Scientific Forum location:	Conference Room C 2nd Floor Austria Center Vienna
Chair:	B. Bigot High Commissioner CEA – Commissariat à l'énergie atomique, France
Scientific Secretaries:	
Session 1:	*Advanced Fuel Cycles and Reactor Concepts* J. Kupitz, Department of Nuclear Energy
Session 2:	*Waste and Spent Fuel Management Issues* W. Danker, Department of Nuclear Energy
Session 3:	*Research Reactor Fuel Cycle and Related Issues* I. Ritchie, Department of Nuclear Energy
Forum Office:	02 A 348, Austria Center Vienna, tel.ext.: 2033

Tuesday, 21 September 2004

10.00-13.00 hours

Opening Address: M. ElBaradei, Director General, IAEA

Session 1: Advanced Fuel Cycles and Reactor Concepts

The keynote presentations will be followed by a panel discussion including the keynote speakers and the following panellists:

	R. Bennett; I.S. Chang
Moderator:	*A. Kakodkar*
Keynote Speakers:	*R.T.H. Mayson*, "Key Issues in Fuel Cycle Options"
	R. Cirimello, "Achievements and Prospects for Advanced Reactor Design and Fuel Cycle"
	Y. Akimoto, "Holistic Consideration of Fuel Cycle Systems for Sustainable Development"
	A. Kakodkar, "Challenges and Directions of Research & Development in Fuel Cycle"
13.00-15.00 hours	Break

Tuesday, 21 September 2004

15.00-18.00 hours

Session 2: Waste and Spent Fuel Management Issues

The keynote presentations will be followed by a panel discussion including the keynote speakers and the following panellists:

	E. Dowdeswell, V. Ryhanen, C. Zhu, J. Maiorino
Moderator:	*L. Shephard*
Keynote Speakers:	*P. Bernard,* "Advances in Treatment of Wastes from Reprocessing of Spent Fuel: Transmutation, Solidification"
	A. Mayorshin, "Advances in Reprocessing of Spent Fuel: Partitioning"
	L. Shephard, "Spent Nuclear Fuel Management"

Wednesday, 22 September 2004

10.00-13.00 hours

Session 3: Research Reactor Fuel Cycle and Related Issues

The keynote presentations will be followed by a panel discussion including the keynote speakers and the following panellists:

	N. Arkhangelski, H. Boeck, *I. Smith*
Moderator:	*S.K. Sharma*
Keynote Speakers:	*A. Travelli,* "Fuel Issues: Replacement of HEU (Conversion of Research Reactors, High Density Fuel Development, Repatriation of Fuel)"
	C. Piani, "Research Reactor Utilization: A Justification for Existence?"
	S. Tőzsér, "Spent Fuel Management: Semi-dry Storage"
	R. Lockwood, "Research Reactor Decommissioning"

SYNOPSES

The following summaries are based on information provided by the presenters. The views expressed remain the responsibility of the named authors and do not necessarily reflect those of the government of the Member State(s) or organization of the author. The IAEA cannot be held responsible for any material reproduced in this book.

Session 1: Advanced Fuel Cycles and Reactor Concepts

Key Issues in Fuel Cycle Options

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In securing a sustainable and secure energy source for the future, the role of the fuel cycle is key. Whilst much work is being undertaken into the way forward for the next generation of reactor systems, less focus has historically been given to the necessity for a optimised approach to the whole fuel cycle.
Two specific technologies offer the prospect of a sufficiently flexible fuel cycle for the future; advanced aqueous and pyrochemical flowsheets. This talk will examine current advances made in these technical areas and how they fit in with the 6 important factors for optimising a fuel cycle. Issues such as the need for proliferation resistance, cost reduction, effluent and waste minimisation will be considered. Other important factors are the prospects of reducing the radiotoxicity of high level waste and of maximising the energy potential in fuel. The role of the two fuel cycle technologies in these aims will be reviewed.
Whilst these technical factors must be considered, the issue of public acceptability must play a larger role than has historically been the case. The nuclear industry has a prime responsibility to engage with and inform the public debate. This role is not of lesser importance but is equal to the technical development role which the industry has.
With the development of new reactor systems, a holistic approach to fuel recycle and waste management is needed. This must be developed alongside the new reactors. Generation IV has a key role to play in this. The need for fuel cycle return in the future and it is a combination of technologies - evolution plus revolution - that will be the way to an optimised fuel cycle in the future.

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Achievements and Prospects for Advanced Reactor Design and Fuel Cycle

R.O. Cirimello

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The future of Nuclear Energy relies on the complementary optimization of reactors for NPPs and the associated nuclear fuel cycles. This is an apparent contradiction if we look in the so large effort made worldwide for developing advance reactors for power plants alone. The vision that focus the optimization effort in reactors and in the other side and separated in the associated fuel cycle jeopardizes the final results of an optimized nuclear system. The control of the primary source of energy is a key question and the technology involved and its control the main issue to be considered when the evaluation of advanced nuclear systems are under consideration. However the main reason of this situation is that reactors for NPP is still been costly, inefficient compared with other energy converters and increasingly complex to accomplish safety requirements.

The maturity of nuclear technology and the present NPP are the background for the evolutionary concepts of reactors while the response to economy, safety, waste generation and management and proliferation resistance are the drivers for innovative concepts.

Most traditional technology holders and NPP vendors have evolutionary LWR and HWR systems and participate directly or indirectly in innovative projects for future applications including fast reactors. EPR, AP 1000, KSNP, ABWR, WWER-600, ACR-700 and AHWR are examples of this fact. Example of continuous effort in fast reactors development are MONJU reactor, CEFR, FBTR and the emblematic Superphenix.

Both reactors and nuclear fuel cycles should evolve throughout a breakthrough process if the energy demand mainly becomes large in developing countries. This may require a different approach that the one that drives the past 50 years mainly because the modules should be optimized for quite different electricity markets.

Small and Medium Power Reactors like SMART, CAREM, IRIS, PBMR and HTGRs, enrichment processes optimized to be economics for small capacity production, modular solutions for spent fuel storage and more simple processes for immobilization of radioactive waste are some of the possibilities searched today. Moreover an important effort is been made by the Agency in promoting regional fuel cycle centres for the future in favor of economy optimization and seeking to reduce the threat of the proliferation issue.

R & D effort should be also devoted in the near future to the application of Nuclear Energy to dual or non electrical application like hydrogen production, desalination and district heating.

The acceptance of nuclear energy as an option of overcoming the problem of global warming and the reversion of public acceptance in several parts of the world may be achieved if the new concepts, both innovative reactors and fuel cycles, are convincing enough to seduce societies and investors worldwide.

This presentation analyses in one side the evolutionary reactors concepts and the innovative one proposed for the R & D program arisen in the frame of Generation IV

Project and the associated fuel cycles while, as results of the preliminary application of the methodology developed within the frame of INPRO Project, the possible concepts in terms of complementary nuclear fuel cycle and the required reactor for developing and emerging nuclear countries will be discussed**.**

Technology development and evolution in nuclear fuel cycle steps namely enrichment, reprocessing and waste management including partitioning and transmutations are mentioned included Tandem Cycles like DUPIC and the prospective for an unexpected future good scenario for nuclear energy.

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Holistic Consideration of Fuel Cycle Systems for Sustainable Development

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For any modern civilized society to achieve sustainable development, the use of atomic energy is indispensable. However, in order for nuclear power to continue to provide the infrastructure essential for all the activities of a civilized society, any nuclear power system itself needs to be fully sustainable.

In this discussion, I will review how the holistic system design of nuclear power generation – a principle already been established in the early days of the peaceful use of atomic energy – was waived and then distorted along with the growth of nuclear power industries incurring the deterioration of inherent nature to sustain nuclear power activities. From this viewpoint, this paper will explore and outline the goals, which the present nuclear power establishments need to aim for in order to make a sustainable contribution to the progress of civilized society.

Everyday, throughout the world, from hundreds of light-water reactors generating energy, plutonium is produced and then accumulated. Simultaneously, massive amounts of the uranium are luxuriously dissipated harnessing only 1% of this precious natural resource. This situation is in vital need of improvement and if this does not happen, the sustainable nature of nuclear power will be seriously threatened from many sides; the issue of resources and the environment or the diversion of nuclear power to military ends. Those advanced countries with substantial nuclear power generation need to actively promote plutonium recycle with light-water reactors and help stop this disastrous trend. Alongside such initiatives, there is a clear need to strengthen the work of international cooperation with an ultimate goal of "preventing the danger of nuclear power being abused for such violent purposes as war or terrorism, along with the establishment of the nuclear fuel cycle system to economically and exhaustively convert nuclear fuel resources into energy." A steady technological break through— commercial scale fast reactor, minor actinide transmutation using a fast reactor and advanced reprocessing-- is the prerequisite for establishing the goal of a fast reactor fuel cycle capable of maximizing the efficient use of resources and minimizing the burden on society of nuclear waste; for which a step by step transition from the LWR fuel cycle is to be programmed.

At the same time, a comprehensive and non-discriminatory system with a graduated framework needs to be created to provide with appropriate measures and steps for each country to access to clean nuclear power energy, in accordance with the capacity, industrial capability and safeguards records. Work is also needed to alleviate and eradicate the unfounded social unrest the public feel about atomic energy and also to modify the distorted perception of the risk of nuclear power and double standards, which damages the public's trust in nuclear power.

Many of these measures need long term efforts and expenditure, which require the operation of extensive development infrastructure network, and naturally do not lend themselves well to the world of free market competition. Therefore, it requires a comprehensive policy based on a framework of long term international cooperation for nuclear promotion; any nation embarking on such a venture would need to be fully committed and draw up and accomplish basic strategies, while clearly establishing the sharing and allocation of responsibilities between the Government and the private sector.

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Challenges and Directions of Research & Development in Fuel Cycle

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Fuel cycle forms an integral component of nuclear energy technologies. It is intimately linked to the choice of reactor systems and national policies on nuclear energy. Choice of closed or open fuel cycle, while it is governed by the national policy; has a strong bearing on sustainability, waste management and associated long-term environmental issues. It is increasingly becoming clear that sustainability and issues concerning environmental impact favour a closed fuel cycle which permits recycle to the maximum possible extent. The key issues identified by INPRO methodology regarding nuclear reactor systems (including fuel cycle) are economy, safety, waste management, sustainability and proliferation resistance. High burn up, coprocessing of fissile and fertile material, remote refabrication and recycle of fuel including minor actinides, recovery of fission products of commercial value particularly high heat generating Cs-137, Sr-90 and noble metals, partitioning and transmutation of actinides and long lived fission products and matrix for immobilization of waste are the key targets for R&D to achieve technical solutions to these challenges.

There is considerable experience in large-scale deployment of Uranium-Plutonium fuel in water reactors and in fast reactors. One could build on this experience for efficient and secure utilization of Pu stockpile in water reactors. This demands R & D for critical evaluation of novel fabrication routes, more amenable to remote fabrication and reduction of waste generation. Despite the large experience available in aqueous reprocessing, there is considerable scope for R & D to enhance plant life, minimise actinides and long-lived fission products in waste streams. R & D areas encompass development of simplified flow sheets with less number of cycles, schemes for minor actinide partitioning, corrosion resistant materials, salt free electrochemical and photochemical steps, on-line monitoring of process streams and in-service inspection of equipment and process vessels. Use of sol-gel based techniques for fabricating the fuel can integrate reprocessing and fuel fabrication facilities resulting in compact plants, lesser waste generation and proliferation resistant fuel cycles. Similarly, application of novel technologies such as membrane separations, supercritical fluid extraction and ultrafiltration can minimise generation of secondary waste streams and contribute towards making the nuclear fuel cycle environmentally benign. These directions would contribute to significant improvements in thermal as well as fast reactor fuel cycles.

Thorium is an excellent fertile host that can make fuel cycle more sustainable and proliferation resistant. Use of thorium also enables a much deeper plutonium burning with manageable reactor characteristics even when the entire core is loaded with plutonium bearing fuel assemblies. There are of course additional R&D challenges with thorium fuel cycle such as removal of U-232 from U-233 and three component (U, Pu, Th) separations.

Fast reactors are emerging as important candidates for next generation reactors. Development of better materials for clad and structural components is important for increasing the burn-up to a value of 200,000 MWd/t and above resulting in improved economics. Metallic fuel cycle, with pyrochemical reprocessing, offers inherent safety and potential for breeding with proliferation resistance. The commercial scale development of the related technologies for deployment of metallic fuels requires R & D in a number of areas like materials development, physicochemical studies, remote refabrication, waste management, on-line measurement of fissile nuclides, etc.

The paper discusses challenges in the above indicated areas and possible directions for research and development which would make nuclear energy competitive, proliferation resistant, safe and environmentally benign.

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Session 2: Waste and Spent Fuel Management Issues

Advances in Treatment of Wastes from Reprocessing of Spent Fuel

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Sustainable nuclear energy production relies on the optimisation of the fuel cycle by minimizing the long-term burden and the hazardousness of waste, and by making optimal use of energetic materials.

The long-term management of high level long lived waste is a major issue, with significant public concern. In France, in December 1991, the Government prepared and the Parliament passed a law requesting in particular R&D of solutions and processes for:

- minimizing the quantity and the radiotoxicity of the HLLLW via partitioning and transmutation,
- waste conditioning and storage,
- deep geological disposal,

with aiming at decision making process in 2006.

Research has been conducted by CEA and ANDRA in a very sustained way and benefited from major cooperations in France (EDF, AREVA, CNRS, Universities,...), in Europe and internationally.

Quite significant scientific and technical results have been produced and will contribute to making solutions available for coming national decisions.

Among significant conclusions from the conduct of research, development and industrial experience:

- The reprocessing operations i) significantly reduce the HLLLW radiotoxicity and volume, ii) recover valuable materials, in particular resources from the waste, and recycle the plutonium, which is a highly energetic material and also the primary contributor to long-term radiotoxicity, iii) and condition the ultimate waste in a safe and durable manner, and in a very small volume,
- Recycling of plutonium in present LWRs is demonstrative at large scale, and 3rd generation reactors, such as EPR, can bring further possible improvements,
- For the future, advanced partitioning processes and transmutation in advanced reactors, could make it possible to recover and recycle all the actinides (uranium, plutonium, americium, curium, neptunium) and reduce the ultimate waste to the only fission products, the radiotoxicity of which drastically decreases in some hundred years,

- Geological disposal of ultimate waste is a safe long term burden free solution, taking benefit from the most important reduction of the quantity and toxicity of HLLLW brought by the closed fuel cycle,
- Flexibility in the back end of the fuel cycle operations is brought by the possibility of storing radioactive materials in a safe and robust manner.

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Advances in Reprocessing Spent Fuel

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The most important principles for the future technologies of reprocessing spent fuel with regard to the current requirements are:

- closed fuel cycle, i.e. inherent closure of the processes with the aim to reduce release of dangerous substances that can do harm to the environment;
- optimization of the process systems in order to achieve the required maximum results excluding unnecessary operations and stages;
- maximum level of the inherent safety, i.e. use of the processes safety of which is based not only on the engineering safety barriers but on the intrinsic, “natural” properties of the technological system that provides maximum degree of the environmental protection.

These principles effect equally general safety and economics.

The current status of the research on reprocessing spent fuel using dry pyroelectrochemical processes is the following:

- Basic research. Properties of uranium, plutonium, thorium and neptunium in chloride melts have been studied in much detail. The data on physical chemistry and electrochemistry of the main FP is enough for understanding the processes. Detailed studies of americium, curium and technetium chemistry are the essential investigation directions.
- Engineering development. The technology and equipment bases have been developed for the processes of oxide fuel reprocessing and fabrication. The technology was checked using 5500 kg of pure fuel from different reactors and 20 kg of irradiated BN-350 and BOR-60 fuel. The bases of the technology have been provided and the feasibility study has been carried out for a full-scale plant of BN-800 CFC.
- Industrial application: Since the technology is highly prepared, the activities on industrial application of U-Pu fuel are now underway. The BOR-60 reactor uses fuel obtained by the dry method, the design of the facility for implementation of CFC reactors is being developed. 9 FAs have been tested and 3 FAs are being irradiated in the BN-600 reactor. The facilities for production of U-Pu fuel of the BN-600 hybrid core are being modernized.

Apart from the main technology of oxide fuel reprocessing and production, new dry processes are being studied:

- obtaining of oxide fuel with neptunium and americium (for transmutation);
- reprocessing of nitride fuel (for the BREST closed fuel cycle);
- reprocessing of uranium fuel from research reactors (in order to solve the problem of unconventional SNF management);
- metallization of oxide fuel for long-term storage.

The work performed in RIAR is actively supported by Japanese organizations; RIAR cooperates with France, the Republic of Korea, and the USA.

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Spent Nuclear Fuel Management

<u>Synopsis Title</u>: Moving Toward a Century of Spent Fuel Management: A View from the Halfway Mark

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A half-century ago, President Eisenhower in his 1953 "Atoms for Peace" speech, offered nuclear technology to other nations as part of a broad nuclear arms control initiative. In the years that followed, the nuclear power generation capabilities of many nations has helped economic development and contributed to the prosperity of the modern world. The growth of nuclear power, while providing many benefits, has also contributed to an increasing global challenge over safe and secure spent fuel management.

Over 40 countries have invested in nuclear energy, developing over 400 nuclear power reactors. Nuclear power supplies approximately 16% of the global electricity needs. With the finite resources and challenges of fossil fuels, nuclear power will undoubtedly become more prevalent in the future, both in the U.S. and abroad. We must address this inevitability with new paradigms for managing a global nuclear future.

Over the past fifty years, the world has come to better understand the strong interplay between all elements of the nuclear fuel cycle, global economics, and global security. In the modern world, the nuclear fuel cycle can no longer be managed as a simple sequence of technological, economic and political challenges. Rather it must be seen, and managed, as a system of strongly interrelated challenges. Spent fuel management, as one element of the nuclear fuel system, cannot be relegated to the back-end of the fuel cycle as only a disposal or storage issue.

There exists a wealth of success and experience with spent fuel management over the past fifty years. We must forge this experience with a global systems perspective, to reshape the governing of all aspects of the nuclear fuel cycle, including spent fuel management. This session will examine the collective experience of spent fuel management enterprises, seeking to shape the development of new management paradigms for the next fifty years.

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Session 3: Research Reactor Fuel Cycle and Related Issues

Fuel Issues: Replacement of HEU*

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Research reactors play a vital role in medical/agricultural/industrial applications and in fundamental scientific research. However, many of them use fuels or targets containing high-enriched uranium (HEU) that could be used to make nuclear weapons. In response to this concern, the USDOE initiated the Reduced Enrichment for Research and Test Reactors (RERTR) program in 1978, to develop the technical means to convert these reactors to low-enriched uranium (LEU) materials and to facilitate such conversions worldwide. The HEU materials from the converted reactors are to be returned to the countries of origin through parallel programs.

The key to making conversions feasible lies in developing fuels with much greater uranium content, because in LEU every atom of ^{235}U must be accompanied by approximately four atoms of ^{238}U. The RERTR program has developed plate-type fuels with progressively greater uranium densities than the original maximum density of 1.6 g/cm^3, and is now developing fuels that can reach 8.0 g/cm^3 (U-Mo dispersion) and 16.0 g/cm^3 (monolithic U-Mo). In addition, LEU targets and processes have been developed to produce ^{99}Mo without using HEU. Extensive cooperation with Russian institutes aims to develop new fuels and analyses for LEU conversion of Russian-designed research reactors.

Information about existing research reactors was collected, and computer codes were developed to study reactor performance with LEU fuels. The results were incorporated in a series of IAEA Technical Documents providing an internationally accepted set of guidebooks for core conversions. Thirty-nine research reactors have been converted to LEU fuels, or are in the process of doing so. In addition, 14 new research reactors have been built using LEU fuels developed by the RERTR program, and six more are under construction or planned. Cumulatively, use of more than 4,000 kilograms of HEU has been avoided by using RERTR fuels.

* The RERTR Program

The events of September 11, 2001, have increased greatly the urgency with which the goals of the RERTR program are to be pursued. On May 26, 2004, U.S. Energy Secretary Spencer Abraham announced at the IAEA a new important initiative ---The Global Threat Reduction Initiative --- and urged international cooperation. The RERTR program, the FRRSNF for acceptance of U.S. materials, and the RRRFR for acceptance of Russian materials, are crucial components of the new initiative that aims to secure, remove or dispose nuclear and other radioactive materials throughout the world that are vulnerable to theft by terrorists.

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Research Reactor Utillization: A Justification for Existence?

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The majority of Research Reactors currently under operation are constantly faced with critical issues relating to decisions justifying their sustainable existence. These issues may relate to aspects such as the age and related state of safe operation, levels of political or environmentalist support, financial independence with regard to operational costs, all of which, together with several other factors, could contribute to justifiable existence in terms of levels of utilisation and safety of these reactors.
This presentation will endeavour to evaluate the mix of desirable characteristics regarded as essential justification to stakeholders for the extended operation and utilisation of a research reactor. The topic centres on the IAEA recommendations in terms of established Strategic Planning regarding such facilities. As an example, the model used to drive the sustained existence of the SAFARI-1 research reactor of South Africa will be evaluated.

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Spent Fuel Management: Semi-dry Storage

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To change the temporary underwater storage mode of nuclear spent fuel (NSF) from wet to semi-dry as a means of slowing down or even stopping corrosion of the cladding and thereby to ensure safe storage conditions for further temporary storage, experts of the Atomic Energy Research Institute developed a canning technology and automatic canning equipment. This equipment was commissioned at the AFR pond of the Budapest Research Reactor and the regulatory licence for NSF encapsulation was granted in March 2002.

The technology uses a tube-type capsule made of an aluminium alloy with a wall thickness of 3 mm. The capsule is capable of accommodating one EK-10, one triple VVR type assembly or three single VVR assemblies. Encapsulation utilizes a closed technology in which the capsule undergoes a powerful drying procedure (heated by an eddy current), is back-filled with dry nitrogen gas and then closed by a shrink–fit capsule head and subsequently welded. The program-controlled equipment of the canning machine is housed in a compact steel container. It includes a device for cropping the fuel legs and provides a means of reopening encapsulated NSF, if the need arises. The cycle time of the whole canning procedure is about 120 minutes allowing about 4 to 5 cans to be sealed per working day.

The canning has been running since May 2002 and was divided into two phases. In Phase 1 the goal was to encapsulate all NSF assemblies irradiated before reactor upgrading (1986), while Phase 2 is a regular canning operation to deal with fuel that has decayed for about 10 years. Phase 1 was successfully completed in August 2004 by which time 82 EK-10, 228 single and 184 triple VVR fuel assemblies (altogether 342 cans) had been encapsulated.

The canning machine and its accessories, including the cropping device, form a compact and mobile technology that ensures an almost completely automatic, safe and reliable encapsulation of spent fuel.

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Research Reactor Decommissioning

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Of the ~ 800 research reactors constructed worldwide to date, ~50% have been shut down and are at various stages of decommissioning. Many reached the end of their design lives or were shut down due to strategic, economic or regulatory considerations. 27% of those in operation are over 40 years old and will need to be decommissioned soon.

Decommissioning normally takes the facility permanently out of service and subjects it to progressive hazard reduction, dismantling and decontamination in a safe, secure economically viable way, using best practicable means to meet the best practicable environmental option, such that the risks and doses to workers and the general public are maintained as low as reasonably practicable. Whilst most decommissioning techniques are well established there are still some challenging and important issues that need resolution. Perhaps the most challenging issue is radioactive waste management and storage. It is vitally important that all local and national waste classification, transportation, storage and end point requirements are known, as the adopted strategy will be heavily influenced by these factors.

Other equally important but softer issues include the requirement for early decommissioning plans, adequate funding/cost estimates and the involvement of all relevant stakeholders. A comprehensive decommissioning plan should be produced up front that encompasses an early radiological characterisation survey of the facility/site. An appropriate funding mechanism needs to be assured. Whilst regular revisions of the decommissioning cost study should help to determine required funds, it is important to validate these cost estimates by benchmarking other decommissioning projects and accumulated experience. The use of appropriate ‘stakeholder dialogue’ methods by the facility operator to inform and communicate with all interested parties, such as government and non-government organisations, regulators, trades unions, anti-nuclear groups, local activists and the general public should ideally start before decommissioning commences and continue throughout the project.

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FORTHCOMING SCIENTIFIC MEETINGS SCHEDULED BY THE IAEA

2004

International Conference on Topical Issues in Nuclear Installation Safety:
Continuous Improvement of Nuclear Safety in a Changing World
18-22 October 2004, Beijing, China

International Conference on Isotopes in Environmental Studies – Aquatic Forum 2004
25-29 October, Monaco

20^{th} IAEA Fusion Energy Conference
1-6 November, Vilamoura, Portugal

Rertr-2004 International Meeting on Reduced Enrichment for Research and Test Reactors
7-12 November, Vienna, Austria

International Symposium on the Disposal of Low-Activity Radioactive Waste
13-17 December, Cordoba, Spain

2005

International Conference on Nuclear Security: Global Directions for the Future
16-18 March, London, UK

International Conference on "Nuclear Power for the 21^{st} Century"
April, Paris, France

International Conference on Area Wide Pest Control
9-13 May, Vienna, Austria

International Symposium on Utilisation of Accelerators
5-9 June, Dubrovnik, Croatia

International Symposium on Uranium Production and Raw Materials for Nuclear Fuel Cycle – Supply and Demand, Environment, Economy and Energy Security
20-24 June, Vienna, Austria

International Conference on the Safety and Security of Radioactive Sources:
Towards a Sustainable Global System of Lifelong Control over Sources
27 June-1 July, Bordeaux, France

International Conference on the Safety of Radioactive Waste Disposal
3-7 October, Tokyo, Japan

International Symposium on Trends in Radiopharmaceuticals
10-14 October, Vienna, Austria

International Symposium on Characterization and Quality Control of Nuclear Fuel
17-21 October, Vienna, Austria

International Conference on Operational Safety Performance in Nuclear Installations
30 November – 2 December, Vienna, Austria

For information on forthcoming scientific meetings, please consult the
IAEA website: http://www.iaea.org/