A.Borio@iaea.org
24-25 Apr	AM of the Technical Work Group on Fuel Performance and Technology	Vienna, Austria	V.Inozemtsev@iaea.org
2-6 Jun	TM of the Joint Working Group on Spent Fuel and Radioactive Waste	Vienna, Austria	P.OSullivan@iaea.org
9-13 Jun	2nd Training Meeting/Workshop on Uranium Exploration, Mining & Processing for Francophone African States	Douala, Cameroon	I.Miko-Dit-Angoula@iaea.org
10-12 Jun	TM of the Miniature Neutron Source Reactor Working Group	Vienna, Austria	R.Sollychin@iaea.org
16-20 Jun	TM for the Development of a Compendium on RR Utilization for Higher Education Programmes	Vienna, Austria	A.Borio@iaea.org
18-20 Jun	TM on Lessons Learned from Russian RR Fuel Return (RRRFR) Programme	Dalat, Viet Nam	S.Tozser@iaea.org
23-27 Jun	International Symposium on Uranium Raw Material for Nuclear Fuel Cycle: Exploration, Mining, Production, Supply & Demand, Economics & Environmental Issues (URAM-2014)	Vienna, Austria	P.Woods@iaea.org T.Harikrishnan@iaea.org
30 Jun-4 Jul	Meeting of the Technical Working Group on Research Reactors	Vienna, Austria	A.Borio@iaea.org
8-10 Jul	TM on Lessons Learned in Spent Fuel Management	Vienna, Austria	P.Standring@iaea.org
18-22 Aug	3rd TR/WS on Uranium Exploration, Mining & Processing for Francophone African States	Dakar, Senegal	I.Miko-Dit-Angoula@iaea.org
25-29 Aug	TM on the Processing & Storage of Institutional Radioactive Waste: Operating Experience & Lessons Learned	Vienna, Austria	M.Ojovan@iaea.org
1-4 Sep	TM on Advances in Exploration Techniques for Uranium Deposits & Other Radioactive Element Deposits	Vienna, Austria	A.Hanly@iaea.org
15-19 Sep	TM on Monitoring & Incipient Failure Detection of Rotating Equipment at Research Reactors	Vienna, Austria	C.Morris@iaea.org
23-24 Sep	TM of the Uranium Mining & Remediation Exchange Group (UMREG)	Freiberg, Germany	P.Woods@iaea.org
29 Sep-1 Oct	TR/WS on Technical Requirements in the Bidding Process for a New Research Reactor	Vienna, Austria	A.Borio@iaea.org
29 Sep-2 Oct	TM on the Analysis of Design Basis Scenarios for Spent Fuel Storage Facilities	Vienna, Austria	A.Belivacqua@iaea.org
29 Sep-2 Oct	TR/WS on the Predisposal Management of Radioactive Waste from NPPs and Other Fuel Cycle Facilities	Vienna, Austria	S.K.Samanta@iaea.org
6-10 Oct	51st Meeting of the Joint OECD/NEA-IAEA Uranium Group	Windhoek, Namibia	A.Hanly@iaea.org
6-10 Oct	Workshop/Training Course on the Back End of the Research Reactor Fuel Cycle and Spent Fuel Management	Vienna, Austria	S.Tozser@iaea.org
13-17 Oct	TM on Accident Tolerant Fuel and In-Core Structural Materials	Oak Ridge, USA	V.Inozemtsev@iaea.org
14-18 Oct	TM on Condition Monitoring and Incipient Failure Detection of Rotating Equipment in RR	Athens, Greece	C.Morris@iaea.org
15-17 Oct	TM of the International Working Group to Support the Transition of Molybdenum-99 Production Away From the Use of HEU	Vienna, Austria	R.Sollychin@iaea.org
20-24 Oct	TM on Costing Methods and Financing Schemes to Support Programme Planning for Radioactive Waste Disposal	Vienna, Austria	S.J.Mayer@iaea.org

Impressum

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