IAEA SCIENTIFIC FORUM 2005

Nuclear Science: Physics Helping the World

27-28 September 2005

Vienna, Austria

Organized by the
International Atomic Energy Agency

Book of Extended Synopses

IAEA-CN-138

Scientific Forum location:	Conference Room C 2nd Floor Austria Centre Vienna
Chair:	B. Richter Director Emeritus at the Stanford Linear Accelerator Centre (SLAC)
Scientific Secretaries:	
Session 1:	*Meeting Energy Needs* A. Stanculescu, Department of Nuclear Energy
Session 2:	*Developing Advanced Materials and Technologies* G. Mank, Department of Nuclear Sciences and Applications
Session 3:	*Advancing Radiation Medicine* K.R. Shortt, Department of Nuclear Sciences and Applications
Session 4:	*Supporting Nuclear Safety* K.E. Brockman, Department of Nuclear Safety and Security
Forum Office:	02 A 348, Austria Centre Vienna, tel.ext.: 2033

Tuesday, 27 September 2005

10.00-13.00 hours

Opening Session: **M. ElBaradei, Director General, IAEA**
B. Richter, Forum Chair

Session 1: Meeting Energy Needs*

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

K.R. Sreenivasan, J. Hunt, Jiangang Li, R. Galvao

Moderator: *B. Richter*

Keynote Speakers: *B. Richter*, "Nuclear Energy: Promise and Issues"

E.P. Velikhov, "Fusion: Key Issues"

13.00-15.00 hours Break

* Towards the end of the session there will be a brief presentation on the International Nuclear Information System (INIS) by the Secretariat.

Tuesday, 27 September 2005

15.00-18.00 hours

Session 2: Developing Advanced Materials and Technologies

The keynote presentations will be followed by a panel discussion.

Moderator:	*I. Othman*
Keynote Speakers:	*S. Banerjee,* “Better Materials for Nuclear Energy”
	S. Machi, “Industrial Uses of Radiation”
	R. Eichler, “Nuclear Applications: Future Prospects”
	R. Schenkel, “Nuclear Measurements”

Wednesday, 28 September 2005

10.00-13.00 hours

Session 3: Advancing Radiation Medicine*

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

	A. Krisanachinda, D. Van Der Merwe, S.B. Elegba
Moderator:	*P. Allisy-Roberts*
Keynote Speakers:	*W. Schlegel,* "Imaging for Cancer Therapy"
	T.R. Mackie, "Progress and Challenges in Cancer Therapy"
	M-E. Brandan, "Next Generation of Medical Physicists"
	F. Diaz-Balart, "Interface of Nuclear and Biotechnologies"

* Towards the end of the session there will be a brief presentation on the Programme of Action for Cancer Therapy (PACT) by the Secretariat.

Wednesday, 28 September 2005

15.00-18.00 hours

Session 4: Supporting Nuclear Safety

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

	R. Taylor, D. Nicholls, O. Tuntland, R. Navarro
Moderator:	*R.A. Meserve,* "The Global Safety Regime – Setting the Stage"
Keynote Speakers:	*J. Saulnier,* "Risk in the Public's Eyes – Incorporating Risks and Public Outreach"
	J. Ellis, "Safety from Operator's Perspective – We Are all in this Together"
	C. Kang, "The Future of Technical Knowledge Management"

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: Meeting Energy Needs

Nuclear Energy: Promise and Issues

B. Richter

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Nuclear energy is having a renaissance driven by both old fashioned supply and demand, and environmental concerns. Oil and gas prices have exploded and show no signs of returning to the levels of only a few years ago. Coal is not in short supply, but the pollution it generates has severe economic and health consequences. Concern about greenhouse gases and global warming has caused the environmental movement to begin a reassessment of the role of nuclear in the world's energy portfolio.

The full potential of nuclear energy will be achieved only if governments and the public are satisfied that it is safe, that the radioactive waste can be safely disposed of, and that the risk of the proliferation of nuclear weapons is low. The first criterion has been met with designs that are inherently safer than current LWRs, primarily through design simplification, reducing the number of critical components, and advanced control and monitoring technologies. Operating safety has to be assured through good practices and a rigorous, independent inspection process.

The second criterion, waste disposal, is a problem where the science and technology (S&T) communities have the primary role in a solution. Many believe that it is solved in principle, but there has as yet been no solution in practice. I will report on where I think we have gotten and what needs to be done.

The third criterion, proliferation resistance, is one that the S&T communities cannot solve on their own. The best that S&T can do is to make proliferation difficult, and to make sure that any attempts are discovered early. The rest can be handled only by enforceable international agreements. Safeguards technology needs more attention.

Fusion: Key Issues

E. P. Velikhov

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Controlled Fusion may provide mankind with an inexhaustible source of energy. Several highly attractive features are intrinsic to this way of energy production: a high safety level due to the impossibility of non-controlled reaction; low original and induced activities of the fuel, waste and construction materials, the possibility to place power stations close to megalopolises, and negligible terrorist opportunities at fusion enterprises.

More than fifty years have been spent by researchers in many countries before the International Fusion Community decided this year to build the first International Thermonuclear Experimental Reactor – ITER - in Cadarache (France).

The reason for such a long development is the very complicated behaviour of high-temperature plasma – a special state of matter that allows nuclei of hydrogen to react, setting free a huge amount of energy due to mass loss. Basic and applied research in high-temperature plasma has influenced a significant number of areas in Science and Technology.

There are two approaches to Controlled Fusion based on magnetic and inertial confinement. The magnetic confinement approach at present seems to be closer to the fusion energy production stage. The idea of the tokamak device invented at the Kurchatov Institute fifty years ago turned out to be very productive and allowed us to realize the fusion of Deuterium and Tritium under conditions very close to breakeven. We know a lot about the tokamak plasma today. However, new advances are foreseen to be achieved in contemporary and future experiments. The main activity is shifting now to the problem of plasma-wall interaction, low activation materials and technologies activating resources in an industrial reactor, which would be of commercial interest.

Intensive work in this field is foreseen, and the Fast Track Programme formulated by the European Union emphasizes the necessity of promptly solving basic problems of fusion energy production.

After the construction of ITER within the next 10 years, we expect that DEMO will start to operate in about 25 years as a demonstration reactor and that in the middle of the century the first industrial power station will be built.

Other devices like lasers and Z-pinches may demonstrate their applicability for fusion energy production within the next few years. The competition between different approaches to fusion seems to be a source of progress in this field.

International collaboration in fusion has a long-term history, and positive achievements should be continued in the future. I believe that an International Organization will be created to control fusion-energy production. This step will allow us to reduce the risks of unapproved technology dissemination and proliferation.

Session 2: Developing Advanced Materials and Technologies

Better Materials for Nuclear Energy

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The improved performance of present generation nuclear reactors and the realization of advanced reactor concepts, both, require development of better materials. Physical metallurgy /materials science principles which have been exploited in meeting the exacting requirements of nuclear systems comprising fuels, structural materials, moderators and coolants are outlined citing a few specific examples. While the incentive for improvement of traditional fuels (e.g., UO_2 fuel) is primarily for increasing the average core burn up, the development of advanced fuels (e.g., MOX, mixed carbide, nitride, silicide and dispersion fuels) are directed towards better utilization of fissile and fertile inventories through adaptation of innovative fuel cycles. As the burn up of UO_2 fuel reaches higher levels, a more detailed and quantitative understanding of the phenomena such as fission gas release, fuel restructuring - induced by radiation and thermal gradients and pellet-clad interaction is being achieved. Development of zirconium based alloys for both cladding and pressure tube applications is discussed with reference to their physical metallurgy, fabrication techniques, in-reactor degradation mechanisms, and in-service inspection. The issue of radiation embrittlement of reactor pressure vessels (RPVs) is covered drawing a comparison between the western and eastern specifications of RPV steels. The search for new materials which can stand higher rates of atomic displacement due to radiation has led to the development of swelling resistant austenitic and ferritic stainless steels for fast reactor applications as exemplified by the development of the D-9 steel for Indian fast breeder reactor. New challenges are thrown to material scientists for the development of materials suitable for high temperature reactors, which have a potential for providing primary heat for thermo chemical dissociation of water. Development of several ceramic materials, carbon based materials, dissimilar material joining are some outstanding issues, which need to be addressed for the successful development of high temperature reactor systems. The presentation will conclude by listing various materials related phenomena, which have a strong bearing on the successful development of future nuclear energy systems.

Industrial Uses of Radiation

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The economic scale of radiation application in the major fields, such as industry, medical care, and agriculture is comparable to that of nuclear power in Japan and in USA where 53 and 103 nuclear power plants are in operation, respectively.

The major tool of radiation application for industry and health care is electron accelerator of which reliability has been much improved in the past 3 decades. There are about 13000 accelerators installed worldwide, of which 1200 are used for industrial applications.

The upgrading of polymers by the radiation cross-linking and grafting by electron beams is extensively used for the production of high quality automobile tires, heat resistant wires and heat shrinkable materials and others. The growing applications of electron accelerator are sterilization of medical products and food packaging as well as cleaning exhaust gases and wastes water for environmental protection.

The functional polymers such as battery separators, deodorant fibers, and wound dressing hydrogel are effectively produced by the use of electron accelerators. Very low energy electron accelerator of 20-200keV is used for curing of surface coating without emission of organic solvent.

Ion accelerators are widely used for the ion-implantation for semiconductor production and surface modification. More than 1000 ion accelerators are used in Japan for these applications. The world first medical ion accelerator in Japan has proven with more than 2,000 clinical test that it can provide highly effective radio-therapy of cancer.

The synchrotron orbital radiation is used for material research. New accelerators based spallation neutron sources are under construction in Japan, USA and Europe (UK) for basic sciences and technology. They produce extremely high flux neutron in pulsed mode which is not available from reactor-based source. Accelerator is an effective tool for nanotechnology.

Nuclear Applications: Future Prospects

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Nuclear physics and energy research depends on and advances science and technology outside of the nuclear field. Perhaps the most commonly perceived benefits to society from nuclear and particle physics are those derived from particle beam technology.

Charged particle accelerators play an increasing role in applications in industry and medicine. Neutrons produced with a high power proton accelerator in a spallation process are used from basic research, radiography in automotive industry (example fuel cell development) to transmutation of highly radioactive fission products. Production and acceleration of ultra cold neutrons provide intense and almost mono-energetic neutrons to study soft matter. Heavier radioisotopes are used in a wide field ranging from medicine to semiconductor industry (ion implantation for doping or coating technologies). Concrete examples and future trends will be given.

Detailed understanding of ion physics at low energy allows the design of compact accelerator mass spectroscopy (close to table top size). The ability to measure concentrations of specific radioactive isotopes even below the natural radioactivity widens the scope of applications from archaeology, climate research to food industry. Such a compact device is close to commercialisation.

Nuclear Measurements

R. Schenkel

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Nuclear measurements play a fundamental role in the development of nuclear technology and the assurance of its peaceful use. They are also required in many non-power nuclear applications such as in nuclear medicine, agriculture, environmental protection, etc. This presentation will show examples of most recent advances in measurement methodology or technology in the areas described below.
The Generation IV International Forum has selected six innovative reactor systems as candidates for a next generation of sustainable, economic and safe nuclear energy systems. The choice of the best options relies heavily on the availability of accurate nuclear data that can only be obtained, in an international effort, using highly specialised facilities.
Significant efforts are being directed towards the partitioning and transmutation of highly active nuclear waste. Different concepts involving fast reactors or accelerator-driven systems are being studied in view of their transmutation capabilities. State of the art equipment has been developed to assess basic properties of nuclear fuel at very high burn-up; some fine examples of this work will be shown.
Physical and chemical methods play a crucial role in the detection and identification of radioisotopes used in various stages of the nuclear fuel cycle. Radiation measurement techniques are used, for example, to monitor the quantities of uranium, plutonium and other actinide elements in fuel enrichment and reprocessing facilities. Another field of application of physical and chemical methods is the characterisation of nuclear material seized from illicit trafficking. Seized material has to be analysed in order to obtain clues on its origin and intended use and to prevent diversion of nuclear material from the same source in the future.
A recent highlight in basic physics relates to nuclear fission and transmutation with high intensity lasers. Ultra-fast high intensity lasers can produce high energy (tens of MeV) photons through electron bremstrahlung, and accelerate charged particles such as protons to many MeV. These accelerated protons can in turn produce high energy neutrons.
These laser experiments open up new possibilities to make nuclear measurements in the laboratory *without* the use of nuclear reactors or particle accelerators.

Session 3: Advancing Radiation Medicine

Imaging for Cancer Therapy

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During the last three decades, 3D imaging with X-ray computerized tomography (CT) and magnetic resonance imaging (MRI) were introduced to characterize tumour morphology for improved delineation of target volumes. At present, the time has come to also start the assessment and correction of the temporal alterations of the target volume**.** This is leading to **"**image guided radiotherapy" (IGRT), which is characterized by the integration of 2D and 3D imaging modalities into the radiotherapy workflow. The vision is to detect deformations and motion between radiotherapy fractions (inter-fractional IGRT) and during beam delivery (intra fractional IGRT). Considering these changes and correcting for them either by gating or tracking of the irradiation beam is leading a step further to "time adapted radiotherapy" (ART). Many institutions are currently addressing this technical challenge, with the goal of implementing IGRT and ART into radiotherapy as a faster, safer and more efficient treatment technique.
Another innovation, which is currently coming up is "biological adaptive radiotherapy". The background for this approach is the fact, that the old hypothesis of radiotherapy assuming that the tumor consists of homogenous tissue and therefore a homogeneous dose distribution has to be delivered to the target can no longer be sustained. It is known today, that a tumor may consist of various subvolumes with different radiobiological properties. New methods are currently being developed to characterize these properties more appropriately, e.g. by functional and molecular imaging using new tracers for Positron Emission Tomography (PET) and by functional magnetic resonance imaging (fMRI). The challenge in radiotherapy is to develop concepts to include and integrate this information into radiotherapy planning and beam delivery, first by extending the morphological image content towards a biological planning target volume including subvolumes of different radiosensitivity, and second by delivering appropriate inhomogeneous dose distributions, e.g. with the new tools of photon- and particle- IMRT techniques ("dose painting").

Progress and Challenges in Cancer Therapy

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Radiation therapy is in the midst of a rebirth largely driven by the use of computers for treatment planning and beam delivery. The first edge of this renaissance was the advent of three-dimensional conformal radiation therapy (3-D CRT). This was enabled by the widespread availability and utilization of three-dimensional imaging such as computed tomography and magnetic resonance scanning, themselves products of the computer revolution. For the first time this allowed radiation oncologists to segment and visualize the tumor in association with it neighboring sensitive soft-tissue structures. Software tools to visualize the beam paths through the body enabled the beam directions and beam shapes to be manually optimized. Simultaneously, improved dose calculations utilizing the CT images of the patient anatomy produced more accurate distributions of dose. The dose was delivered with custom-shaped blocks or recently collimators with multiple leaves that allow complex shaped fields to be delivered without the need for block fabrication.

In the last couple of decades new treatment delivery methodologies have emerged. The first has been stereotactic radiosurgery (SRS) or stereotactic radiotherapy (SRT) which is the purview of neurosurgeons (who call it SRS) as well as radiation oncologists (who usually call it SRT). SRS and SRT are premised on multiple beams focusing on one location typically with circular aperture collimators but increasingly with fields shaped by multi-leaved collimators. Often only a single treatment session (the usual for SRS) is used when the treatment volume is small, but for larger lesions several treatment sessions, or fractions, are used (most often for SRT) to allow for normal tissue repair. The new equipment market for SRS and SRT is about 10% of the total for radiation therapy.

Intensity-modulated radiation therapy (IMRT) is the latest treatment methodology and its adoption has been extremely rapid, particularly in the United States. IMRT uses computer optimization to determine optimal beam delivery intensity maps in order to maximize the target coverage and spare critical tissues as much as possible. The intensity modulated beams are delivered by conventional multileaf collimators or binary collimators modulating fan beams delivered rotationally. IMRT can enable higher doses to be delivered to the tumor and/or reduce the complications of sensitive tissues.

Variability in the setup of the patient and movement of organs has likely limited the success of radiation therapy in the past but has become critical with the newfound ability of IMRT to put high dose gradients between the tumor and critical tissues. These issues are now being addressed with imaging systems present in the treatment room. Image-guided radiation therapy (IGRT) includes methods, such as transabdominal ultrasound and in-room CT scanners to image the patient just before treatment to improve setup accuracy and methods such as electronic x-ray imaging systems viewing implanted markers during treatment to minimize the effect of organ motion.

Excluding proton radiotherapy, equipment costs of modern radiotherapy are only marginally greater than for conventional radiotherapy. In the developed world the cost of radiotherapy equipment is about 15-20% of the total to deliver the treatment. Moreover, the cost of radiation therapy delivery represents only about 10-15% of the budget of a comprehensive cancer center and so it is a bargain as compared to other therapy forms such as surgery and chemotherapy.

Next Generation of Medical Physicists

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The practice of medicine in present times is intimately tied to technological developments. The professional performance of a contemporary medical doctor depends on instrumentation and procedures, which make use of ionizing radiation, radionuclides, ultrasound, fluids, lasers, optics, magnetic resonance, biomaterials, and other phenomena studied by the physical sciences. As a consequence, the medical physicist, a specialist who understands the physics principles and the basis for their clinical application, has become part of the hospital environment. Originally associated only to radiation protection and radiotherapy services, the field of work for medical physicists now expands into the imaging area, since precise diagnostic information has become a required element of the therapy planning.

Medical physicists need to be properly trained and different education schemes exist. At this moment in Latin America, a dozen programs offer specialization to interested physicists or engineers. After being educated, medical physicists need to be hired at a health institution and given the elements to perform their professional duties. In spite of differences in the detail among Latin American countries, they all share a common need for more and better medical physicists in their public and private health institutions. In many places, not even the basic needs of a traditional cobalt irradiation facility are met.

The adoption of advanced techniques such as digital radiology, positron emission tomography (PET) or intensity-modulated radiotherapy (IMRT) generally involves a great investment that some institutions are willing to pay to acquire the equipment. However, the need for trained human resources (physicians, physicists, technicians) is not always part of the original planning. Without this link, the chain to the expected quality of health service is broken. An efficient use of the current investment in medical equipment demands the presence of a new generation of medical physicists.

Interface of Nuclear and Biotechnologies

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Addressing nuclear and biotechnologies in the International Year of Physics should begin by highlighting the important role that this science has played in the development of both branches of science and technologies. The first as a direct consequence of the Theory of Relativity, the further was considerably influenced by Schrödinger's remarks that there must be a code of some kind that allowed molecules in cells to carry information, making a connection between genes and proteins. Both, like any highly technical endeavor, have also in common that the use of technologies demands a vast accumulation of knowledge, i.e. volumes of scientific research, engineering analysis, strict regulatory controls and a huge amount of information combined with a complex assortment of people with the required educational background, expertise and skills to master it.

This presentation briefly explores the ways in which nuclear technology has been used in the last decades of the 20th century in the field of biomedicine applications, which includes the use of radiation to obtain accurate images as well as in diagnosis and therapy. The paper looks at the present prospects of some nuclear methods and instrumentation in the so-called Red biotechnology and its genetically engineered therapeutic agents and diagnostic tests as well as some related perspectives in the field of bioinformatics.

As an example of biotechnology being successfully applied to health problems in developing countries the presentation gives an outlook of relevant Cuban achievements in this field.

Session 4: Supporting Nuclear Safety

The Global Safety Regime – Setting the Stage

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The existing global safety regime has arisen from the exercise of sovereign authority, with an overlay of voluntary international cooperation from a network of international and regional organizations and intergovernmental agreements. This system has, in the main, served us well.

For several reasons, the time is ripe to consider the desired shape of a future global safety regime and to take steps to achieve it. First, every nation's reliance on nuclear power is hostage to some extent to safety performance elsewhere in the world because of the effects on public attitudes and hence there is an interest in ensuring achievement of common standards. Second, the world is increasingly interdependent and the vendors of nuclear powerplants seek to market their products throughout the globe. Efficiency would arise from the avoidance of needless differences in approach that require custom modifications from country to country. Finally, we have much to learn from each other and a common effort would strengthen us all. Such an effort might also serve to enhance public confidence.

Some possible characteristics of such a regime can be identified. The regime should reflect a global consensus on the level of safety that should be achieved. There should be sufficient standardization of approach so that expertise and equipment can be used everywhere without significant modification. There should be efforts to ensure a fundamental commitment to safety and the encouragement of a safety culture. And there should be efforts to adopt more widely the best regulatory practices, recognizing that some modications in approach may be necessary to reflect each nation's legal and social culture. At the same type, the regime should have the characteristics of flexibility, transparency, stability, practicality, and encouragement of competence.

Risk in the Public's Eyes – Incorporating Risks and Public Outreach

J. Saulnier

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New social risk management: perceived risk and actual risk

- Risks at the heart of public concerns (health, environment)
- Refusal to delegate power to a centralized authority
- Calling scientific beliefs into doubt

A new context: dialog with stakeholders & general public

- 1980s: questions not taken into account/negative debate/Chernobyl
- New context: increase in the price of oil/fossil fuel reserves/energy mix
- Arbitration between perceived risks/advantages can only occur during this period

Time for transparency: a new corporate attitude

- Work on explaining and listening to rationalize the public's perception
- Assume one's role and responsibilities as an industry that is socially aware: transparency policy/participation in the discussion/dialog with stakeholders

Concrete example: AREVA communications policy since 1999 (web cam, etc.) in France and abroad.

Safety from Operator's Experience – We Are All in this Together

J. Ellis

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Following the Three Mile Island accident, the U.S. nuclear industry recognized that all nuclear utilities are affected by the performance of any one utility – that they are hostages of each other. This led to the formation of INPO, a unique model of self-regulation through peer review.

As part of the industry's pursuit of excellence, INPO promotes a strong safety culture at each member utility. Nuclear stations need a strong safety culture because of the unique nature of the technology – the presence of radioactive byproducts and decay heat, and the concentration of energy in the reactor core.

INPO's evaluation program is an intentionally intrusive process that provides comprehensive insight about a nuclear station's safety culture. The foundation for the program is the "Performance Objectives and Criteria," which contains standards for plant and corporate performance. It is a behavior-based "safety checklist" that INPO evaluators use in the field as they observe people at work in the plant, in the control room, during training, and in meetings. Open, candid discussions about safety culture are held with the plant staff, senior utility management, and within INPO.

The 2002 discovery of degradation of the Davis-Besse Nuclear Power Station reactor vessel head highlighted problems that result when the safety environment at a plant receives insufficient attention. It also served as a stark reminder that safety culture is perishable and must constantly be rebuilt. As a result, INPO has improved its ability to detect declining plant performance, which will help the industry prevent safety significant events in the future.

Promoting and evaluating safety culture has always been fundamental to INPO's work. While it has been called different things over the years (operational excellence, professionalism, conservative decision-making, or reactivity management), ensuring that nuclear safety has the overriding priority is woven into the fabric of all INPO activities.

The Future of Technical Knowledge Management

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The sustainable development of nuclear energy can only be achieved by establishing the global nuclear safety regime. The effective management of technical knowledge will become one of the issues and challenges in establishing the global nuclear safety. We have to develop the measures to identify the nature and scope of associated problems and to explore the cooperative international actions to resolve them. The future of its effective management will depend on how to optimize the transfer and deployment of the knowledge as well as how to maintain the knowledge base. In this presentation, two specific topics are discussed: sharing of the knowledge and preservation of the workforce. In sharing the knowledge, topics are assurance of free flow of safety-related R&D information from developed to developing countries and potential imposition of a strong trade agreement between nuclear exporting and importing countries to ensure the safety. In preserving the workforce, topics are development of the knowledge transfer system from this generation to the next like a forum of IYNC, enforcement of regional and international educational systems like ANENT and WNU for workforce development, and exploration of optimal mechanism in using retired workforce. The publication of the world-wide directory of nuclear professionals, aggressive implementation of the youth internship program and introduction of the international professional certification program are also discussed. The reformation of CNS as a more enforcing and binding agreement in keeping the safety along with the introduction of "Global Nuclear Safety Treaty" could be an excellent mechanism of achieving an effective knowledge management and eventually enforcing the global safety regime. IAEA has always been the corroborator of maintaining high levels of nuclear safety through close international nuclear cooperation. These important roles of IAEA should continue to be emphasized more than ever in order to secure the global safety regime in time.

FORTHCOMING SCIENTIFIC MEETINGS SCHEDULED BY THE IAEA

2005

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

International Symposium on Trends in Radiopharmaceuticals
14-18 November, Vienna, Austria

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

2006

International Conference on the Safe Utilization and Regulation of Technical Support Services in the Nuclear Industry
8-12 May, Vienna, Austria

International Conference on Management of Spent Fuel from Nuclear Power Reactors
19-23 June, Vienna, Austria

International Conference on Environmental Radioactivity: From Measurements and Assessments to Regulation
26-29 June, Vienna, Austria

International Safeguards Symposium on Addressing Verification Challenges
16-20 October, Vienna, Austria

21st IAEA Fusion Energy Conference
16-22 October, Chengdu, China

International Conference on Quality Assurance and New Techniques in Radiation Medicine
13-15 November, Vienna, Austria

International Conference on Lessons Learned from Decommissioning of Nuclear Facilities and the Safe Termination of Nuclear Activities
11-15 December, Athens, Greece

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