Nuclear Safety Review for the Year 2005

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Foreword

The *Nuclear Safety Review for the Year 2005* reports on worldwide efforts to strengthen nuclear, radiation, transport and radioactive waste safety and emergency preparedness.

A short analytical overview is supported by more detailed Annexes: *Safety Related Events and Activities Worldwide during 2005* (Annex 1), *The Agency's Safety Standards: Activities during 2005* (Annex 2) and *Civil Liability for Nuclear Damage: International Expert Group on Nuclear Liability (INLEX)* (Annex 3).

A draft *Nuclear Safety Review for the Year 2005* was submitted to the March 2006 session of the Board of Governors in document GOV/2006/4. The final version of the *Nuclear Safety Review for the Year 2005* was prepared in the light of the discussions in the Board.

Executive Summary

In 2005, the Agency and its Director General were awarded the Nobel Peace Prize. The Nobel Committee statement recognizes the Agency's "efforts to prevent nuclear energy from being used for military purposes and to ensure that nuclear energy for peaceful purposes is used in the safest possible way."

The global nature of safety is reflected in the relevant international legal instruments, both binding conventions and the non-binding codes of conduct currently in place. During the year, the third review meeting of the Contracting Parties to the Convention on Nuclear Safety as well as the third meeting of the representatives of the competent authorities under the Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or a Radiological Emergency took place.

Improvements have been made in national legislation and regulatory infrastructure in many Member States in 2005. However, inadequate safety management and regulatory supervision of nuclear installations and use of ionizing radiation is a continuing issue in many Member States. A continuing challenge is to collect, analyse and disseminate safety experience and knowledge.

Nuclear power plant (NPP) operational safety performance remained high throughout the world in 2005. Radiation doses to workers and members of the public due to NPP operation are well below regulatory limits. Personal injury accidents and incidents are among the lowest in industry. There were no accidents that resulted in the release of radiation that could adversely impact the environment. NPPs in many parts of the world have successfully coped with severe natural disaster conditions such as earthquakes, tsunamis, widespread river flooding and hurricanes. However, operational safety performance has been on a plateau for several years and concern has been expressed in many forums regarding the need to guard against complacency in the industry.

Research reactors also maintained a good record of safe operation during the year. However, in many cases, resources are not available to adequately deal with potential safety challenges. This concern applies to both the operators and regulatory bodies responsible for research reactor safety.

In 2005, operators of many fuel cycle facilities started to share more information on specific technical safety practices. Sharing lessons learned from incidents at fuel cycle facilities remains a challenge.

Key occupational radiation protection performance indicators once again showed improvement in 2005. Most Member States now have in place some form of individual and workplace monitoring programmes for occupationally exposed workers. Rapid advances in, and increasing application of, medical techniques using radiation continue to challenge radiation protection specialists, both in terms of protecting personnel performing the techniques and patients undergoing treatment. Many Member States, as well as manufacturers and suppliers, are increasingly proactive in their approaches to radioactive source safety. However, serious incidents involving the safety and security of medical and industrial sources continue to occur.

The good safety record for the transport of radioactive materials continued in 2005 and much work was started to address the issue of denial of shipments of radioactive materials intended for use in medical diagnosis and treatment. In July 2005, a group of eight coastal and shipping States had informal discussions in Vienna and there are plans to hold additional meetings.

While high level attention continued to be paid to the protection of humans from radioactive discharges, there is an increasing awareness of the need to demonstrate that non-human species are also protected.

Delays in the practical implementation of suitable disposal solutions means that radioactive waste must be subject to extended storage and more storage facilities will be required. More countries are beginning to consider the holistic view of waste management and disposal that takes into account all factors and considers the entire life cycle. There is also increasing interest in multinational approaches and solutions. More Member States now recognize that decommissioning will be required for all facilities that have used or produced radioactive material.

In 2005, the Chernobyl Forum completed its work and issued its reports as consensus documents. In addition to assessing the health and environmental consequences of the 1986 Chernobyl accident, the Forum provided recommendations for future activities.

There is a need to further harmonize and make compatible international emergency assistance and communications to facilitate more effective and timely responses. This will involve enhancing emergency preparedness programmes, including modernizing emergency management centres and conducting broader emergency exercises. Expeditious transmission of accurate information in the case of an emergency to neighbouring and potentially affected countries continues to be a challenge.

Continuous effort to improve safety is the key to maintaining a high level of safety. In light of the strong performance already achieved, the future challenge will be to maintain this momentum. Safety assessments and international peer reviews must continue to play an important role in assessing and improving safety levels in all areas. It is also essential that more proactive and integrated approaches to safety become the norm.

Safety and security synergies are being better explored and used for the common goal of protecting people and the environment. Before implementing safety or security measures, consideration must be given to the impact of such measures on each other.

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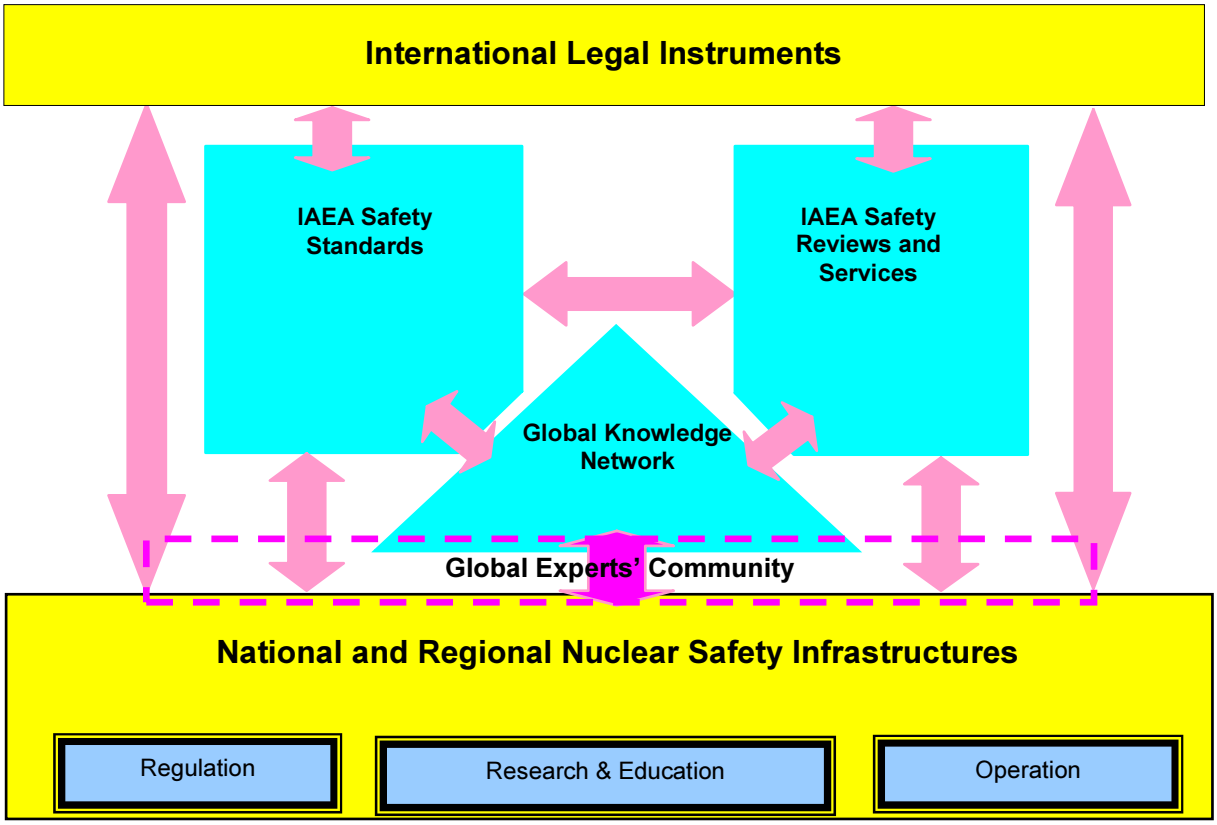
Analytical Overview

A. Introduction

The *Nuclear Safety Review for the Year 2005* presents an overview of worldwide trends and issues in nuclear, radiation, transport and radioactive waste safety and emergency preparedness, highlighting developments in 2005. This overview is supported by more detailed Annexes[1]. This report also discusses security as it relates to safety. A separate report will cover nuclear security.

B. The Global Nuclear Safety Regime

B.1. Overview



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[1] *Safety Related Events and Activities Worldwide during 2005* (Annex 1), *The Agency's Safety Standards: Activities during 2005* (Annex 2) and *Civil Liability for Nuclear Damage: International Expert Group on Nuclear Liability (INLEX)* (Annex 3).

military purposes and to ensure that nuclear energy for peaceful purposes is used in the safest possible way." Connecting nuclear safety and world peace recognizes the importance of various national and sub-national actors and international organizations, in particular, the Agency's role.

The Chernobyl accident in 1986 and the terrorist attacks in the USA in September 2001 have accelerated international cooperation in nuclear safety and security and the establishment of global safety and security frameworks as a more visible important aspect of the globalization process. The world today is increasingly complex and the globalization not only of technology, business and communication, but also of terrorism, affects all human activities. Therefore, solutions for increased nuclear safety and security require a multilateral approach that takes into consideration the interests of key stakeholders, national policies and global trends.

The Global Nuclear Safety Regime is based on considering the interest of a wide range of national and international actors to achieve shared goals while preserving the sovereignty, authority and ultimate responsibilities of States. The relevant actors include industry, governmental, non-governmental and intergovernmental organizations, experts' communities and civil society.

The Agency continues to support a Global Nuclear Safety Regime based on four principal elements: first, the widespread subscription to binding and non-binding international legal instruments such as the safety conventions and codes of conduct; second, a comprehensive suite of nuclear safety standards that embodies good practices as a reference point to the high level of safety required for all nuclear activities; third, a suite of international safety reviews and services, based on the safety standards; fourth, the need to ensure strong national infrastructures and a global experts' community. National infrastructures include appropriate legal and institutional aspects, particularly the nuclear regulatory body, the research and educational institutions and the industrial capability. Self sustaining safety networks of expert knowledge and experience are essential to continuous safety improvement and mutual learning. The Agency serves as the principal actor for the second and third elements.

In 2005, progress has been visible in all four elements of the Global Nuclear Safety Regime as shown in this *Review*. Moreover, the Regime is maturing and becoming a practical example of global cooperation.

A similar vision is being developed for a global security framework that is fully integrated with that for safety in the longer term, although recognizing the current practical needs of a separate but synergistic approach. Safety and security share a common aim, which is preventing or restricting harm to life, health and property. In this context, it is a basic safety requirement to ensure that radioactive sources be kept secure to prevent theft, loss and unauthorized possession or transfer. Before implementing safety or security measures, consideration must be given to the impact of such measures on each other.

B.2. National safety infrastructures

B.2.1. Trends and issues

Strong legislative and regulatory frameworks are essential for global nuclear safety. Among countries operating nuclear power plants (NPPs), significant improvements are taking place in national safety legislation and regulatory frameworks. An increasing number of countries operating research reactors now have promulgated specific laws and established independent regulatory bodies. Questions still remain, however, regarding the effective independence of regulatory bodies and the adequacy and technical competence of regulatory staff in some Member States.

Although certain improvements have been observed, inadequate regulatory supervision of nuclear installations and the use of ionizing radiation remains an issue in some Member States. Staffing of the regulatory body with competent, trained people is also a problem, especially in Member States having a limited pool of qualified persons to staff both the regulatory body and the operating organization.

Increasingly, the regulatory bodies of Member States make use of the IAEA Safety Standards both for establishing regulatory standards and for benchmarking and reviewing their national standards. However, many challenges remain both in bringing consistency to national regulations and codes and in harmonizing these with international standards.

Most Member States recognize the need for full regulatory control over radioactive sources and want to compare their efforts with situations in other countries. This will become more important as the guidance on import and export of radioactive sources is implemented. The issue of control over radioactive sources in the more than 40 countries that are not Agency Member States remains a challenge.

As experienced staff retire and as the need for expanded regulatory activities increases, many regulatory bodies remain challenged for human and financial resources and with maintaining competence. Many regulatory bodies still require extensive assistance to implement an adequate regulatory regime, particularly in terms of training, skills and experience.

B.2.2. International activities

There are a number of forums in which regulators can exchange information and experience with their counterparts in other countries such as the International Nuclear Regulators Association (INRA), the G8 Nuclear Safety and Security Group, the Western European Nuclear Regulators' Association (WENRA), the Ibero-American Forum of Nuclear Regulators, the Cooperation Forum of State Nuclear Safety Authorities of countries which operate water cooled, water moderated power reactors (WWERs), Network of Regulators of Countries with Small Nuclear Programmes (NERS) and the Senior Regulators from Countries Operating CANDU Type Nuclear Power Plants.

The Agency continues to offer support to assist Member State regulatory bodies. These services include missions such as International Regulatory Review Teams (IRRTs), Integrated Safety Assessment of Research Reactors (INSARR), Radiation Safety and Security of Radioactive Sources Infrastructure Appraisals (RaSSIAs), Transport Safety Appraisal Services (TranSASs) and International Nuclear Security Advisory Services (INSServs), as well as many training courses, seminars and workshops. The Agency has developed and distributed an information management tool (RAIS 3.0) to assist regulatory bodies in managing their day-to-day activities. The Agency also continues to provide standardized training packages for the staff of regulatory bodies.

Following past practice, the 2005 Senior Regulators' Meeting was held in Vienna in conjunction with the General Conference. Senior regulators from more than 50 Member States discussed regulatory challenges such as safety fundamentals, a holistic approach to radiation protection standards and insights from the Review Meeting of the Convention on Nuclear Safety on the role of leadership and dialogue. Senior regulators also had an extensive discussion regarding the IAEA Safety Standards, specifically how various regulatory bodies are making effective use of the Standards.

B.2.3. Future challenges

The Agency is developing an integrated approach to make its services related to legal and governmental infrastructure more consistent, efficient and useful for Member States. This integrated approach will also avoid overlaps and undue duplication.

Although the operating experience feedback processes are well established at the national level and in many cases among similar facilities, the feedback of operating experience at the international level needs to be substantially improved.

A major challenge facing many Member States is to establish, maintain and sustain technical competence as experienced staff retire and facilities age. Providing adequate resources, both financial and human, for regulatory bodies remains a challenge in many Member States, particularly as more Member States move towards sustainable national approaches. As the use of nuclear related technologies expands, more regulatory bodies will be challenged to effectively regulate these expanded uses, advanced technologies and innovative designs. There is also an increased desire and need for harmonization at the international level.

Interdisciplinary scientific and technical expertise is often observed in research centres and specialized technical support organizations (TSOs). In many Member States, these organizations provide services to regulators and operators to assess and improve safety. In other Member States, there is still a need to establish these organizations. The need also exists to strengthen the knowledge and experience exchange among TSOs of various Member States and the global experts' community.

In addition to licensing and regulating new nuclear facilities, many regulators also need to deal with licence renewals and life extensions of existing facilities.

A major challenge facing many Member States is the establishment and maintenance of the inventory of radioactive sources in the country.

Considerable effort will be required to ensure that assistance provided by the Agency to Member States continues to be harmonized, consistent and coordinated with assistance provided by other international organizations or that provided on a bilateral basis.

B.3. International legal instruments

The international legal instruments, both binding conventions and non-binding codes of conduct, currently in place demonstrate the global nature of safety. These instruments are incentive instruments based on a common desire to achieve high levels of safety worldwide.

In March 2005, India ratified the Convention on Nuclear Safety (CNS), which now has 56 Contracting Parties, including all Member States operating NPPs. The 3rd Review Meeting of the Contracting Parties to the CNS was held in April 2005 in Vienna, where delegates concluded that Contracting Parties were in compliance with the CNS and that, after 10 years and three Review Meetings, there was a need for renewal.

The third meeting of the representatives of competent authorities identified under the Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency was held in Vienna in July 2005. Participants agreed on a proposal for enhancing the existing drill and exercise regime and encouraged competent authorities and the Agency to develop a code of conduct for the international emergency management system.

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) had 36 Contracting Parties at the end of 2005. The Contracting Parties to the Joint Convention met to finalize arrangements for the 2nd Review Meeting. Contracting Parties also held an extraordinary meeting to approve revised Rules of Procedure and Financial Rules, revised guidelines regarding the review process and new guidelines regarding the topic sessions in the review process.

In 2005, agreement was reached to substantially strengthen the Convention on the Physical Protection of Nuclear Material (CPPNM) by making it legally binding for States Parties to inter alia protect nuclear facilities and material in peaceful domestic use and storage, as well as transport. The new rules will come into effect once they have been ratified by two-thirds of the States Parties of the CPPNM.

To the end of 2005, 79 countries had written to the Director General expressing their support for the Code of Conduct on the Safety and Security of Radioactive Sources, while only 17 had formally written indicating their commitment to follow the Code's supplementary guidance on the import and export of radioactive sources. With the completion of the Code of Conduct on the Safety of Research Reactors, Agency activities are now focused on its effective application.

B.4. International safety standards

There has been increased application of the IAEA Safety Standards as the global reference for protecting people and the environment against nuclear accidents and the harmful effects of radiation exposure. Some Member States make direct use of the standards for licensing, while others use them as reference for establishing and reviewing national regulations and effective regulatory oversight. During the Senior Regulators' Meeting in September 2005, a number of initiatives were presented regarding Member State use of the IAEA Safety Standards. The UK Health and Safety Executive has benchmarked its Safety Assessment Principles against the IAEA Safety Standards and the Western European Nuclear Regulators Association (WENRA) is using the IAEA Safety Standards as a basis for the harmonization of national regulations in Europe. Both China and Pakistan reported extensive use of the IAEA Safety Standards in their regulation of NPPs.

In 2005, the Agency collected relevant information on the use of the IAEA Safety Standards and feedback from regulatory bodies and other users in Member States. This information comes from the Agency's safety review services, the Commission on Safety Standards and the four standards committees, the individual users of the standards through a questionnaire on the Agency website and from international organizations. This information is systematically considered in the periodic review of the IAEA Safety Standards to ensure their applicability and continuous improvement.

C. Nuclear power plant safety

C.1. Trends and issues

Nuclear power plant (NPP) operational safety performance, in general, has remained at a high level throughout the world. Radiation doses to workers and members of the public due to NPP operation are well below regulatory limits. Personal injury accidents and incidents are among the lowest in industry. There have been no accidents that have resulted in the unplanned release of radiation that could adversely impact the environment. This operational safety performance is a strong testimony to the attention to improving the engineering and human performance attributes of safety that have occurred over the past two decades. However, it has been on a plateau for a number of years. Events whose root causes have previously been identified and shared throughout the nuclear community continue to recur. A number of regulatory bodies around the world continue to strive for the resources and capabilities necessary to properly regulate their nuclear power industries. These issues, combined with less tangible indicators that reflect motivation and attention-to-detail, raise the question of whether complacency may be becoming an issue.

Universally, there is recognition among operators and regulators that nuclear safety has worldwide impacts. There is interest for a form of international certification for NPP design to effectively manage the extensive effort needed to review the design of new reactors and meet the common needs of regulatory bodies to conduct this review. WENRA has continued its work to harmonize the various sets of rules and regulations that currently exist in Europe. The Agency continues to upgrade and conduct its programme on assessing the compliance of NPPs being designed and constructed with the IAEA Safety Standards. The USA has also proposed a new multilateral programme that would allow for the sharing of design and licensing information for new NPPs seeking a Design Certification under its NRC Regulation, Title 10, Code of Federal Regulations (CFR), Part 52.

Another issue is the need for the necessary infrastructure to support not only the design and initial licensing of a new NPP, but the construction, commissioning and operation of the NPP over its expected lifetime. The recent increase in the construction of new NPPs, especially in the Far East, is being reinforced by actual and proposed construction in Europe and North America. Operators and regulators are more and more using international peer reviews to ascertain the adequacy of new NPPs to meet both national and international expectations. The global implications of nuclear safety have been universally recognized and the Agency has initiated programmes to assure that the lessons learned and good practices identified in all Member States can be shared.

The application of risk-informed techniques into the decision-making process of both the operating and regulatory bodies within the industry continues and these techniques are being expanded into the design of new NPPs. Many NPPs are now using some type of “risk monitor” to assist them in making operational decisions, especially those related to on-line maintenance. Most national regulatory bodies also use risk considerations in establishing requirements for the approval of operational activities, the licensing of designs and for inspection and enforcement. As is recommended in the IAEA Safety Standards, more Member States are making probabilistic safety analyses a requirement for the siting and design of new facilities.

Most Member States with NPPs now have extensive programmes to analyse operating experience at the operating organization or even national level. In most cases however, these programmes do not take into account and effectively communicate international operating experience. Over the past several years, the quality and number of events reported to both operator and regulatory incident reporting systems have remained at a minimal level, despite continued efforts to improve the commitment to sharing information. One of the results of this trend has been that events with the same root causes continue to recur.

NPPs in many parts of the world have successfully coped with extreme natural disaster conditions such as earthquakes, tsunamis, widespread river flooding, tornadoes and hurricanes. In no case were the reported results of these conditions such that public safety was challenged or environmental impacts were experienced. These NPPs were also capable of returning to operation shortly after conditions had moderated, thereby contributing to restoration efforts. Continual vigilance is needed to assess the possible impact of these extreme conditions on facilities and operational practices.

With almost 65% of the world’s operating NPPs more than 20 years old, substantive decisions are being made concerning their future. Power uprates and licence extensions are being proposed for more and more facilities. Operational upgrades are being implemented to improve financial return-on-investment and integrate technological advancements. Programmes on ageing management and maintenance and motivation of the work force are important to maintaining safety throughout the entire life cycle of the facility.

Compounding this trend are some signs that the competitive nature of the nuclear power business has spilled over into the safety area. There are instances where competing entities do not freely share

safety advice and lessons learned. Also, the International Nuclear Safety Group (INSAG), World Association of Nuclear Operators (WANO) and the Agency have all recognized that more executives with non-nuclear backgrounds are taking the helms of operating NPPs. While not a flaw in itself, it sets up an environment where safety insights may not be self-evident and, when combined with other signals, such as the selective use of performance indicators, it may negatively impact safety.

C.2. International activities

From 11 to 22 April 2005, Contracting Parties to the Convention on Nuclear Safety (CNS) met in Vienna for their 3rd Review Meeting, with 50 of the Contracting Parties, and over 500 delegates, in attendance. The participants conducted a thorough peer review of the Contracting Parties' national reports. For each Contracting Party, the participants identified good practices and opportunities for improvement. The participants also concluded that all Contracting Parties in attendance were in compliance with the requirements of the CNS. The Contracting Parties also identified the challenge of avoiding any complacency resulting from this success. Finally, the Contracting Parties noted that although the focus tends to be on the triennial national reports and review meetings, the CNS is an ongoing process that looks to continually promote the advancement of nuclear safety. The Review Meeting included a panel discussion on the challenges facing the nuclear safety leadership of both regulators and operators, including strong safety culture and safety management. This panel reinforced the need to pay particular attention to leadership factors.

From 30 November to 2 December 2005, the Agency hosted an international conference to share, in a global sense, the operating and regulatory experiences for improving operational safety performance in nuclear installations. Participants made recommendations for operating, regulatory and international organizations regarding how to improve the sharing of operating experiences, how to learn from and share experiences on regulatory management systems, how best to achieve and ensure the safety of extended operations and how best to ensure that operating experience is reflected in the design, construction, commissioning and operation of new NPPs.

Many Member States recognize that peer review services, such as the Agency's Operational Safety Review Team (OSART) and Engineering Safety Review Services and WANO's peer evaluations are important tools for assuring the safety of the design, operations and maintenance of NPPs. These services were specifically mentioned at both the 3rd Review Meeting of the CNS and WANO's Biennial General Meeting and some Member States have incorporated them into their design, operational and regulatory processes. The Agency's efforts complement those offered by WANO in enhancing operational effectiveness and improving management of safety.

C.3. Future challenges

One of the largest challenges facing NPP safety is maintaining, and in some cases developing, the necessary infrastructure needed to design, construct, operate, maintain and regulate NPPs. This includes the knowledge, skills or abilities in operating, technical support and regulatory organizations. Experienced industry and regulatory executives are retiring and this is challenging the nuclear safety leadership of both regulators and operators. Good practices such as recruitment and retention of qualified staff, succession planning and overlap between out-going and incoming staff, quality procedural guidance, mentoring and training programmes are being used, with varying success. Likewise, it is important to have the necessary transmission and distribution structures to effectively integrate large capacity generating facilities into the energy market. For many countries, these challenges are further compounded by the demands on construction industries to have the technical depth needed to effectively undertake complicated civil, mechanical and electrical projects. The potential renaissance of commercial nuclear power will exacerbate the knowledge management

problem by increasing the demand and competition for those scarce resources with institutional and technical competence.

Recurring events are a challenge that must be dealt with in an effective and efficient manner. Additional work must be done so that everyone involved in the nuclear industry has a strong appreciation for the value of openly and comprehensively sharing the details behind all incidents and events. More effective mechanisms must be developed to share, in the broadest manner, the lessons learned from events. It is equally important that success stories, good practices and pre-emptive strategies that help preclude the occurrence of events be shared across the industry.

The challenges of assuring that the concepts of safety and security are both adequately considered and dealt with will require the attention of designers, operators and regulators. Both safety and security forums have recognized that these two concepts have overlapping jurisdictions and implications. Before implementing safety or security measures, consideration must be given to the impact of such measures on each other. Bringing balance and harmony to these two principles will require the development of appropriate international guidance, as well as the implementation of effectively coordinated national coping strategies.

More Member States have plans to extend or are considering extending the life of current NPPs. The development of effective programmes that address life cycle management must be pursued.

Leadership is essential for nuclear safety and particularly important for complacency to be avoided. It is a continuing challenge to ensure that nuclear operating companies' Boards of Directors and senior executives, many of whom do not have a nuclear safety background, understand the importance of achieving a high level of nuclear safety.

D. Research reactor safety

D.1. Trends and issues

For over 50 years, research reactors have been one of the cornerstones of nuclear science and technology. Throughout this time, these facilities have maintained a good record of safe operation. This record continued in 2005. Some new research reactors have recently begun operation or are in advanced stages of construction. In addition, plans for new reactors or upgrading of existing facilities are being developed in several Member States. These new and upgraded reactors not only provide improved capabilities to serve their user communities, but provide improved safety by virtue of an increased attention to safety in design and incorporation of modern safety systems.

Resources in many cases are not adequate to deal with safety appropriately. The ageing of research reactor facilities and staff is a continuing problem. While many reactors have been upgraded with modernized safety systems, the ageing of permanent systems, structures and components requires continuing careful and increasing attention. The loss of skilled and experienced staff due to age has been compounded by difficulty in recruiting new personnel and has become a critical issue in some facilities. In many cases, this is caused by a lack of financial resources.

Although limited improvements have been observed in some Member States, inadequate regulatory supervision of research reactors is another continuing issue. In many Member States, the legal and governmental infrastructure is inadequate and/or the regulatory body does not satisfy international

standards for independence and effectiveness. Staffing of the regulatory body with competent, trained people is also a problem, especially in Member States having a limited pool of qualified persons to staff both the regulatory body and operating organization.

Many research reactors remain in a state of extended shutdown. While the operators of most of these reactors state that they have plans to either restart or decommission, the safety of these facilities must be assured in the interim.

More Member States are aware of the need for preliminary decommissioning plans, but it is proving difficult to translate this awareness into action. In some Member States, there continues to be resistance to preparing preliminary decommissioning plans because of the perception that the preparation of a plan is an indication that the facilities will be shut down.

The Agency, at the request of Member States, has been assisting countries with the voluntary conversion of nuclear facilities and repatriation of high-enriched uranium (HEU) fuel. In the context of this work, the Agency attaches particular importance to the application of relevant safety standards and guides.

D.2. International activities

The Agency initiated a Research Reactor Safety Enhancement Plan in 2001. With the completion of the Code of Conduct on the Safety of Research Reactors, the latest version of the plan is now focused on three main activities:

- Establishing Agency safety documents as the foundation upon which a global safety framework for research reactors is based;
- Encouraging and assisting Member States in effective application of these safety documents; and,
- Fostering global and regional cooperation in research reactor safety.

The Code of Conduct on the Safety of Research Reactors provides guidance for the development and harmonization of national policies, laws and regulations, and sets forth the desirable attributes for the management of research reactor safety. Development of the Code of Conduct is complete and activities are now related to its application.

In December 2005, the Agency organized an open-ended meeting where representatives from over 30 Member States met to explore how best to apply the Code of Conduct on the Safety of Research Reactors. At this meeting, participants called inter alia for periodic meetings to discuss the effective application of the Code of Conduct, an internet site to facilitate the exchange of information as well as the integration of the Code of Conduct into all Agency safety assistance and review activities.

The work to complete the corpus of safety standards for research reactor safety in support of the Code of Conduct is well underway. The Safety Requirements NS-R-4, *Safety of Research Reactors,* was published in 2005. Nine supporting safety guides are in various stages of the drafting and review process, and should be published by the end of 2007.

Regional cooperation among Member States can be an effective means of dealing with issues facing the research reactor community. Cooperation in addressing safety issues, building strong safety cultures, overcoming a scarcity of resources and disseminating operational experience will all be strongly encouraged by the Agency.

Training workshops and seminars, and associated training materials for research reactor safety have been and will be developed and made available to all interested Member States. Generally, the approach is to train the trainers. This approach allows the Agency to develop more efficient training

programmes, and it promotes independence and self-reliance in the Member States and encourages sharing knowledge and experience.

The Agency's current programme includes an Incident Reporting System for Research Reactors (IRSRR) with the objective to improve the safety of research reactors through the exchange of safety-related information on unusual events. By the end of 2005, 47 Member States with research reactors had joined the IRSRR. In 2005, the Republic of Korea hosted an IRSRR technical meeting where participants received training on event analysis techniques and discussed events that occurred at research reactors to share the lessons learned.

D.3. Future challenges

From the Agency's perspective, the primary future challenges in research reactor safety are to ensure: that effective regulatory supervision in line with the IAEA Safety Standards is in place in all Member States; that a strong management system is developed in the whole research reactor community; and that ageing issues are dealt with through appropriate refurbishment and upgrading or decommissioning. Effective application of the Code of Conduct and the IAEA Safety Standards is a continuing challenge, as is building the regional and international cooperation to address these issues.

Assessment of research reactor safety and assistance in its improvement will continue to be a major challenge. This safety assessment will emphasize the application of the Code of Conduct and IAEA Safety Standards, the development of processes to identify operational strengths, weaknesses and good practices, and the sharing of these insights throughout the research reactor community as a means to improve safety. Implementation of the recommendations from the December 2005 meeting will help achieve these.

Research reactors under project and supply agreements present a special challenge in view of the Agency's specific safety related responsibilities with respect to these reactors. While many of these reactors have received safety missions, regularly scheduled safety review missions need to become the norm. In addition, the Secretariat will conduct periodic meetings of operators of such reactors to provide a forum to discuss and share operational experience and safety insights, consider regulatory implications and formulate suggestions for more effective mutual assistance and Agency support.

E. Fuel cycle facility safety

E.1. Trends and issues

Fuel cycle facilities cover a wide range of activities, including mining and milling, conversion and enrichment, fuel fabrication, interim spent fuel storage, reprocessing and waste conditioning. Many of these facilities are operated by the private sector, with operators often in competition with each other, making much of the process and technology information commercially sensitive. In the past, this sensitivity often extended into the safety area. However, recently there have been signs that this may be changing. In Europe, for example, there is now multilateral sharing of information on specific technical safety practices.

These facilities face unique safety challenges such as criticality control, chemical hazards and susceptibility to fires and explosions. Many of these facilities rely heavily on operator intervention and

administrative controls to assure safety. Although the principles of fuel cycle facility safety are similar to those of NPPs, the approach to safety must be graded and based on potential hazards.

Many of the smaller facilities must deal with a lack of human and financial resources. In some countries, these resource limitations are also seen in the regulatory bodies. Many facilities are also operating at only a fraction of full capacity, a situation that exacerbates the financial limitations and results in additional challenges, such as maintaining human performance skills and exercising system operations in a predictable manner. Thus, it is difficult for many of these facilities to maintain competence in all areas of safety. International safety guidance for fuel cycle facilities is not yet complete and Agency safety services have yet to be made more effective.

For spent fuel, the lack of permanent repositories has led to storage facilities being used for extended periods. Changes in fuel designs, such as higher burnup fuel, higher enrichment and MOX, are creating additional challenges to ensure fuel cladding integrity and residual heat removal. It should be noted that the majority of innovative NPP designs include the recycling of spent fuel.

E.2. International activities

The Agency is currently developing a set of safety standards dedicated to the entire range of fuel cycle facilities. These standards will address both generic and process-specific considerations.

Initial guidelines for the evaluation of the operational safety of fuel cycle facilities have been prepared. They allow for a self-assessment by a Member State of its fuel cycle facilities, as well as the implementation of a new Agency safety peer review service titled “Safety Evaluation During Operation of Fuel Cycle Facilities” (SEDO). The SEDO guidelines were approved in 2004 and the SEDO service is now available to Member States upon request. The Agency continues to develop the training material needed to support the SEDO service.

In close cooperation with the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), the Agency is also fostering the international exchange of information of fuel cycle facility safety issues. At a technical meeting in 2005, Agency Member State participants endorsed the guidelines for the OECD/NEA Fuel Incident Notification and Analysis System (FINAS) and the Secretariat is currently developing a common web platform which is to cover the Incident Reporting Systems dedicated to NPPs (IRS), research reactors (IRSRR) and the fuel cycle facilities (FINAS).

E.3. Future challenges

The Agency needs to prepare a complete set of safety documents dedicated to fuel cycle facilities, including those of small size — such as the pilot and R&D fuel cycle facilities devoted to the production of research reactor fuel — and those of large size — such as commercial power reactor fuel production and reprocessing facilities.

The Agency will work with Member States to develop and improve the SEDO peer review service so that Member States will recognize its value and take advantage of it for improving the safety of their fuel cycle facilities.

The Agency must also develop customized training and safety assessment services for fuel cycle facilities that will address both generic and process-specific safety issues and trends.

F. Radiation protection

F.1. Biological effects attributable to radiation

At its September 2005 meeting, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) determined that its current estimates of the risks of radiation exposure which are used as the basis of radiation protection are essentially robust, even though ongoing research continues to indicate a more complex situation than has hitherto been assumed for the purposes of protection.

F.2. Approaches to radiation safety

F.2.1. International Commission on Radiological Protection (ICRP) Recommendations

The recommendations of the ICRP have underpinned the international and national radiation safety standards for over 50 years. The current recommendations were finalized in 1990 and several years ago, ICRP initiated a review of them. There have been no substantial changes in the assumed health effects from low levels of radiation exposure over the last 15 years, but ICRP felt that their current system of protection, based on the concepts of practice[2] and intervention[3], needed clarification. In June 2004, the ICRP issued a draft of a revised set of recommendations for public consultation. Nearly 200 responses, amounting to some 600 pages of written text, were received. In its review of these comments at a meeting in March 2005, the ICRP felt that many had arisen because the foundation documents had not, at the time, been put out for consultation. Since then, drafts of a number of foundation documents have been made available for comment. These are:

- Health risks attributable to radiation;
- Dosimetric quantities for radiological protection;
- Assessing dose to the representative individual.
- The optimization of protection.
- Reference animals and plants for protection of non-human species.

Amended versions of the first four were approved in principle at the ICRP meeting in September 2005. The fifth was passed to a new committee (Committee 5) on the protection of non-human species to use as working material. In addition, three new foundation documents were thought to be necessary as a result of the consultation exercise, the first dealing with the scope of radiation protection controls, the second with the basis for the ICRP dose limits and the third with medical exposures.

The next draft of the recommendations will be completed after the finalization of the foundation documents and should be ready for consideration by the ICRP in the early part of 2006. A second round of consultation on the proposed recommendations is now expected to take place during 2006. The most likely consequence of this will be that the publication of the new recommendations will be delayed until at least late 2006.

F.2.2. Regulating radiation safety

The Agency's *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* (BSS) are regarded as the global point of reference for standards for protection against ionizing radiation. They are based on the most up-to-date data on the health

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[2] A "practice" is a human activity undertaken by choice that increases the overall exposure of persons to radiation.

[3] An "intervention" is an action against radiation exposure that already exists, for the purpose of reducing the exposures.

consequences of radiation exposure as provided by UNSCEAR and on the recommendations of the ICRP. Regional requirements, such as the Euratom directive on basic safety standards, are similarly based and are therefore broadly consistent with the BSS.

A number of important developments have occurred since the BSS were published in 1996. At the technical level, further safety standards have been prepared that have a direct relationship with the BSS. This, combined with the activities being carried out under the Agency's action plan on safety standards and the prospect of new ICRP recommendations, has prompted the Agency to initiate a review of the BSS. During 2005, a policy and strategy for the review and eventual revision of the BSS was established. This policy indicates that the BSS should continue to underpin the approaches to radiation safety in every domain, including medicine, general industry, nuclear industry, radioactive waste management, and transport and covering occupational exposure, medical exposure and exposure of members of the public. Consistent with the BSS being a Safety Requirements level document, they should be in such a form that they can be readily transformed into national regulatory requirements.

The intention is that the review will be completed before the end of 2006. It will identify the issues that need to be addressed and will propose solutions. In that sense, the review and revision should not be regarded as totally separate exercises. In particular, it is foreseen that papers discussing some substantive issues and the solutions that might be applied will be presented at the June 2006 meeting of the Commission on Safety Standards. The work will be done in full cooperation with the co-sponsors of the BSS in order to maintain the broad consensus that already exists. In addition, the work will proceed in parallel with a review of the Euratom directive on basic safety standards, the objective being to seek as much harmonization as possible.

G. Occupational radiation safety

G.1. Trends and issues

Key occupational radiation protection performance indicators, such as annual dose, annual collective dose, the number of workers receiving high doses, and the numbers of overexposures once again continued to improve in 2005, based on information from UNSCEAR, the Information System on Occupational Exposure and various regional and national studies. The International Agency for Research on Cancer study on radiation workers supports the viability of current international radiation protection standards.

There is a need for more harmonization of occupational radiation safety guidance at the national level. While trade unions and regulatory bodies exist for different reasons, both have an interest and a responsibility in protecting workers. Trade unions tend to use guidance from the International Labour Organization (ILO) (ILO Convention 115 and code of practice), while national regulatory bodies tend to use Agency and ICRP guidance. Over the past several years, Agency and ILO staff have established closer working relationships and actions are underway to harmonize the guidance of the two organizations.

More Member States and organizations are implementing quality management for occupational radiation protection programmes.

Most Member States now have in place some form of individual and workplace monitoring programmes for occupationally exposed workers. Considerable work has been and is still being done to improve and harmonize the individual monitoring programmes and techniques.

G.2. International activities

The Secretariat is implementing the Action Plan for Occupational Radiation Protection in collaboration with the ILO Secretariat and a number of international professional societies. The Secretariats of the Agency and the ILO have established a Steering Committee comprising representatives of several interested States and international organizations to advise on, monitor and assist in the implementation of the Action Plan.

ILO's responsibility for occupational safety and health is discharged in the radiation protection area through the promotion of the ILO Convention concerning the Protection of Workers against Ionising Radiations (ILO Convention 115), which has so far been ratified by 47 countries. ILO uses the requirements embodied in the BSS as the basis for assessing compliance with Convention 115. Many documents on occupational radiation protection published by the Agency, as well as the BSS, are also co-sponsored by ILO. The ILO recently concluded that Convention 115 is still relevant and continues to promote the ratification and implementation of the Convention. The ILO has a well-established system involving direct lines of communication with its Member States for reporting on and review of the application of all its Conventions and recommendations.

The ILO also has a code of practice on radiation protection of workers (ionizing radiations) and recently conducted a review of this code of practice, which proposed some changes. The ILO is now considering the findings of the review.

The Agency continues to conduct intercomparisons of monitoring methods for assessing occupational exposure, in order to assist Member States in complying with dose limitation requirements and to harmonize the use of internationally agreed quantities and assessment methods. Many different intercomparison exercises are at various stages of implementation.

Training packages on occupational protection in diagnostic radiology, nuclear medicine and radiotherapy, as well as a package on radiation protection for cardiologists were completed in 2005.

G.3. Future challenges

Clearer guidance is needed to assist regulatory bodies in deciding what activities to regulate and how to apply a suitable graded approach to the regulation of occupational exposure to enhanced natural radiation that is compatible with protection against exposures from artificial sources. This will involve assisting authorities in identifying activities involving exposure to natural radiation that may need to be controlled, and to generate and disseminate additional sector-specific information on radioactivity levels, exposure conditions, and chemical and physical characteristics of airborne pollutants in workplaces involving naturally occurring radioactive material.

It is important that radiation protection and other safety measures in the workplace are not in conflict. Rather, all of these measures should reinforce each other in the overall context of safety awareness and safety culture. A holistic view is needed that takes into account the various interactions of all potential workplace hazards.

There are indications that in the case of certain radionuclides, some possible exposure routes for pregnant workers and their embryos and foetuses might not have been fully identified. Some Member States and a number of bodies, such as the ICRP, have done relevant work in this area, but there may

be a need for further international guidance on the formulation and application of standards for their protection.

The ILO Convention concerning Benefits in the Case of Employment Injury (ILO Convention 121), provides for compensation for diseases caused by ionizing radiation. However, occupationally exposed workers may develop diseases similar to those developed by members of the general public, including cancers. Some of these diseases may be attributable to radiation exposure at work. Although a number of Member States have schemes for this, international guidance would aid the decision-making on the attribution of cases of detrimental health effects to occupational exposure to ionizing radiation.

H. Radiological protection of patients

H.1. Trends and issues

An almost three-fold increase in the number of countries involved in Agency technical cooperation projects in the area of radiological protection of patients has been witnessed in the last three years.

The development of ever faster computed tomography (CT) systems every year has made it possible to achieve dynamic imaging of the beating heart, and visualize and quantify calcium build-up in coronary arteries. The possibility to image the whole chest with multi-detector CT in a single breath means greater usage of the technology for repeat scans. In some Member States, CT now contributes to nearly 70% of the collective dose from medical exposure.

The second largest contributor to collective dose is the range of interventional procedures that are performed in place of surgery. Such procedures utilize X rays to guide catheters and wires through blood vessels. Individual patient doses, in terms of maximum skin dose to a patient, often exceed the levels where deterministic effects appear. With the doubling of such procedures in many countries every two to four years, coupled with repeat procedures sometimes required for the same patient, such procedures are posing a growing challenge to radiation protection specialists.

The need for more radiotherapy facilities to treat and cure cancer has led the Agency to launch the Programme of Action for Cancer Therapy (PACT), which will further increase the need for radiation safety.

The Agency's activities in training interventional cardiologists in radiation protection have resulted in a significant increase in awareness among cardiologists about radiation risks and the need to protect patients.

H.2. International activities

In 2005, the ICRP published *Release of Patients after Therapy with Unsealed Radionuclides* (ICRP Publication 94). There are wide variations in practice in Member States on release criteria after radionuclide therapy and such guidance from ICRP was very much needed. Since the IAEA Safety Standards consider the ICRP recommendations, there is a need to review the existing guides against ICRP Publication 94.

The European Commission has issued guidelines on radiation protection in dental radiology.

In 2005, the Agency continued to train interventional cardiologists in radiation protection. Interventional cardiologists are among the highest users of X ray fluoroscopy, but have minimal or no training in radiation protection. A draft version of the training material on CD-ROM was completed in 2005.

Under the International Action Plan for the Radiological Protection of Patients a wide range of activities were pursued that resulted in achieving consensus on three training CDs (radiation protection in diagnostic and interventional radiology, radiotherapy, and nuclear medicine) with the World Health Organization (WHO), the Pan American Health Organization (PAHO), ILO and corresponding international professional societies[4]. Training courses were held in 2005 for all technical cooperation regions. A basis element of the International Action Plan is the work on quality management both through equipment quality control and patient dose management.

Important work is also done by associations of medical physicists in various countries to avoid unnecessary doses to patients.

H.3. Future challenges

The website[5] on radiological protection of patients will be launched in 2006. Its objective is to be a focal point for information on this topic of fast-growing importance.

A new training programme for doctors performing fluoroscopic procedures, other than cardiologists and radiologists, is being launched in 2006. Since an increasing number of non-radiologists (e.g. urologists, gastroenterologists, and orthopaedic surgeons) use X ray fluoroscopy in their practice, with the potential for high patient exposure, such training programmes have become essential.

I. Protecting the public and the environment

I.1. Trends and issues

There are clear international standards for controlling radioactive discharges to protect the public and according to UNSCEAR estimates, doses to humans from these discharges are negligible. At present, the risk assessment and management of radionuclides entering or present in the environment is generally based on human health considerations alone. This is based on the belief that the level of protection afforded to humans under existing regulatory mechanisms also provides a level of protection to the environment which likely does not put non-human species at risk. However, there has been an increasing awareness of the vulnerability of the environment and of the need to be able to demonstrate that it is being protected against the effects of industrial pollutants, including radionuclides. Policies and approaches that specifically address impacts of radioactive substances on non-human species are now being developed by a number of international, regional and national organizations.

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[4] International Society of Radiology (ISR), International Organization for Medical Physics (IOMP), and the International Society of Radiographers and Radiological Technologists (ISRRT)

[5] http://rpop.iaea.org

As technological advances allow for the detection of ever lower levels of radioactivity, the practicality and usefulness of zero discharge requirements, such as that provided for in the OSPAR Convention in Europe, is increasingly being questioned.

Naturally occurring radioactive material (NORM) can become concentrated, in areas not normally controlled by regulatory bodies, to levels beyond the concentration limits set for practices. Such activities include conventional mining and processing of ores. At present, there are no defined repositories for this waste and current standards do not always provide the necessary guidance.

I.2. International activities

The ICRP is developing a combined approach to the protection of humans and other species within an overall framework that recognizes the different but complementary aims and objectives that this involves. Although the protection of human beings has aims and objectives that may be universally applied, the aims and objectives with respect to the protection of other species will vary considerably, depending on the species involved, and the nature and the circumstances relating to the risks to which they are exposed. ICRP Committee 5 has been created to explicitly consider the radiological protection of non-human species.

The International Union of Radioecology (IUR) coordinates scientific research relevant to environmental radiation protection. Presently, the IUR is establishing a network of research organizations to promote collaboration and the resource-effective research that will address general and specific gaps in the ICRP reference animals and plants database.

The Agency's Plan of Activities on the Radiation Protection of the Environment was approved by the Board of Governors in 2005. While the Plan of Activities focuses specifically on the actions of the Agency, it takes into account the contributions of other international organizations[6] that are active in the field. The main aims of the Plan of Activities are to promote collaborative work that enhances current approaches in radiation protection by taking explicit account of non-human species in developing an approach for the assessment and management of radionuclides entering or present in the environment and to provide assistance to Member States in their efforts to protect the environment.

I.3. Future challenges

There is a lack of international guidance on the protection of non-human species from ionizing radiation and there are no agreed assessment procedures, criteria, guidelines or reference data sets with which to approach these issues in a coherent way. This has resulted in the development of different national approaches, which makes international harmonization difficult. Any broader framework for radiation protection of the environment must be sufficiently flexible to be applied within the context of the many existing and varied approaches to environmental management generally, and to environmental protection in particular.

There is a need to explore further the nature of the risks that may apply to other species, how such risks may be quantified, and thus how it can be positively demonstrated that other species are not put at risk. A large number of animals and plants are already afforded protection at the level of the individual in international or national law, and a challenge remains to provide advice that could be used in such legal contexts.

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[6] Including UNSCEAR, ICRP, IUR, OECD/NEA, and the European Commission.

J. Radioactive source safety and security

J.1. Trends and issues

The need for safety and security measures to support the peaceful uses of radioactive sources in social and economic development has been recognized for many years. Inadequately controlled radioactive sources have led to radiological accidents, some causing serious injuries, deaths, and economic disruption in a number of countries throughout the world. There is now a general realization that such sources might be used for malicious purposes.

Work continues on developing alternative technologies that do not use radioactive sources. However, in most cases, these are in the early stages of development and will not be globally available for many years. Therefore, radioactive sources will continue to be essential for the foreseeable future.

The completion of the Code of Conduct on the Safety and Security of Radioactive Sources was a major step forward for source safety and security and at the end of 2005, 79 States had written to the Director General expressing their support for the Code of Conduct. The degree of Member State implementation of the Code of Conduct varies widely. Even Member States with well established regulatory infrastructures have work remaining to fully implement the Code of Conduct. There is increasing desire to share information and experiences among Member States regarding the safety and security of radioactive sources.

The Guidance on the Import and Export of Radioactive Sources, published as supplementary guidance to the Code of Conduct, is another important step to globally improve the safety and security of radioactive sources. To the end of 2005, 17 States had formally written to the Director General indicating their commitment to follow this supplementary guidance.

Many Member States have undertaken substantial effort to establish national strategies for regaining and maintaining control of vulnerable and orphan sources and are now actively searching for these sources rather than simply responding to chance discoveries. National registers of sources exist or are being established in many Member States. In addition, many metal recycling facilities world-wide are now equipped with radiation monitors and have procedures in place should radioactivity be detected in incoming scrap metal. Nevertheless, once an orphan source is discovered, recovery and safe and secure storage or disposal remains a challenge. In many Member States, short-term storage facilities are adequate, but many lack long-term storage and/or disposal capability.

Source manufacturers and suppliers are also increasingly aware of their responsibilities and are becoming proactive in their approaches to source safety and security. This includes measures such as designing inherently safer sources and providing support to users throughout the entire life cycle of the source.

Although the recycling of radioactive sources must be pursued to the extent possible, appropriate disposal options must be available as an integral part of a complete radioactive source management system. It is now generally recognized that manufacturers and suppliers have a role in dealing with disused sources.

J.2. International activities

A number of multilateral efforts to strengthen the safety and security of radioactive sources and the legacy of past activities have been successful. Such initiatives include the Tripartite Initiative between the USA, Russian Federation and the Agency, which focuses on countries of the former Soviet Union, and programmes initiated with the support of the European Union (EU). The EU programmes have

been expanded to include the Balkans, Middle East and the Mediterranean regions. The "HASS" Directive regarding the control of high activity sealed radioactive sources and orphan sources is part of the EU legislation and is legally binding for all EU Member States. Initiatives such as the Global Threat Reduction Initiative, the G8 Global Partnership, and the cooperative arrangements in South East Asia are expected to strengthen controls in many more countries throughout the world.

In 2005, the Agency published safety guide RS-G-1.9 *Categorization of Radioactive Sources* to provide a simple, logical system for ranking radioactive sources in terms of their potential to cause harm to human health, and for grouping sources and the practices in which they are used into discrete categories. This categorization can assist regulatory bodies in establishing regulatory requirements that ensure an appropriate level of control for each authorized source.

In March 2005, the Agency organized the International Conference on Nuclear Security: Global Directions for the Future, which was hosted by the government of the United Kingdom in London. The Conference included discussions on the Code of Conduct for the Safety and Security of Radioactive Sources, the G8 Global Partnership and the EU strategy against the spread of weapons of mass destruction and the Global Threat Reduction Initiative.

The International Conference on Safety and Security of Radioactive Sources: Towards a Global System for Continuous Control of Sources throughout their Life Cycle in Bordeaux was hosted by the Government of France and was attended by about 300 participants from 64 Member States. The participants encouraged all Member States to continue to work towards implementing the Code of Conduct and noted that many national and multinational efforts are taking place to regain and maintain control of vulnerable and orphan sources. The Conference recognized the continuing need to prevent illicit trafficking in, and inadvertent movements of, radioactive sources.

The Agency has developed an International Catalogue of Sealed Radioactive Sources and Devices. Available to officially nominated national contacts, the Catalogue contains detailed technical information on sources and devices and a database of source and device manufacturers. The Catalogue is a useful tool to identify and characterize orphan sources.

The International Source Suppliers and Producers Association (ISSPA) has been established and its mission statement and draft Code of Good Practice demonstrate the intention to contribute to the safety and security of radioactive sources. Members of this Association account for a large percentage of the world's radioactive source supply.

The Agency and the International Organization for Standardization (ISO) have been collaborating on the development of a new international radiation warning sign for dangerous sources to convey the message of "Danger – Run Away – Do Not Touch." A Gallup survey sponsored by the Agency has been completed to determine the most effective warning sign for labelling large radioactive sources. ISO will use the results for establishing an international standard on the new radiation warning sign. A target date of June 2006 for publishing the standard is projected.

J.3. Future challenges

While substantial progress has been made, much effort is still required in order that every Member State has developed and can maintain national expertise to effectively deal with the safety and security of radioactive sources.

There are many bilateral, multinational and international activities underway to strengthen controls for radioactive sources and manage the legacy of past activities. Continuing effort will be required to ensure these efforts are coordinated and coherent, while avoiding duplication.

There are cases where safety and/or security concerns have resulted in discontinuing the use of radiation sources in favour of other technologies. However, in many instances, radioactive sources are beneficial and a careful balance must be maintained between realizing the benefits of a radioactive source and the safety and security of that source.

K. Safety of transport of radioactive material

K.1. Trends and issues

The good safety record for the transport of radioactive materials continued in 2005. The continued involvement of Member States and international organizations in the review process contributes to increasing confidence in the safety requirements established in the *Regulations for the Safe Transport of Radioactive Material* (the Transport Regulations). Member States essentially adopt the Transport Regulations into their national regulations and international organizations include the provisions of the Transport Regulations in their instruments governing the safe transport of dangerous goods.

In 2005, there was much work to address the issue of denial of shipments of radioactive materials intended for use in medical diagnosis and treatment. There is increasing awareness of the issue among carriers and international organizations such as the International Maritime Organization (IMO), the International Civil Aviation Organization (ICAO) and the International Federation of Air Line Pilots' Associations (IFALPA) are engaged in the discussion.

There is increasing interest in Member States regarding the development of radiation protection programmes for the transport of radioactive material and many sought Agency assistance in this regard.

K.2. International activities

In 2005, the Agency issued the 2005 Edition of the Transport Regulations. The Board of Governors also approved a new policy for reviewing and revising the Transport Regulations. Under this policy, the Transport Regulations will be reviewed every two years (the current review cycle of the relevant international bodies), but the decision on an actual revision or publication will be made based on the assessments of the Transport Safety Standards Committee (TRANSSC) and the Commission on Safety Standards. At its September 2005 meeting, TRANSSC developed the criteria for conducting their assessment of the safety significance of proposed amendments.

Work also continued to establish recommendations for security during the transport of radioactive materials. Security levels and physical protection measures have been proposed and should be finalized in early 2006.

The Agency continued its efforts to finalize a draft safety guide on compliance assurance for the safe transport of radioactive material based on the Transport Regulations. This safety guide will provide detailed advice for competent authorities wishing to establish programmes to ensure compliance with national regulations governing the safe transport of radioactive material. The guide will also be useful to those competent authorities with established programmes seeking greater harmonization with the international implementation of the Transport Regulations. Additionally, the guide will assist users in their interactions with competent authorities.

The Agency has prepared a draft safety guide on radiation protection programmes for the safe transport of radioactive material and held two technical meetings to further elaborate the international guidance on the subject.

In July 2005, IFALPA published the position of the IFALPA Dangerous Goods Committee stating, "The IFALPA Dangerous Goods Committee supports the transport of all classes of dangerous goods, including radioactive material, as long as this transport is strictly conducted according to the ICAO Annex 18 and the associated Technical Instructions for the Safe Transport of Dangerous Goods by Air. In consideration of whether a denial is appropriate or not, it must be made clear that safety is always the overriding factor and that other issues never have priority."

In 2005, the IMO issued a circular — prepared with Agency assistance — appealing to its Member States not to deny carriage of radioactive cargo forwarded in compliance with the International Maritime Dangerous Goods (IMDG) Code, in view of the adequate standards of safety and the importance of the movement of radioactive material for health care and other purposes. The Agency was invited to participate in the deliberations of the Safety Panel of ICHCA International Limited and informed the panel about the safety standards of the Transport Regulations and the actions initiated by the Agency in the context of denial of shipment.

In July 2005, a group of eight coastal and shipping States had informal discussions in Vienna and there are plans to hold additional meetings. The participants placed considerable importance on maintaining dialogue and consultation aimed at improving mutual understanding, confidence building and communication in relation to safe maritime transport of radioactive material.

The International Expert Group on Nuclear Liability (INLEX), held two further meetings in 2005. The explanatory texts (including an overview of the modernized IAEA nuclear liability regime) on the nuclear liability instruments adopted under Agency auspices, which were made available to Member States as an attachment to GOV/INF/2004/9-GC(48)/INF/5, have now been translated into all official languages of the Agency. They have been posted on the IAEA's website and will be published as part of the IAEA International Law Series, later in 2006.

INLEX also initiated a number of outreach activities, including the development of standard training material in the area of nuclear liability and the organization of regional workshops aimed at providing a platform for both fostering adherence to the international nuclear liability regime and providing a forum for open discussions on possible difficulties, concerns or issues which States may have with the regime. The first Regional Workshop on Liability for Nuclear Damage was held in Sydney, Australia, from 28 to 30 November 2005. A second Regional Workshop is scheduled to be held in Lima, Peru, later in 2006.

During the course of its meetings in 2005, INLEX also discussed and reached conclusions and recommendations on some possible gaps and ambiguities in the scope and coverage of the existing international nuclear liability instruments. While some of these conclusions and recommendations were addressed through the aforementioned explanatory texts and are also reflected in the Group's outreach activities, others are reflected in a Report by the Secretariat contained in Annex 3 of this Review. This Report also provides further information on the work that INLEX has carried out since its establishment and on future activities of the Group.

K.3. Future challenges

The new policy for revision of the Transport Regulations will enhance their stability and allow Member States to more easily harmonize national regulations with the current version of the Transport Regulations. Nevertheless, a significant challenge is the implementation of the 2005 Edition of the

Transport Regulations in all Member States. In addition, implementing other transport safety and security guidance in a timely manner remains a challenge.

Although much work has been undertaken to address the issues related to denials of shipments, the Agency needs to develop and implement an international plan of action to reduce the frequency of denials. The Agency intends to establish an advisory committee to provide guidance in the implementation of this plan of action.

In many Member States, two or more regulatory bodies have the mandate to regulate the transport of radioactive materials depending on the mode of transport. In some cases, the roles of the various regulatory bodies are clearly defined. However, in many cases, the interfaces between the various bodies require more definition.

L. Safety of radioactive waste management and disposal

L.1. Trends and issues

In each Member State, the most appropriate management option adopted for the different types of radioactive waste varies depending on the nature of the waste, the amounts of waste being generated and the nature of the facilities available for storage and disposal. Disposal of radioactive waste is seen as the final solution and for differing waste types disposal may be either on or near the surface or deep underground. The lack of suitable disposal solutions means that in some cases, radioactive waste must be subject to extended storage and more storage facilities will be required.

More Member States are beginning to consider waste management and disposal with a holistic view that takes into account all factors and considers the entire life cycle of the nuclear and radioactive material. In this respect, classifying waste types with an implicit linkage to a particular management option is useful and this is reflected in the IAEA 1994 Classification of Radioactive Waste. However, the 1994 classification is not comprehensive and omits several important waste types and will be updated as part of the Agency's *Action Plan on the Safety of Radioactive Waste Management*.

More than 100 near surface repositories are in existence in the world and they account for the main part of the disposed radioactive waste, with the exception of waste from mining and minerals processing operations containing elevated levels of naturally occurring radionuclides. These near surface facilities vary in quality and some that were developed several decades ago are currently being upgraded to bring them into compliance with modern standards. The approach for designing near surface repository systems to achieve safety is now well established. For such systems, compliance with the safety standards can be achieved by a combination of engineered barriers, natural systems and institutional controls to prevent inadvertent intrusion. In 2005, Hungary and Republic of Korea decided upon candidate sites to develop new near surface disposal facilities and Australia and Switzerland took legal/administrative measures to enable decisions to be made on the selection of candidate sites. Canada took a decision to develop a deep disposal facility for low and intermediate level waste.

Considerable attention continues to be focused on geological disposal for high level waste. The progress of recent years towards achieving operational geological repositories is continuing in several Member States. Providing for protection of the public at long timescales far beyond the lifetimes of current generations, requires the use of predictive models and stylized scenarios to provide assurance

that the facilities will comply with safety standards and radiation safety criteria. The subject is difficult and different approaches to safety demonstration are being adopted in some Member States.

Many Member States have comparatively small volumes of radioactive waste requiring geological disposal. It would be disproportionately costly for each of them to develop its own geological repository. For this reason, studies have been initiated at a regional level, with some support from the European Union, to examine the feasibility of a regional repository in which the waste from several countries could be placed. However, no potential site has yet been identified and the issue will have to be further considered in light of its potential impact on the further implementation of national disposal projects.

Large volumes of waste from the mining and milling of radioactive ores or from other industries producing waste containing natural radionuclides have been deposited on the earth's surface. The radiation exposure of local populations at these sites can exceed radiation protection limits for members of the public. Because of the large volumes, the practical protection measures that can be taken are limited. International guidance on the safe management of these sites needs to be developed and measures put in place to ensure compliance.

The safety case concept for demonstrating the safety of waste management and disposal facilities is becoming more common throughout the world, although consensus is still developing on the structure and content of these safety cases. There is, however, agreement that the safety cases should include all the arguments and evidence demonstrating safety and that it should cover the adequacy of the engineering and design logic, a quantitative safety assessment and the adequacy of the management systems for all aspects of the project. There is also agreement that the safety case will develop along with the project, but must be adequately developed to support major decisions such as site selection, design and layout approval, construction, operation and closure. International peer reviews are also increasingly being used to evaluate the safety of radioactive waste management and disposal facilities with a view to creating confidence in their safety.

L.2. International activities

Finland has commenced construction of an underground laboratory at the site of the Onkalo geological disposal facility. The USA is revisiting its safety standards for Yucca Mountain to take account of longer time scales. France has developed the Dossier 2005 on the concept of a geological disposal facility in a clay environment. China is exploring acceleration of its geological disposal programme and Japan continues to consider potential host communities.

The Board of Governors approved the Safety Requirements for geological disposal at its September 2005 meeting. The consensus on these requirements will provide an international point of reference for consideration and demonstration of the safety of these facilities.

In October 2005, the International Conference on the Safety of Radioactive Waste Disposal was held in Tokyo, Japan. Participants from around the world exchanged information on the safety of radioactive waste disposal, the identification of appropriate waste disposal options, safety standards, safety cases for presenting safety arguments and demonstrating compliance with standards, safety assessment methodologies, dealing with uncertainty, regulatory review and stakeholder involvement.

International projects are ongoing to help remove the global problem of disused sealed radiation sources by the technique of borehole disposal. Such a disposal concept offers, for some Member States, the prospect of a disposal option commensurate with the hazard potential of such radioactive waste. However further work is needed in the demonstration of the safety of the concept and in developing the regulatory capacity necessary for their licensing.

A number of projects are currently underway within the Agency programme of work that provide for development and inter-comparison of safety assessment methodology related to radioactive waste safety. The programmes dealing with application of safety assessment methodologies (ASAM) to near surface disposal facilities and safety assessment driven waste management solutions (SADRWS) are generating considerable interest amongst Member States.

The Agency has a common framework project underway aimed at determining, mainly from the perspective of hazard, the most appropriate disposal solution for each major waste type. The linkage being developed between waste types and disposal options is taking into consideration the waste safety standards, but does nevertheless recognize that national strategies need to address the number and type of activities generating radioactive waste within the country and the facilities available.

L.3. Future challenges

Agency activities relating to the safety of radioactive waste management, including safety standards development and their use and application, will be reviewed in the light of the conclusions of the Tokyo conference and those from the International Symposium on Disposal of Low Activity Radioactive Waste that took place in December 2004 in Cordoba, Spain.

Consideration is being given to the disposal of certain waste types which are unsuitable for near surface disposal in facilities at intermediate depths. The additional benefits in terms of isolation and containment offered by disposal at these greater depths needs further evaluation and what waste is appropriate for disposal at such depths also needs to be determined.

Evaluating the implications of extended storage of radioactive waste is assuming greater significance as radioactive waste continues to accumulate. The safety implications of extended storage need elaboration and systematic evaluation and there may be a need for specific safety standards for extended storage circumstances. These evaluations must take into account not only legacy waste, but waste that will be generated in the future.

Another important future challenge is the demonstration of the suitability and viability of borehole disposal by licensing and operation in one or more countries.

A common understanding of the concept of a safety case for radioactive waste disposal facilities needs to be developed as does the process of regulatory review and evaluation of such safety cases and their supporting safety assessments.

M. Decommissioning

M.1. Trends and issues

Decommissioning is a growing business and more Member States are recognizing that decommissioning will be required for all facilities that have used or produced radioactive material, not just NPPs. In particular, more research reactors have been identified that have been or will be shut down in the near future and more consideration of early decommission planning is taking place. However, for many facilities, decommissioning funding remains a concern and many countries lack adequate appropriate regulatory and operational infrastructure to support decommissioning, including adequate waste disposal solutions.

Around the world, there is now considerable experience in decommissioning. However, it has not been systematically collected and is therefore difficult to share with others.

M.2. International activities

Planning is underway to establish a research reactor decommissioning demonstration project. This project will provide a training site allowing representatives that will be planning and implementing decommissioning projects in the future to receive hands-on experience.

M.3. Future challenges

Decommissioning activities have been performed since the early 1950s and extensive experience has been gained. Therefore, the time seems to be ripe for an extensive information exchange among decision makers, regulators, radiation and waste safety specialists, and the nuclear industry on lessons that have been learned during the planning and implementation of past decommissioning projects. In particular, information on the adequate level of infrastructure needed to support the decommissioning process and the proper timing to start the decommissioning planning process is of critical importance and has not yet been sufficiently emphasized.

N. Remediating contaminated sites

N.1. Trends and issues

The Chernobyl accident in 1986 involved a vast release of radionuclides to the environment. Countermeasures implemented by the Governments in coping with the consequences of the accident were mainly timely and adequate. However, modern research shows that the direction of these efforts must be adjusted. Social and economic restoration of the affected Belarusian, Russian and Ukrainian regions, as well as the elimination of the psychological burden of the general public and emergency workers, must be a priority. Targeted research and monitoring of some long term environmental, health and social consequences of the Chernobyl accident should be continued for decades to come. Preservation of the tacit knowledge developed in the mitigation of the accident consequences is essential.

Throughout the Central Asian countries of the former Soviet Union there are many legacy sites from previous uranium mining and processing activities. These include abandoned mine sites, former processing facilities, and a number of locations with associated residues. These residues include mill tailings and waste rock as well as scrap metal dumps and abandoned infrastructure. All of these locations represent potential hazards to the safety of the population and the environment in radiological, chemical and physical terms.

N.2. International activities

The Chernobyl Forum[7] completed its operation in 2005 and issued two technical reports: one discussing the environmental consequences of the Chernobyl accident and one discussing the health effects of the accident. These reports were considered in detail by the Forum participants and accepted by consensus. The Forum participants also agreed that the approved reports are the common position of the Forum members regarding environmental and health consequences of the Chernobyl accident as well as recommended future actions. In addition, the digest Forum report "Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts and Recommendations to the Governments of Belarus, the Russian Federation and Ukraine", considers both the scientific issues and practical recommendations to the Governments of the affected states and relevant international organizations.

All of the Chernobyl Forum reports were presented, discussed and approved during the International Conference: Chernobyl — Looking Back to Go Forwards held in Vienna in September 2005. The consensus of the Forum participants was also noted by the UN Secretary-General in his report to the General Assembly A/60/443, from 24 October 2005, entitled *Optimizing the international effort to study, mitigate and minimize the consequences of the Chernobyl disaster* and in the resolution of the UN General Assembly A/60/L.19, from 10 November 2005, entitled *Strengthening of international cooperation and coordination of efforts to study, mitigate and minimize the consequences of the Chernobyl disaster*.

The results of the preliminary radiological assessment of the former French test sites in In Ekker and Reggane, Algeria were published. The report provided recommendations for consideration by the Algerian Government. Preliminary plans for the radiological assessment of the former Soviet Union nuclear weapons test site at Semipalatinsk, Kazakhstan have been prepared. The development of these plans, and their subsequent implementation, has been a cooperative effort through an international working group and supported by the European Union. There is considerable pressure to release portions of the site that meet international release criteria for redevelopment by the local population.

Under an Agency regional technical cooperation project, a series of workshops is being held in Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan, with the objective of improving systems of surveillance and monitoring and planning methods in remediation of legacy uranium mining and processing sites. In addition to the workshops, the project is supplying suitable equipment to enhance the surveillance and monitoring capabilities of the authorities in each of these Member States and a programme of scientific visits has been organized and implemented. The project has also involved liaison with other agencies carrying out associated projects in the region.

N.3. Future challenges

The decommissioning of the destroyed Chernobyl Unit 4 and the safe management of radioactive waste in the Chernobyl Exclusion Zone, as well as its gradual remediation remains a significant challenge for the foreseeable future.

It has been proposed that the regional project be extended to include development of some specific plans for remediation of tailings and other residue affected sites. The liaison with other Agencies must also continue to ensure the optimization of the combined assistance efforts.

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[7] The Forum participants were eight UN organizations (IAEA, WHO, United Nations Development Programme (UNDP), FAO, United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), United Nations Environment Programme (UNEP), UNSCEAR and the World Bank) as well as the competent authorities of Belarus, Russian Federation and Ukraine.

A number of additional nuclear weapons test sites have been identified that may require a radiological assessment to determine if portions can be released for economic development.

O. Incident and emergency preparedness and response

O.1. Trends and issues

Incidents and emergencies continue to occur — often involving lost, stolen, damaged or discovered sources that may raise undue anxieties among the public, and there remains the unlikely possibility of an emergency at a nuclear facility that could result in transnational impacts. Emergency preparedness and response plans are integral to the safety of workers and the public living in the vicinity of nuclear installations and wherever radioactive materials are used. In recent years, the focus of this preparedness has moved away from NPP emergency preparedness to include not just all nuclear installations, but a general concern regarding radiological incidents and emergencies, including the malicious use of radioactive materials.

In general, there is a heightened interest in emergency response, especially in local efforts and capabilities and in general, communities located near nuclear installations have some capability to deal with radiological emergencies. However, for the vast majority of local governments throughout the world, effectively dealing with radiological emergencies is a challenge. First responders (fire, ambulance, police) especially require better training, procedures and equipment for dealing with radiological emergencies.

Many Member States continue to find it difficult to enhance their emergency preparedness programmes for out-of-country events. Provisions for communicating timely and comprehensive information to neighbouring countries in the case of an emergency are the essence of successful implementation of emergency countermeasures in potentially affected countries.

Nuclear or radiological incidents and emergencies of any scale can have wide-ranging and complex impacts, real and perceived. Recent experience has shown that impacts of nuclear or radiological incidents and emergencies are rarely confined to one area or one country, but that they can also affect the international community in direct and indirect ways. For authorities or the public to make sound decisions, there must be effective information sharing, which can only be achieved with a greater degree of openness, transparency and speed in information exchange during and after an incident or emergency.

Member States have developed different national arrangements to respond to incidents and emergencies within their own borders. The types of response teams, technical products, equipment, training and methods of operation differ between Member States, resulting in significant challenges in providing effective international assistance.

O.2. International activities

The Inter-Agency Committee on Response to Nuclear Accidents (IACRNA) coordinates the arrangements of the relevant international intergovernmental organizations for preparing for and responding to nuclear or radiological emergencies. IACRNA plans, conducts, analyses and shares the results of international nuclear emergency exercises. Over the past decade, many international nuclear emergency exercises have taken place, and much experience has been gained.

In 2005, the Director General established the Incident and Emergency Centre (IEC) as the Agency's focal point for communications about, preparedness for and response to incidents and emergencies. Through the IEC, Member States, their competent authorities, international organizations, technical experts and the Secretariat can effectively share information and experience and coordinate the deployment of assistance for preparedness or response to incidents and emergencies.

The Agency is implementing the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies. This Action Plan covers the three main areas of international communication, international assistance and sustainable infrastructure. In 2005, a communication working group and an assistance working group developed draft documents describing the concept and strategy for achieving an internationally harmonized communications system and for enhancing international assistance for nuclear and radiological incidents and emergencies.

The most recent international nuclear emergency exercise was ConvEx-3 (2005) which took place in May 2005. The exercise was based on a Romanian national exercise, with Unit 1 at the Cernavoda NPP as the accident unit. The scenario for the exercise was prepared by Cernavoda NPP staff together with the Romanian National Commission for Nuclear Activities Control and the IACRNA Working Group on Joint International Exercises. Key systems that would be required in an actual emergency were tested and several opportunities for improvement were identified. The evaluation team's final report will be an important input to the Action Plan.

The Agency[8] has also published the *Joint Radiation Emergency Management Plan of the International Organizations* (the Joint Plan), which describes: the objectives of response; the organizations involved in response, their roles and responsibilities, and the interfaces among them and between them and States; operational concepts; and preparedness arrangements. The various organizations reflect these arrangements in their own emergency plans. The Joint Plan does not prescribe arrangements between the participating organizations, but describes a common understanding of how each organization acts during a response and in making preparedness arrangements.

The Third Meeting of the representatives of competent authorities identified under the Early Notification and Assistance Conventions was held in Vienna in July 2005. Participants approved a number of documents and reviewed the ConvEx-3 (2005) evaluation report. Participants also agreed to enhance the existing drill and exercise regime, recommending that the regime cover all regions over a suitable time period and that the exercises should address both nuclear accidents and radiological emergencies, including those arising from malicious acts.

The Agency continues to work with various international organizations, such as ICRP and WHO, to develop standards that address the shortcoming in the current international guidance identified during the response to past emergencies. In addition, the Agency is concentrating on assisting Member States to promptly develop a minimal capability to respond to radiological emergencies with an emphasis on the preparedness of first responders.

In 2005, the Agency published a number of documents, including Preparation, Conduct and Evaluation of Exercises to Test Preparedness for a Nuclear or Radiological Emergency and Generic procedures for medical response during a nuclear or radiological emergency, to assist Member States in enhancing emergency preparedness and response. The Agency also supported training courses and

[8] The Plan is co-sponsored by FAO, OECD/NEA, UNOCHA, WHO, WMO, European Commission (EC), PAHO, Europol, Interpol, UNEP and the United Nations Office for Outer Space Affairs (OOSA), in cooperation with ICAO.

technical cooperation projects related to emergency preparedness and response throughout the world and conducted one peer review to a Member State.

O.3. Future challenges

A key challenge is ensuring that first responders to an emergency have appropriate training in dealing with ionizing radiation. It is also important to provide useful information in plain language, so that local authorities and the public can make informed decisions. This training and information must take into account the latest information on radiological effects.

There is a need to further harmonize and make compatible international emergency assistance and communications. This will involve enhancing emergency preparedness programmes, including modernizing emergency management centres and conducting broader emergency exercises. A challenge remains to expeditiously transmit information in the case of an emergency to neighbouring and potentially affected countries.

As with many other nuclear and radiological safety areas, much experience exists throughout the world regarding emergency preparedness and response. Currently, experts report on this experience through different processes and there is a need for a coordinated system to consolidate and disseminate this experience. The experience with nuclear safety networks needs to be expanded to the area of emergency preparedness and response.

Annex 1

Safety related events and activities worldwide during 2005

A. Introduction

This annex identifies those safety related events or issues during 2005 that were of particular importance, provided lessons that may be more generally applicable, had potential long-term consequences, or indicated emerging or changing trends. It is not intended to provide a comprehensive account of all safety related events or issues during 2005.

B. International legal instruments

B.1. Conventions

B.1.1. Convention on Nuclear Safety (CNS)

In March 2005, India ratified the CNS, which now has 56 Contracting Parties, including all Member States operating nuclear power plants.

From 11 to 22 April 2005, Contracting Parties to the CNS met in Vienna for the 3rd Review Meeting, with 50 of the Contracting Parties and over 500 delegates in attendance. The participants conducted a thorough peer review of the national reports which Contracting Parties had submitted in 2004. The many important findings and conclusions during the Review Meeting will serve as valuable guidance for the Agency in implementing its future safety programmes. The Contracting Parties made specific reference to the relevant IAEA Safety Standards as a tool to assist in the review process and recognized the value of the Agency's safety services, such as operational safety and regulatory reviews.

All Contracting Parties identified the fundamental need for openness and transparency in the nuclear industry. There was also special emphasis put on the need for both regulators and operators to show leadership in nuclear safety and about the need to continue and improve communication between regulators and operators. Safety management received a great deal of attention, and is particularly important for operational safety. Probabilistic Safety Assessment is now a mainstream tool in most countries, although every Contracting Party stressed that it is not used in isolation. More and more countries are now requiring periodic safety reviews as part of their regulatory regimes. Knowledge management continues to be important as experienced staff retire and as facilities move into extended operation. The meeting also noted the important role that peer reviews, such as those offered by the Agency and the World Association of Nuclear Operators (WANO), have in maintaining and improving operational safety. Finally, the meeting reinforced the fact that the IAEA Safety Standards

have matured and now offer a comprehensive suite of nuclear safety standards that embodies good practices and a reference point to the high level of safety required for all nuclear activities.

The Contracting Parties also noted that during the first decade of the CNS, there was a focus on tackling specific technical issues of concern in the world. By and large, these technical issues are being addressed and many improvements have taken place. The challenge for the next decade therefore is to avoid any complacency resulting from this success and move the focus on safety to the next plateau. The CNS is not just a triennial exercise and gathering of nuclear professionals, but is instead an ongoing process that looks to continually promote the advancement of nuclear safety.

B.1.2. Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Early Notification and Assistance Conventions)

The Early Notification Convention aims to strengthen international cooperation and exchange of information about nuclear accidents, as early as possible, to minimize transboundary radiological consequences. In 2005 Chile ratified and El Salvador, Qatar and the United Republic of Tanzania acceded to the Early Notification Convention. As of the end of 2005, there were 97 parties to the Early Notification Convention.

The Assistance Convention requires that States and Contracting Parties cooperate between themselves and with the Agency to facilitate prompt assistance in the event of a nuclear accident or radiological emergency to minimize its consequences and to protect life, property and the environment from the effects of radioactive releases. In 2005 Colombia, El Salvador, Qatar and the United Republic of Tanzania acceded to the Assistance Convention, which had 94 parties at the end of 2005.

The Third Meeting of the representatives of competent authorities identified under the Early Notification and Assistance Conventions was held in Vienna from 12 to 15 July 2005. It was attended by 101 representatives of competent authorities from 60 Member States (56 of which are Parties to the Early Notification and/or the Assistance Convention) and by representatives of the World Meteorological Organization (WMO) and the FAO. In addition, observers attended from the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), the European Commission and the UN Office for Outer Space Affairs.

The Meeting reviewed progress achieved since the last meeting in 2003 and discussed and approved documents prepared under the International Action Plan[9] — specifically proposals relating to strategies for enhancing international assistance and international communication in the event of a nuclear accident or radiological emergency. Participants also reviewed the evaluation of the ConvEx-3 (2005) international exercise[10] and lessons learned and identified future activities.

The Third Competent Authorities' Meeting:

- agreed on a proposal for enhancing the existing drill and exercise regime, recommending that the regime cover all regions over a suitable time period and

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[9] International Action Plan for strengthening the international preparedness and response system for nuclear and radiological emergencies, GOV/2004/40 (Corrected).

[10] The ConvEx-3 command post exercise was based on a Romanian national emergency exercise held 11–12 May 2005, and involved the participation of 62 Member States and 8 international organizations over 39 hours. The exercise tested the international information exchange arrangements and mechanisms for providing public information in the early phase of a postulated serious nuclear emergency at the Cernavoda nuclear power plant. The Secretariat is grateful to the Government of Romania for hosting and providing support for this exercise.

that the exercises should address both nuclear accidents and radiological emergencies, including those arising from malicious acts;

- recommended to the Secretariat that it consider taking a more active role in the implementation of the International Action Plan using its normal mechanisms to accelerate implementation while ensuring coordination with the NCACG[11];
- encouraged competent authorities to initiate a request to develop a Code of Conduct for the International Emergency Management System.

In 2005, the Agency was informed of 170 events involving or suspected to involve ionising radiation. Of these, 137 events involved very low activity radiation sources and had no impact on the public or the environment. There were 14 events reported involving radiation sources used in radiography where exposure to workers exceeded regulatory limits, another eight reported cases involving "dangerous" radiation sources and nine other events which occurred at nuclear facilities.

In 15 cases, the Agency was requested to provide assistance pursuant to the Assistance Convention and in eight other cases the Agency offered its good offices. In another four cases, either individuals or the media informed the Agency and this information was uncorroborated. In all cases, the Agency took actions, such as authenticating and verifying the information, providing official information or assistance to the requesting party, and offering the Agency's good offices.

In four cases, the Agency either sent a fact-finding mission or facilitated multi or bilateral assistance and discussions among the parties involved.

B.1.3. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention)

The Joint Convention applies to spent fuel and radioactive waste resulting from civilian nuclear activities and to planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities. In 2005, Uruguay and Euratom acceded to the Joint Convention, which had 34 parties at the end of 2005 (for Euratom and Uruguay the Joint Convention will enter into force on 2 and 28 March 2006 respectively). Considering that the vast majority of Member States have some requirements for radioactive waste management, it is hoped that more States adhere to the Joint Convention. The Agency conducted four seminars where more than 30 Member States received presentations regarding the benefits of adherence to the Joint Convention.

In preparation for the 2nd Review Meeting of the Contracting Parties to the Joint Convention in May 2006, the organizational meeting took place in Vienna from 8 to 9 November 2005. This meeting elected the Officers and established the Country Groups for the Review Meeting. The Contracting Parties also held an Extraordinary Meeting to formally approve revised Rules of Procedure and Financial Rules, revised Guidelines regarding the review process and new Guidelines regarding the topic sessions in the review process.

B.1.4. Convention on the Physical Protection of Nuclear Material (CPPNM)

The CPPNM inter alia obliges Contracting States to ensure, during international nuclear transport, the protection of nuclear material within their territory or on board their ships or aircraft. At the end of 2005, there were 116 parties to the CPPNM.

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[11] The National Competent Authorities' Coordinating Group (NCACG) was established at the Second Meeting of Competent Authorities in 2003 to manage tasks assigned to the competent authorities by the Meeting.

On July 8, 2005, delegates from 89 countries agreed on an amendment to the CPPNM that will substantially strengthen the convention. The amended CPPNM makes it legally binding for States Parties to protect nuclear facilities and material in peaceful domestic use, storage as well as transport. It will also provide for expanded cooperation between and among States regarding rapid measures to locate and recover stolen or smuggled nuclear material, mitigate any radiological consequences of sabotage, and prevent and combat related offences. The new rules will come into effect once they have been ratified by two-thirds of the States Parties of the CPPNM.

B.2. Codes of Conduct

B.2.1. Code of Conduct on the Safety of Research Reactors

The Code of Conduct on the Safety of Research Reactors is a non-binding international legal instrument designed to achieve and maintain a high level of safety in research reactors worldwide through the enhancement of national measures and international cooperation. It provides "best practice" guidance to Member States, regulatory bodies and operating organizations for management of research reactor safety. The Code was adopted by the Board in March 2004 and endorsed by the General Conference in September 2004.

In December 2005, in response to a request from the Contracting Parties to the Convention on Nuclear Safety, the Agency held an open-ended meeting to discuss how best to assure effective application of the Code of Conduct. Thirty-one Member States were represented at this meeting. It was agreed that, while national commitments would be valuable, commitment is best displayed through participation in meetings for exchanging information and experience on application of the Code of Conduct, rather than through a unilateral undertaking. Periodic meetings to discuss topics related to application of the Code of Conduct, to exchange experience and lessons learned, identify good practices, discuss future plans, and discuss difficulties encountered and assistance required to reach full compliance were called for. The meeting also called for an Internet site on which documents related to the periodic meetings can be posted to facilitate exchange of information. Finally, there was a call for the Code of Conduct to be integrated into all Agency safety assistance and review activities, and for consideration to be given to updating the Project and Supply Agreements to reflect the provisions of the Code.

B.2.2. Code of Conduct on the Safety and Security of Radioactive Sources

This non-binding international legal instrument applies to civilian radioactive sources that may pose a significant risk to individuals, society and the environment. The Code's objectives are to achieve and maintain a high level of safety and security of radioactive sources. By the end of 2005, 79 States had expressed their political support and intent to work toward following the Code.

One section of the Code of Conduct on the Safety and Security of Radioactive Sources is devoted to the import and export of high activity radioactive sources. Additional details are provided in the *Guidance on the Import and Export of Radioactive Sources* (the Guidance) which was endorsed by the General Conference in 2004 and published as supplementary guidance to the Code of Conduct. Work has continued throughout 2005 to facilitate the implementation of the Guidance, with some States wishing to do so by the beginning of 2006. Noting the findings of the *International Conference on Safety and Security of Radioactive Sources: Towards a Global System for Continuous Control throughout their Life* Cycle in Bordeaux, the Agency held a meeting in Vienna in December 2005 for States to share experiences in implementing the supplementary guidance on the import and export of radioactive sources. Participants from 54 Member States and observers from the European Commission, the World Customs Organization and the International Source Suppliers Association attended. At the meeting, participants noted the multilateral nature of the Guidance and recognized the

importance of States making a political commitment to implement the guidance in a harmonized manner. Most participants also encouraged States to provide details of contact points to the Agency for the purposes of sharing the information with other States. Participants also recognized the need for flexibility whilst States work towards implementing the guidance. Communication between exporting and importing States will be important and participants considered two draft "model" forms — *Request for Consent* and *Notification of Shipment* — that States could adapt for use. Finally, a number of future challenges were identified a number of future challenges that will need to be addressed if the Guidance is to be implemented in a harmonized manner.

C. Cooperation between national regulatory bodies

There are a number of forums in which regulators can exchange information and experience with their counterparts in other countries. Some of these are regional, some deal with particular reactor types and others are based on the size of the nuclear power programme. All of these forums meet regularly to exchange information of common interest and some are developing exchange mechanisms involving the Internet for more rapid means of communication. In addition, selected safety issues of wide interest to regulators are discussed at a meeting of senior regulators held in association with the Agency's General Conference each year.

C.1. International Nuclear Regulators Association (INRA)

INRA comprises the most senior officials of a number of well-established national nuclear regulatory organizations who wish to exchange perspectives on important issues on nuclear safety with the purpose of influencing and enhancing nuclear safety from a regulatory perspective. INRA met twice in 2005 under German chairmanship.

INRA members exchanged views on the management of ageing processes in NPPs and aspects of knowledge management and informed each other on recent developments regarding nuclear safety regulation in their countries. INRA members also discussed experiences from nuclear safety review and regulatory oversight of an EPR Type Plant. The procedures and processes of the Convention on Nuclear Safety were also discussed.

INRA continued to focus on the issue of independence of nuclear regulatory bodies. Structures of the respective national authorities and possible criteria or key elements for effective independence were discussed. Members agreed to keep the issue on their agenda.

C.2. G8-Nuclear Safety and Security Group (G8-NSSG)

Under the presidency of the UK, the G8-NSSG met three times in 2005. The Agency, OECD/NEA and the European Bank for Reconstruction and Development also attend these meetings. Issues discussed included the Chernobyl Shelter, waste processing facilities at Chernobyl, the Agency's Code of Conduct on the Safety and Security of Radioactive Sources and the additional guidance on export/import control. Upon request of the Russian Government, the G8-NSSG has established a Peer Review Working Group to provide assistance to the Russian Federation in the preparation of technical regulations for nuclear and radiation safety. The peer review meetings held in 2005 focused on the general and special technical regulations (nuclear reactors and fuel cycle facilities; management of nuclear materials; radioactive substances and radiation sources; radioactive waste management; and transport of nuclear materials and radioactive substances).

C.3. Western European Nuclear Regulators Association (WENRA)

WENRA is comprised of the heads of nuclear regulatory bodies from 17 European countries and has launched working groups on reactor safety and nuclear waste safety. The mandate of these working groups is to analyse the current situation and the different safety approaches, compare individual national regulatory approaches with the IAEA Safety Standards, identify any differences and propose a way forward to possibly eliminate the differences without impairing the final resulting level of safety. The proposals should be based on the best practices among the most advanced existing requirements. The working groups completed their activities at the end of 2005 and WENRA has planned a seminar for stakeholders for February 2006 to present WENRA's report on common reference levels.

C.4. The Ibero-American Forum of Nuclear Regulators

This Forum met from 17 to 19 January 2005 in Rio de Janeiro, Brazil, with the chief regulators from Argentina, Brazil, Cuba, Mexico and Spain attending. At that meeting, the Forum established a Technical Executive Committee to coordinate and supervise the implementation of the Ibero-American Radiation Safety Network.

The Agency continued to support the activities of the Forum in the frame of an extrabudgetary programme dedicated to radiation safety. The programme involves sharing knowledge and experience and mutual learning on safety standards, control of radioactive sources, protection of patients and education and training.

C.5. Cooperation forum of state nuclear safety authorities of countries which operate WWER[12] reactors

The Forum provides an opportunity for senior staff of regulatory bodies in countries operating WWER reactors to exchange information on various regulatory issues and share recent experiences. The 12th Annual Meeting of this Forum was held in July 2005, with 16 representatives, mostly Regulatory Body Heads and Deputy Heads, from eight countries operating WWER reactors participating. Observers from OECD/NEA, the German technical support organization (GRS) and the French Institute for Radiological Protection and Nuclear Safety (IRSN) also attended. The national reports — highlighting the new developments within the last year in the national nuclear industries and regulatory bodies — were presented and discussed. Presentations were also given by the Agency, OECD/NEA, GRS and IRSN and discussed by the participants. The participants also agreed to expand the membership to China, India and Iran where new WWER reactors are under construction.

Under the WWER Forum, the second meeting of the I&C[13] Working Group was held in November 2005 in Germany to evaluate and share the experience with digital I&C of NPPs for WWER units.

C.6. Network of regulators of countries with small nuclear programmes (NERS)

The current membership of NERS includes Argentina, Belgium, Czech Republic, Finland, Hungary, Netherlands, Pakistan, Slovak Republic, Slovenia, Switzerland, South Africa. The Eighth Annual

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[12] water cooled, water moderated power reactor

[13] Instrumentation and Control

Meeting of Network of Regulators of Countries with Small Nuclear Programs was held in Pakistan in 2005. Discussions at the meeting included:

- Assessment of and management of safety and safety culture in licensees;
- Quality management and ways of maintaining corporate knowledge in regulatory bodies, including training needs assessments and competency profiles;
- Regulatory aspects of licensing new NPPs;
- Regulatory challenges and areas for improvement; and
- Learning from operational experience and safety assessments.

C.7. The senior regulators from countries which operate CANDU-type nuclear power plants

The annual meeting of senior regulators from countries which operate CANDU-Type NPPs (Argentina, Canada, China, India, Republic of Korea, Pakistan and Romania) was hosted by the Atomic Energy Regulatory Board of India in November 2005. The meeting agenda included: the group's mandate; operational experience feedback and significant events; probabilistic safety assessment (PSA) for CANDU, including feedback from the specialists' meeting and from plant specific PSAs; feeder pipe thinning and cracking; regulatory requirements for secondary side inspections; periodic safety review updates; regulatory effectiveness; and issues specific to pressurized heavy water reactors from the 3rd Review Meeting of the Convention on Nuclear Safety. Participants also discussed how to measure, enforce and promote safety culture.

D. Activities of international bodies

Several international expert bodies issue authoritative findings and recommendations on safety related topics. The advice provided by these bodies is an important input to the development of the Agency's safety standards and other international standards and is frequently incorporated in national safety related laws and regulations. The recent activities of a number of these bodies are reviewed in this section.

D.1. United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)

UNSCEAR, an international body reporting to the United Nations General Assembly, includes the leading specialists in the field. UNSCEAR reviews epidemiological studies and results from fundamental radiological research to assess the health risks from radiation exposure. Its extremely detailed reports — globally acknowledged as being authoritative — are a synthesis of thousands of peer-reviewed references. These reports provide the scientific basis for radiation protection schemes and basic standards formed by international and national organizations.

The Committee held its fifty-third session in Vienna in September 2005. At that session, the Committee held detailed technical discussions that resulted in clear direction as to the content and form of its future scientific annexes. The deliberations focused on topics that included analyses of exposures of workers and the public to various sources of radiation; re-evaluation of the risks from radon in homes and workplaces; review of the risk and effects of radiation on non-human biota; consideration of new evidence for the mechanisms by which ionizing radiation can induce health effects; evaluation of new epidemiological studies of radiation and cancer; review of evidence for

diseases other than cancer that might be related to radiation exposure; analysis of the wide variability globally in medical radiation exposures; and analysis of the health impacts due to radiation from the Chernobyl accident.

The Committee had participated in the Chernobyl Forum, whose important mission had covered many aspects of the Chernobyl accident, including the review of radiation health effects. The Committee noted that recent findings of the Forum had affirmed the scientific conclusions on the health consequences due to radiation from the Chernobyl accident. The Committee will continue to provide the scientific basis for better understanding of the radiation health effects of the accident.

D.2. International Commission on Radiological Protection (ICRP)

The ICRP is an independent group of experts that issues recommendations on the principles of radiation protection. ICRP recommendations have provided the basis for national and international standards including the International Basic Safety Standards (BSS). Appointments to the ICRP and its Committees are made for periods of four years, and a new cycle began in July 2005. In 2005, a new Committee was established to consider specifically the protection of the environment.

The current version of the ICRP Recommendations was issued in 1990 and in June 2004, the ICRP issued a draft revision for public consultation. At its March 2005 Meeting, after reviewing the extensive comments received, the ICRP decided that the new Recommendations would not be ready for publishing in 2005 and that the ICRP would focus its attention on the Foundation Documents — supporting the Recommendations — being prepared by the Committees. In 2005, the ICRP consulted on Foundation Documents concerning the following topics:

- Optimisation of radiological protection;
- Assessing dose to the representative individual;
- Health risks attributable to radiation;
- Dosimetric quantities for radiological protection; and
- Reference animals and plants for protection of non-human species.

After consultation, amended versions of the first four documents were approved in principle and these are currently being copy-edited for publication. The fifth draft, on reference animals and plants, and the consultation comments were handed over to the new committee on protection of non-human species as working material.

In 2005, the ICRP also approved for publication reports on:

- A new, more sophisticated model of the human alimentary tract for radiological protection which will be used to calculate updated information on dose per unit intake; and
- Cancer risks attributable to low-dose radiation.

The following ICRP reports were published in 2005:

- Publication 94: Release of patients after therapy with unsealed radionuclides;
- Publication 95: Doses to infants from ingestion of radionuclides in mothers' milk;
- Publication 96: Protecting people against radiation exposure in the event of a radiological attack;
- Publication 97: Prevention of high-dose-rate brachytherapy accidents; and
- Publication 98: Radiation safety aspects of brachytherapy for prostate cancer using permanently implanted sources (in press).

D.3. International Commission on Radiation Units and Measurements (ICRU)

The ICRU, a sister organization of the ICRP, provides internationally acceptable recommendations concerning concepts, quantities, units, and measurement procedures for users of ionizing radiation in medicine, basic science, industry, and radiation protection. The current ICRU programme is focused on four areas:

- Diagnostic radiology and nuclear medicine;
- Radiation therapy;
- Radiation protection; and
- Basic science.

In 2005, the ICRU published reports on *Dosimetry of Beta Rays and Low-Energy Photons for Brachytherapy with Sealed Sources* (Report 72) and *Stopping of Ions Heavier than Helium* (Report 73).

D.4. International Nuclear Safety Group (INSAG)

The INSAG was chartered by the IAEA Director General to be an independent, authoritative body that could provide insights and recommendations to Member State governments, industry, the media, the public and the Secretariat. Its efforts focus on nuclear installation safety, but include any other issues that could relate to the safety of nuclear installations. INSAG is made up of 16 internationally recognized experts from around the world who serve for a four-year term. The group represents national regulatory bodies, the nuclear industry, academia and research institutions.

INSAG met twice in 2005 and continued its discussion on the following areas:

- Global Safety Regime: INSAG is seeking to further the development of a consistent and comprehensive approach to nuclear safety. INSAG's approach is to define an appropriate ultimate safety regime and then explore means to achieve it.
- Safety Principles: Safety principles are subject to change, in part as a result of the application of probabilistic approaches to complement deterministic analyses, the need to encompass fuel-cycle facilities as well as reactors, and the necessity to prepare for new reactor concepts and designs. INSAG is pursuing the conceptual aspects of this problem.
- Operational Safety: There are opportunities for continuing improvement of operational safety at existing plants. INSAG is defining some of these opportunities, guided by the experience of operators around the globe.
- Stakeholder Involvement: Various stakeholders have a legitimate expectation that they will be informed of nuclear matters and their active involvement can enhance nuclear safety. INSAG is encouraging openness in communication and to promote relationships between the nuclear enterprise and various stakeholders that could have a positive impact on nuclear safety. INSAG is developing insights as to when and how to enhance stakeholder involvement.

Additional thoughts from INSAG include developing a survey of how approaches to nuclear safety have changed over the past five decades to provide a backdrop for further change; dealing with and overcoming complacency that can arise from uneventful past operations; deteriorating nuclear infrastructure; and issues associated with nuclear waste.

E. Activities of other international organizations

E.1. Institutions of the European Union

On 12 November 2004 the European Commission adopted a proposal for a Council Directive intended to replace Directive 92/3/Euratom, on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community. The text was submitted to the European Economic and Social Committee, which issued its opinion on 8 June 2005. The Commission proposal is now being finalised for submission to the Council for further discussion and adoption. The proposed new Directive, which should also apply to shipments of spent fuel intended for reprocessing, simplifies the procedures and ensures consistency with the latest Euratom directives[14] and international Conventions[15].

Agreements for cooperation in the peaceful uses of nuclear energy are now in force between the European Community and Uzbekistan and between the European Community and Ukraine. The objective of these Agreements is to provide a framework for strengthening the overall cooperation relationship.

On 24 January 2005, based on a Commission Proposal, the Council adopted a Decision approving the accession of the European Atomic Energy Community to the Joint Convention, including the declaration of competencies as foreseen in Article 39(4)(iii) of the Convention. On 14 June 2005, based on this Council Decision, the Commission adopted the necessary Decision on accession to the Joint Convention. The instruments of accession were deposited with the IAEA Director General on 4 October 2005, and entry into force was expected for 2 January 2006.

On 25 November 2005, based on Council Decisions, the Commission adopted the necessary Decisions on the accession to the Early Notification and Assistance Conventions by the European Atomic Energy Community[16]. The entry into force was expected 30 days after the date of deposit of instrument of accession.

E.2. Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA)

The Nuclear Energy Agency is a semi-autonomous body within the OECD maintaining and developing, through international cooperation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy. It operates mainly through a number of committees covering specific areas.

In the area of nuclear safety and regulation, the Committee on the Safety of Nuclear Installations (CSNI) and the Committee on Nuclear Regulatory Activities (CNRA), have developed a Joint Strategic Plan for safety, where special emphasis is placed on coordination and cooperation. Also, the OECD/NEA held a joint CNRA/CNSI Safety and Regulation Forum on Multilateral Cooperation in Nuclear Safety Research and Regulation in June 2005 in Paris. Over 100 participants took part in the meeting, including most top regulators and research managers from OECD/NEA countries. While

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[14] in particular Directive 96/29 Euratom on Basic Safety Standards, and Directive 2003/122/Euratom on the Control of High-activity Sealed Radioactive Sources and Orphan Sources

[15] in particular the Joint Convention

[16] OJ L 314, pp. 21 and 27

many insights were gathered by the participants throughout the Forum, the conclusions focused on four main issues:

- The need to continuously improve operating experience feedback;
- The need to obtain convergence between countries on nuclear safety practices;
- The need to conserve nuclear safety research; and
- The need to have good knowledge transfer.

The CNRA approved a report on regulatory decision making, which presents some basic principles and criteria that a regulatory body should consider in making decisions and describes the elements of an integrated framework for making regulatory decisions. In addition, a report was issued on regulatory inspection practices used to bring about compliance. CNRA approved the expansion of the mandate of the Working Group on Inspection Practices (WGIP) to cover an integrated assessment of lessons learnt from inspection activities. CNRA also approved a new mandate for the Working Group on Public Communication (WGPC) including stakeholder interaction and preparation of a new report on a general strategy for regulatory communications.

The CSNI reviewed the progress achieved by three of its working groups dealing respectively with ageing and structural integrity, risk assessment and operating experience, and by the special expert group addressing human and organisational factors. The CNSI approved the conclusions from the Workshop on PSA for non-reactor facilities and a new activity was endorsed on the use and developments of PSA in member countries. In the field of research facilities for existing and advanced reactors, a group of senior research managers was constituted to provide the necessary input and elaborate elements of strategy for maintaining key research facilities and possibly expanding their use. In 2005, the OECD/NEA published CSNI Technical Opinion Paper No. 7: *Living PSA and its Use in the Nuclear Safety Decision-making Process* and No. 8: *Development and Use of Risk Monitors at Nuclear Power Plants*.

The Radioactive Waste Management Committee (RWMC) finalised a report on *Roles of Storage* that examines the position of storage in various national strategies for the management of long-lived waste and spent nuclear fuel, and clarifies the motivations and the implications on waste management programmes. The RWMC is proceeding with its technical activities to support the safety case for geological disposal and has started a broader initiative to review international experience in preparing a modern long-term safety case. Major outcomes include a report on the practical experiences of compiling safety cases for geological repositories and lessons learnt from current practices and a major symposium in early 2007. An RWMC working party is organising a series of workshops on Approaches and Methods for Integrating Geologic Information in the Safety Case (AMIGO). The 2nd AMIGO workshop was held in September 2005 in Canada, and addressed the linkage of geoscientifc arguments and evidence in supporting the safety case. Another workshop series, jointly organised with the EC, addresses aspects of performance of engineered barrier systems (EBS). The 3rd EBS workshop took place in Spain in August 2005 dealing with EBS modelling issues in the context of the safety case and the design process. The RWMC issued a status paper on the *Safety Case of Decommissioning* in 2005 and similar status papers — on Strategy Selection, Release of Sites, Release of Materials and Buildings and Funding Issues — are in progress.

The OECD/NEA was asked by French authorities to organise an International Peer Review of the French geological disposal programme in clay formations. A team of ten internationally renowned experts working on this review delivered its preliminary findings to the French authorities and the waste agency Andra in November 2005. The OECD/NEA had also been asked to undertake a similar and parallel review of the French Partitioning and Transmutation Programme. These peer reviews will become part of the technical support for the upcoming French debate on future options for waste management.

The RWMC Forum on Stakeholders' Confidence (FSC) holds regular workshops in a national context. The 2005 workshop took place in Spain in November 2005 in cooperation with "COWAM - Spain", a joint initiative of Spanish institutional actors and AMAC, the association of Spanish nuclear municipalities. The RWMC Working Party on Decommissioning and Dismantling (WPDD) finalised a report titled *Achieving the Goals of the Decommissioning Safety Case*, and its work on the release of materials and sites is progressing. A specific WPDD working group addresses issues related to the funding of decommissioning activities. At its annual meeting, the WPDD organised a special session on socio-economic aspects of decommissioning.

The Committee on Radiation Protection and Public Health (CRPPH) is finalising its forward-looking work to develop its new collective opinion, focusing on emerging social and scientific issues that could affect radiation protection policy, regulation and practice over the coming 10 to 15 years. One of the key challenges to address is the scientific indications that, in specific exposure circumstances, the standard linear non-threshold model may not be scientifically valid. This would necessitate a higher-level assessment of how risks are evaluated and managed. Further challenges are posed by social trends towards broader stakeholder involvement in decision processes addressing public, worker and environmental health and safety. The CRPPH also supported initiatives in Japan — including two meetings in 2005 between the CRPPH Chair and Secretariat and Japanese radiation protection experts — to exchange lessons and experience in the area of stakeholder involvement in decision making. The CRPPH held a new emergency management exercise (INEX 3) as a common framework for 20 national exercises during 2005. This table-top exercise was designed to help governments better identify practical aspects of consequence management which may affect their policy and regulatory approaches. The summary workshop for INEX 3 will take place in Paris in May 2006.

The Information System on Occupational Exposure (ISOE) is finalising its strategy for the future, using modern web technology to develop a "one-stop-shopping" site for all dosimetric data and trending information, and for finding and sharing all ALARA[17]/dose reduction information, experience and lessons learned. This new site will make all ISOE databases available on the web, and will significantly enhance the ability of members of ISOE to most effectively plan and implement radiological protection at the world's nuclear power plants.

E.3. World Association of Nuclear Operators (WANO)

Every organization in the world that operates an NPP is a member of WANO. WANO is an association set up purely to help its members achieve the highest practicable levels of operational safety by giving them access to the wealth of operating experience from the world-wide nuclear community.

WANO conducted peer reviews at 30 NPPs during 2005, altogether 278 since the programme began in 1992. WANO's long-term goal is to conduct a peer review of each nuclear unit at least once per six years, either as an individual unit or as part of a peer review that includes other units at an NPP. In addition, WANO encourages each NPP to host an outside review at least every three years.[18]

WANO continues to emphasize technical support missions, which focus on providing assistance in selected areas, with more than 120 technical support missions undertaken during 2005.

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[17] As Low As Reasonably Achievable

[18] Outside reviews include WANO peer reviews, WANO follow-up peer reviews, OSARTs and national organizational reviews such as those conducted by the Institute of Nuclear Power Operators and the Japan Nuclear Technology Institute.

A central operating experience team with representatives from all four WANO regional centres continues to develop operating experience products and information for members. This team produces Significant Event Reports, Significant Operating Experience Reports, and Hot Topics to keep members informed of important events and trends occurring in the industry. In addition, WANO maintains a "Just in Time Training" database that gives plant staff access to relevant operating experience immediately prior to undertaking specific operations and maintenance activities.

WANO's workshop/seminar/training course programme has developed both in scope and in numbers. During 2005, a WANO materials workshop was held in Antwerp, Belgium. This three-day, operationally focused workshop was aimed at senior nuclear managers and provided a forum to discuss significant plant materials issues and the strategies for addressing them. Topics included pressure vessel and piping integrity, nuclear fuel, cabling, and electronic equipment degradation. In addition, each region conducted workshops and seminars on a variety of topics related to NPP operations.

WANO also conducted its 2005 Biennial General Meeting (BGM) in Budapest, Hungary from 10 to 11 October 2005 where senior nuclear utility executives and representatives from WANO members met to review progress and provide guidance for the future aims and objectives of WANO. The theme for the 2005 BGM was *The 21st Century: Nuclear Energy's Promise*.

F. Safety legislation and regulation

During the Senior Regulators' Meeting held in conjunction with the 49th General Conference, a number of Member States made presentations regarding their regulatory activities during 2005.

The Head of the Nigerian Nuclear Regulatory Authority described the positive experience of participating in the Agency's Model Project on Strengthening Radiation Protection Infrastructure. This included the publishing of a number of guidance documents and the accreditation of a resident dosimetry service provider. Much work has also been completed to establish a medical exposure control programme.

The Head of the UK Nuclear Installation Inspectorate described the activities that organization has taken to review its Safety Assessment Principles. In addition to taking into account experience since the last review in 1999, the activity includes benchmarking against the IAEA Safety Standards. The work also involves reviewing the findings of the review against the WENRA harmonization activities.

The Chairman of the Nuclear Safety Commission of Japan described how that organization is fostering safety culture as a complementing measure to safety standards. Recent activities included interviewing the top management of 12 licensees and 36 contractors and future activities will include participating in international initiatives and interviewing maintenance and radiation control personnel. The Commission is also planning on "transfusing" safety expertise from other industrial sectors and introducing "Safety Culture Degradation Indicators".

The Deputy Director General of the Chinese National Nuclear Safety Administration described the activities underway to incorporate the IAEA Safety Standards into the NNSA regulatory requirements for NPPs. It was noted that regulatory requirements of other countries are also considered for incorporation into Chinese requirements.

The Chairman of the Pakistan Nuclear Regulatory Authority described its activities related to the regulatory review of the Chasma 2 NPP design, as well as experience in applying the IAEA Safety Standards to the review process.

G. Safety significant conferences in 2005

From 27 June to 1 July 2005, the government of France hosted the *International Conference on Safety and Security of Radioactive Sources: Towards a Global System for Continuous Control of Sources throughout their Life Cycle* in Bordeaux. The conference was organized by the Agency[19] and was attended by about 300 participants from 64 Member States. The Conference acknowledged that the completion and subsequent endorsement of the Code of Conduct on the Safety and Security of Radioactive Sources represented a major achievement. The Conference encouraged all Member States to continue to work towards implementing the Code's guidance. It also encouraged the Agency to take account of the Code in the review and eventual revision of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. The Conference recognized that safety and security are an integral part of effective and comprehensive regulatory structures for ensuring the continuous control of radioactive sources throughout their life cycle and noted that an adequate balance between confidentiality and information exchange must be struck to ensure the safety and security of radioactive sources. The Conference also noted that many national and multi-national efforts are taking place to regain and maintain control of vulnerable and orphan sources. There were also discussions regarding the continuing need to prevent illicit trafficking in and inadvertent movements of radioactive sources. Finally, the Conference noted that the effective management of radiological emergencies involving radioactive sources needs to be an integral part of national strategies for the safety and security of radioactive sources.

From 3 to 7 October 2005, the government of Japan hosted the *International Conference on the Safety of Radioactive Waste Disposal*, organized by the Agency in cooperation with the OECD/NEA and the Japan Nuclear Energy Safety Organization. The Conference considered all possible disposal options available, including near surface, intermediate depth, borehole and geological disposal facilities and also considered multilateral approaches. Participants at the Conference discussed the benefits of being part of the Joint Convention and ways in which more countries could be encouraged to join so that the Convention could become truly global and able to properly fulfill its objectives. Participants also discussed the advantages and disadvantages of regional geological repositories. Participants discussed the situation at the sites at which large volumes of waste from the mining and milling of radioactive ores or from other industries producing waste containing natural radionuclides have been deposited on the earth's surface. Examples of how the communications with affected parties have been managed in national projects were described during the Conference. From these it was clear to participants that openness, trust and participation are all essential in such communication.

From November 30 to December 2 the Agency hosted the *International Conference on Operational Safety Performance in Nuclear Installations* to share, in a global sense, the operating and regulatory

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[19] In cooperation with the European Commission, The European Police Office (Europol), the International Criminal Police Organization (Interpol), The International Commission on Radiological Protection (ICRP), the International Labour Organization (ILO), the International Radiation Protection Association (IRPA), the World Customs Organizations (WCO), and the World Health Organization (WHO) and under the auspices of the G-8.

experiences for improving operational safety performance in nuclear installations. Participants made recommendations for operating, regulatory and international organizations regarding how to improve the sharing of operating experiences, how to learn from and share experiences on regulatory management systems, how best to achieve and ensure the safety of extended operations and how best to ensure that operating experience is reflected in the design, construction, commissioning and operation of new NPPs. In particular, the participants noted that both operators and regulators must avoid isolation, freely share safety information and show leadership in nuclear safety.

A number of other important conferences throughout 2005 included nuclear safety as part of their programmes. These included the International Conference on Nuclear Security – Global Directions for the Future in March 2005 in London, United Kingdom, the 4th International Congress on Advances in Nuclear Power Plants (ICAPP '05) in May in Seoul, Republic of Korea, the 18th International Conference on Structural Mechanics in Reactor Technology (SMiRT) in August in Beijing, China and the European Nuclear Conference in December in Versailles, France.

H. Safety significant events and international appraisals in 2005

The International Nuclear Events Scale (INES) is used for facilitating rapid communication to the media and the public regarding the safety significance of events at all nuclear installations associated with the civil nuclear industry, including events involving the use of radiation sources and the transport of radioactive materials. More than 60 countries are currently participating in the INES Information Service. To provide more detailed information and an expanded approach for the INES rating based on actual exposure of workers and members of the public, the INES methodology has been enhanced with additional guidance — endorsed by the INES national officers for pilot use in July 2004 — for the rating of events involving the transport of radioactive material. The INES manual is under revision to incorporate this additional guidance and other clarifications regarding the use of the INES.

The Nuclear Events Web Based System (NEWS) is a joint project of the Agency, OECD/NEA and WANO that provides fast, flexible and authoritative information on the occurrence of nuclear events that are of interest to the international community. NEWS covers all significant events at NPPs, research reactors, nuclear fuel cycle facilities, as well as occurrences involving radiation sources and the transport of radioactive material. The general public can access information submitted during the previous six months through the Agency's website[20].

The INES Advisory Committee met to assess the latest developments of INES and NEWS including the pilot use of the additional guidance for rating events involving radiation sources and transport. Events sent in 2004 and 2005, the update of INES manuals and new training material were also assessed. The committee has identified that training on the use of the scale and its guidance should be reinforced by the Agency. At the request of the Canadian government, a seminar on the INES methodology was provided in 2005 to a wide technical audience comprising Canadian nuclear power operators, regulators and public information experts.

[20] http://www-news.iaea.org/news/default.asp

The Incident Reporting System (IRS) jointly operated by the Agency and the OECD/NEA is an essential element for providing information regarding NPP operating experience worldwide. The 2005 joint Agency/NEA meeting discussed lessons learned from 40 recent events in countries participating in the IRS. In addition, participants discussed four events in detail:

- *Penly 2, France (pressurized water reactor)*: (September 2003) This event involved latent failures in the vicinity of power cable containment penetrations. Defects included insulation faults, stripped cables and cut cables. These cables provide power to safety-related components (such as valves) in the reactor containment building. These defects had likely been existing for some years (i.e., latent failures) and the cables had been installed by a contractor who supplies the same sort of services to a number of NPPs in France. The latent failures were such that in a possible post-LOCA environment, some systems might not operate satisfactorily. Corrective actions included improved training for technicians involved, improved procedures, repair and replacement of affected cables, and improved surveillance.
- *Vandellos 2, Spain (pressurized water reactor)*: (June 2004) This event involved a circumferential break in one train of the Emergency Service Water (ESW) system. The ESW provides heat removal for component cooling, emergency generators, safety ventilations and other systems. There had been early indications of problems (leakage in the vicinity of the rupture had been observed in the early 1990s). There are two trains of ESW, and while the failed train was inoperative, some indications of degradation were observed on the other train, although it did not fail. If both trains had failed, procedural realignments would have been required to provide the necessary cooling. The main causes and contributors to this event included design weakness, inefficient maintenance and surveillance, and organizational and management weakness.
- *Tihange 2, Belgium (pressurized water reactor)*: (March 2005) This event also involved latent failures. In March 2005, a number of 380 volt switchboards were replaced. However, some of these have defects which were not discovered for several months and could have resulted in the loss of some safety-related functions. Had a failure occurred, the loss could have been irreversible since neither the control room operator nor local actions could have actuated some functions. The latent failure was only discovered by chance and a comprehensive design review of the equipment was subsequently necessary.
- *Millstone 3, USA (pressurized water reactor)*: (April 2005) This event involved a reactor trip with safety injection, with some complications caused by the formation of a "tin whisker" on a circuit card in the solid-state protection system. In this case, the tin whisker resulted in a short-circuit in the card. The formation and growth of these whiskers is not unknown in the nuclear industry and other failures had previously been reported at several NPPs. In this case, the failure caused a protective feature to actuate, which suggests the possibility that a similar failure could prevent the actuation of a protective system. The corrective actions are not immediately obvious.

India also presented the situation at its Madras-2 pressurized heavy water reactor during the tsunami in December 2004. Despite the high water level, the diesel generators operated as required and the plant was successfully shutdown. The plant restarted one week later.

Participants made some general observations about these — and other — events presented at the meeting. Several events involved latent failures, which has been a continuing concern in recent years. Emerging phenomena, such as the "tin whisker", may be more widespread and may require a more generic investigation by the Agency or OECD/NEA. Proper oversight of contractor activities remains an issue that requires intensified attention by both operating organizations and regulatory bodies.

In Argentina, there have been allegations that groundwater supply in the vicinity of the Ezeiza Atomic Center (EAC) was contaminated with anthropogenic radioactive substances including enriched and depleted uranium. The Argentine Nuclear Regulatory Authority (ARN) issued a report dispelling the allegations. To further reassure the local population, the Argentine Government requested the Agency to organize an independent and authoritative expert appraisal (*peritaje*) on the subject with representatives from the competent organizations within the UN system. Experts from FAO, the Pan American Health Organization (PAHO), UNSCEAR, WHO, as well as ICRP and IRPA, and the IAEA participated in the appraisal. The first stage of the International Expert Appraisal consisted in 2005 of a technical field mission to the area of influence of the EAC. The final report to the Argentine Government is expected to be issued in April 2006.

As discussed earlier, the Agency responded to a number of requests pursuant to the Assistance Convention. The more prominent of these included:

- On 16 December 2004, a dangerous Cs-137 radiation source was detected in a transportation container in a truck with scrap metal at a border crossing between Turkey and Georgia. The truck had travelled from Armenia via Georgia to Turkey. On 13 January 2005, Turkey requested Agency assistance to facilitate the return of the source to the control of a responsible and competent authority. The Agency facilitated multilateral discussions among the countries and arrangements for the transport to, and storage at, an appropriate facility in Turkey.
- On 22 September 2005, the Agency received information regarding the theft of an undetermined number of Cs-137 capsules from a storage facility in Venezuela. The capsules had been used for brachytherapy between 1980 and 1990. During the theft, the sources were removed from their shields and left on the floor of the storage facility. At the request of Venezuelan authorities, the Agency facilitated arrangements for the transport of blood samples of involved persons to the Laboratory of Biological Dosimetry of the Argentine Nuclear Regulatory Authority.
- On 14 December 2005, three workers were overexposed by an Ir-192 source (3.3 TBq) from gammagraphy equipment at a cellulose plant under construction in Chile. On 18 December 2005, the Agency received a request for assistance from the Chilean Nuclear Energy Commission and the same day a fact-finding mission composed of experts from Argentina, Brazil, France and the Agency was sent to Chile. One of the three workers presented severe radiation injury and the fact-finding mission recommended inter alia specialized management and treatment for this worker. The Agency, upon request of Chilean authorities, facilitated arrangements for the transfer of this worker to a highly specialised hospital in France with experience in treatment of severe radiation burns.

I. Safety Networks

I.1. Asian Nuclear Safety Network (ANSN)

The steering committee of the ANSN met in December 2005 in Vienna. At that meeting, in addition to reviewing 2005 activities, the committee made a number of decisions regarding the ANSN, including

the contents of, and country responsibilities for maintaining, the main portal[21] and the ANSN access policy. A visual identity policy is now in place to better identify the various sites of the ANSN. All of the National Centres have now received assistance from the Agency/ANL team to put their Centres in full operation.

The Topical Groups (TG) are important components of the ANSN. Three Topical Groups are currently active: Safety Analysis of Research Reactors, Education & Training and Operational Safety. The steering committee reviewed the status of the existing and future Topical Groups (TG) and made a number of recommendations. Member countries agreed to review the Japanese proposal for the activities of the TG on Emergency Preparedness and Response and the TG on Radioactive Waste Management by mid February 2006.

Although most of the documents currently available in the ANSN are education and training-related, other types of documents — such as operational safety documents — are now being added. Many other documents are available through the Hubs or National Centres.

Measures for further promoting the ANSN include a bi-weekly ANSN Newsletter regularly published since mid-March 2005. It is widely distributed in the countries participating to the programme. Promotional meetings (called *Caravan*) are also being organized in participating countries to introduce ANSN to a larger audience, including key decision makers. In 2005, Caravan missions were sent to Indonesia and Vietnam.

I.2. Ibero-American Radiation Safety Network

In January 2005, the heads of the regulatory bodies of the countries participating in the Forum met in Rio de Janeiro and established a steering committee to coordinate the implementation of the programme. The steering committee oversees the activities leading to the design, commissioning and operation of the Ibero American Network. The steering committee includes one representative per country and one Secretariat representative. The steering committee met three times in 2005. At the first meeting in Vienna, the committee discussed its terms of reference and operational structure and reviewed the progress on the IT solution for the network. The committee also agreed to: develop a detailed proposal for the format and contents of a document that describes the regulatory practices in the countries of the region; establish contacts with the relevant professional societies in Iberoamerica; and update the list of contact institutions in the region.

At the second meeting in Buenos Aires, the following aspects were further developed: the *Conceptual Structure* of the network, including the revision of the taxonomy to reflect the regulatory functions; the *Knowledge Management* applications that are required to achieve the objectives of the technical areas and the *IT functionalities* of the network, including the topology of the system, the management of users and information resources.

At the third meeting in Mexico City, a workshop was organized with the participation of the steering committee members and IT specialists where the network prototype was extensively tested. In addition, the steering committee agreed to a quality system, prepared a draft procedure to classify and upload resources in the network, and the Agency experience with the development of the Asian Safety Network was shared. The steering committee also discussed the status of the probabilistic safety analysis in radiotherapy and agreed to present a project proposal on patient protection to the Forum at its next meeting.

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[21] http://www.ansn.org/

J. Chernobyl Forum

The Chernobyl Forum consists of relevant international organizations[22] from within the UN family and representatives of the three countries[23] primarily affected by the Chernobyl accident. The Forum was established with a view to contributing to the implementation of the UN strategy, *Human Consequences of the Chernobyl Accident — A Strategy for Recovery*, launched in 2002.

The Chernobyl Forum completed its operation in 2005 and issued two technical reports: one discussing the environmental consequences of the Chernobyl accident and one discussing the health effects of the accident. These reports were considered in detail by the Forum participants and accepted by consensus. The Forum participants also agreed that the approved reports are the common position of the Forum members regarding environmental and health consequences of the Chernobyl accident as well as recommended future actions. In addition, the digest Forum report "Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts and Recommendations to the Governments of Belarus, the Russian Federation and Ukraine", considers both the scientific issues and practical recommendations to the governments of the affected states and relevant international organisations.

All of the Chernobyl Forum reports were presented and discussed during the International Conference entitled "Chernobyl: Looking Back to Go Forwards" held in Vienna in September 2005. The consensus of the Forum participants was also noted by the UN Secretary-General in his report to the General Assembly A/60/443, from 24 October 2005, entitled 'Optimizing the international effort to study, mitigate and minimize the consequences of the Chernobyl disaster' and in the Resolution of the UN General Assembly A/60/L.19, from 10 November 2005, entitled 'Strengthening of international cooperation and coordination of efforts to study, mitigate and minimize the consequences of the Chernobyl disaster'.

[22] FAO, UN-OCHA, UNDP, UNEP, UNSCEAR, WHO, World Bank

[23] Belarus, the Russian Federation, Ukraine

Annex 2

The Agency's Safety Standards: Activities during 2005

A. Introduction

Article III.A.6 of the IAEA Statute authorizes the Agency to "establish… standards of safety… and to provide for the application of these standards" to its own operations, to assisted operations, to operations under bilateral or multilateral arrangements (at the request of the parties), and to any of a State's activities (at the request of that State). The preparation and review process for IAEA Safety Standards is described in the Attachment to GOV/INF/2001/1.

An Action Plan for the development and application of IAEA Safety Standards was submitted to the Board of Governors in March 2004 (GOV/INF/2004/10-GC(48)/INF/7). The Action Plan pays special attention to providing for the application of standards and collecting feedback on their use and to putting in place a rigorous process to review other Agency safety related publications developed outside the IAEA Safety Standards programme.

The categories in the Safety Standards Series are Safety Fundamentals, Safety Requirements and Safety Guides. Safety Fundamentals present basic objectives, concepts and principles; Safety Requirements establish the requirements that must be met to ensure safety (*shall* statements); and Safety Guides provide recommendations and guidance on how to comply with the safety requirements (*should* statements). Safety Fundamentals and Safety Requirements require the approval of the Board of Governors. Safety Guides are issued under the authority of the Director General.

The IAEA Safety Standards cover five safety areas:

- nuclear safety: safety of nuclear installations;
- radiation safety: radiation protection and safety of radiation sources;
- transport safety: safety of transport of radioactive materials;
- waste safety: safety of radioactive waste management; and
- general safety: of relevance in two or more of the above four areas.

The topics in the general safety area include legal and governmental infrastructure for safety, emergency preparedness and response, assessment and verification, and management systems.

All IAEA Safety Standards are prepared and reviewed in accordance with a uniform process, involving a set of four Committees — the Nuclear Safety Standards Committee (NUSSC), the Radiation Safety Standards Committee (RASSC), the Transport Safety Standards Committee (TRANSSC) and the Waste Safety Standards Committee (WASSC) — with harmonized terms of reference to assist the Secretariat in preparing and reviewing all standards, and a Commission on Safety Standards (CSS) to assist the Secretariat in coordinating the activities of the Committees.

Eight IAEA Safety Standards were published in 2005:

- Nuclear safety: one safety requirements and three safety guides;
- Radiation safety: two safety guides;
- Transport safety: transport regulations 2005 edition; and

- Waste safety: one safety guide.

Since the establishment of the CSS and the Committees in 1995, a total of 73 IAEA Safety Standards have been endorsed by the CSS for publication; of those, 72 (13 Safety Requirements and 59 safety guides) have been published; and 58 further standards (one safety fundamentals, eight requirements and 49 safety guides) are being drafted or revised. A list of IAEA Safety Standards, indicating their current status, is attached as Annex I, and up-to-date status reports can be found on the Agency's website, at http://www-ns.iaea.org/downloads/standards/status.pdf. The full text of published IAEA Safety Standards is also available on the Web site, at http://www-ns.iaea.org/standards/.

The Agency is working on a draft Unified Safety Fundamentals document (DS298) to replace the Safety Series No. 110, No. 111-F and No. 120. In 2004, the draft was submitted to Member States for comments. A revised draft prepared on the basis of comments from Member States was presented to the Committees in September 2005. The draft is currently under review by the four committees. It is planned to submit a final draft to the CSS in June 2006, and to the Board of Governors for approval in September 2006.

The members of the four Committees are appointed for three-year terms. The fourth such term started at the beginning of 2005; the Committees were all reconstituted for the 2005–2007 period with modified terms of reference that give more emphasis to the use of standards and sharing of the experience from their use. The current term of the CSS is for the four-year period of 2004–2007.

In 2005, the Board of Governors approved the publication of NS-R-4: *Safety Requirements on Safety of Research Reactors* and WS-R-4: *Geological Disposal of Radioactive Waste*.

In June 2005, the Board of Governors approved a revised policy for reviewing and revising TS-R-1: *Regulations for the Safe Transport of Radioactive Material* (the Transport Regulations). Under the previous policy, the Transport Regulations were both reviewed and revised for publication every two years without any consideration whether the changes proposed in the review process had safety significance or not. In the revised policy, while the Transport Regulations will continue to be reviewed every two years (the current review cycle of the relevant international bodies), the decision on the revision and publication will be made based on the assessment of TRANSSC and CSS.

B. Commission on Safety Standards (CSS)

The CSS, chaired by Mr. A.C. Lacoste, Director General of the Directorate General for Nuclear Safety and Radiation Protection in France, met twice during 2005, in June and November.

At its June meeting, the CSS considered the treatment of security related issues in the safety standards, as well as a strategy regarding the review of safety standards for radiation protection. The CSS also endorsed the publication of one safety guide and approved document preparations profiles (DPPs) for seven safety standards.

At its November meeting, the CSS discussed the status of the draft Safety Fundamentals and agreed to consider the document at its next meeting. The CSS endorsed the submission of Safety Requirements on *The Management System for Facilities and Activities* to the Board of Governors for approval. The CSS also endorsed the publication of four safety guides and approved DPPs for eight safety standards. At the request of the President of the 3rd Review Meeting of the Convention on Nuclear Safety, CSS nominated a representative to assist the President in implementing an adopted resolution of the

Contracting Parties on "The Use of the IAEA Safety Requirements in the Review Process". The CSS also received a briefing on the activities of the Advisory Group on Nuclear Security (AdSec).

The CSS discussed a progress report being prepared by the Secretariat for submission to the Board of Governors on the implementation of the Action Plan, particularly with regard to the feedback from the use of the IAEA Safety Standards. Reports by CSS members confirm the increased utilization of IAEA Safety Standards worldwide.

C. Nuclear Safety Standards Committee (NUSSC)

NUSSC, chaired by Mr. Lasse Reiman of the Radiation and Nuclear Safety Authority (STUK) of Finland, met in April and October in 2005.

At these meetings, NUSSC endorsed six draft IAEA Safety Standards for submission to the CSS (in some cases subject to specified comments being incorporated). These draft IAEA Safety Standards included the *Safety Requirements: The Management System for Facilities and Activities*. These safety requirements will replace the Agency's Safety Standards on quality assurance published in 1996.

The updating of the IAEA Safety Standards in the areas of nuclear power plant design and operation is complete. However, the new overall safety standards structure has identified the need for a number of new Safety Guides. In 2005, NUSSC endorsed proposals for 11 of these new Safety Guides.

In the near term, the focus of attention for NUSSC will be on the completion of the Safety Guides for Research Reactors as well as the Requirement and Guides for Fuel Cycle Facilities. Another important task of NUSSC will be the development of the Safety Requirement and Guides in the thematic area of Assessment and Verification, including the methodology and application of probabilistic safety assessment.

D. Radiation Safety Standards Committee (RASSC)

RASSC, chaired by Mr. Sigurdur Magnussson of the Icelandic Radiation Protection Institute, met in April and October in 2005. The April meeting included a joint session with WASSC to discuss issues of common interest.

Two Safety Guides were published during 2005: RS-G-1.8: *Environmental and Source Monitoring for Purposes of Radiation Protection* (in conjunction with WASSC) and RS-G-1.9: *Categorization of Radioactive Sources*.

In 2005, RASSC approved a Safety Guide on *Preparedness for Nuclear and Radiological Emergencies* for submission to the CSS. At the October meeting, RASSC approved Safety Requirements on *Management Systems*, a Safety Guide on *Management Systems: Generic Guidance*, a Safety Guide on *Safety of Radiation Generators and Sealed Radioactive Sources*, and a Safety Guide on *Release of Sites from Regulatory Control upon Termination of Practices* for submission to the CSS.

RASSC also reviewed reports from the Secretariat on the implementation of the Action Plan on the development and application of the IAEA Safety Standards. RASSC received reports from the Secretariat on the review and revision of the *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* (the BSS). At its October meeting, RASSC developed an outline of an action plan for the review of the BSS and requested that the Secretariat complete the review during 2006. The report of the review should outline the content of the DPP for the revised BSS. The review will identify all of the issues that need to be addressed and will propose solutions. A basic DPP should be submitted in June 2006 to the CSS.

In 2005, RASSC endorsed proposals for two new Safety Guides.

E. Transport Safety Standards Committee (TRANSSC)

Beginning in 2005, TRANSSC will meet twice each year. In 2005, TRANSSC met in March and September. The March meeting was chaired by Mr. Peter Colgan of the Australian Radiation Protection and Nuclear Safety Agency and the September meeting was chaired by Mr. Jarlath Duffy of the Radiological Protection Institute of Ireland.

At its March 2005 meeting, TRANSSC had an in-depth discussion regarding the revision cycle and process for the Transport Regulations. TRANSSC also recommended that the Agency create an advisory group for addressing the issue of denial of shipments, with participation by a limited number of members (such as representatives of producers, carriers, port authorities, customs organizations) who may authoritatively speak on the issue and suggest resolutions. Finally, TRANSSC made a number of recommendations regarding a proposed seminar on complex technical issues relating to the transport of radioactive material.

TRANSSC approved the following documents for submission to Member States for 120-day comments: TS-R-1: *The Regulations for the Safe Transport of Radioactive Material (2007 edition)*, TS-G-1.1 *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material* (both the combined 2003 and 2005 Edition, and the 2007 Edition), TS-G-1.3: *Safety Guide for Management Systems for the Safe Transport of Radioactive Material* and TS-G-1.5: *Safety Guide for Radiation Protection Programmes in Transport*. TRANSSC also endorsed a proposal for one new Safety guide.

At the September meeting, TRANSSC noted that the Board of Governors had approved a new policy for review and revision of the Transport Regulations and discussed how it would implement this policy.

At the September meeting, TRANSSC approved Safety Requirements on *Management Systems* and a Safety Guide on *Management Systems: Generic Guidance* for submission to the CSS.

F. Waste Safety Standards Committee (WASSC)

WASSC, chaired by Mr. Thiagan Pather of the National Nuclear Regulator of South Africa, met in April and October in 2005. The April meeting included a joint session with RASSC. The October

meeting was held in Tokyo, Japan, following the International Conference on the Safety of Radioactive Waste Disposal. The meeting was hosted by the Nuclear and Industrial Safety Agency (NISA), Ministry of Economy, Trade and Industry (METI).

Two Safety Guides were published during 2005: RS-G-1.8: *Environmental and Source Monitoring for Purposes of Radiation Protection* (in conjunction with RASSC) and WS-G-2.7: *Management of Waste from the Use of Radioactive Materials in Medicine, Industry, Research, Agriculture and Education*.

In 2005, WASSC also approved the submission of five Safety Guides to the CSS: DS292: *Storage of Radioactive Waste*; DS332: *Release of Sites from Regulatory Control upon Termination of Practices*; DS335: *Borehole Disposal of Radioactive Waste*; DS336: *Management Systems for the Safety of the Treatment, Handling and Storage of Radioactive Waste*; and DS337: *Management Systems for the Safety of Radioactive Waste Disposal*.

In 2005, WASSC endorsed proposals for three new Safety Requirements and four new Safety Guides.

Appendix 1: The Current IAEA Safety Standards

Safety Fundamentals

110	The Safety of Nuclear Installations (1993)
111-F	The Principles of Radioactive Waste Management (1995)
120	Radiation Protection and the Safety of Radiation Sources (1996) **Co-sponsorship:** FAO, ILO, OECD/NEA, PAHO, WHO

The Safety Fundamentals are being revised combining the three documents into one.

Thematic Safety Standards

Legal and Governmental Infrastructure

GS-R-1	Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety (2000)
GS-G-1.1	Organization and Staffing of the Regulatory Body for Nuclear Facilities (2002)
GS-G-1.2	Review and Assessment of Nuclear Facilities by the Regulatory Body (2002)
GS-G-1.3	Regulatory Inspection of Nuclear Facilities and Enforcement by the Regulatory Body (2002)
GS-G-1.4	Documentation for Use in Regulating Nuclear Facilities (2002)
GS-G-1.5	Regulatory Control of Radiation Sources (2004) **Co-sponsorship:** FAO, ILO, PAHO, WHO

Emergency Preparedness and Response

GS-R-2	Preparedness and Response for a Nuclear or Radiological Emergency (2002) **Co-sponsorship:** FAO, OCHA, OECD/NEA, ILO, PAHO, WHO
50-SG-G6	Preparedness of Public Authorities for Emergencies at Nuclear Power Plants (1982)
50-SG-O6	Preparedness of the Operating Organization (Licensee) for Emergencies at NPPs (1982)
98	On-Site Habitability in the Event of an Accident at a Nuclear Facility (1989)
109	Intervention Criteria in a Nuclear or Radiation Emergency (1994)

Two new Safety Guides on: preparedness for emergencies (combining G6, O6 and 98); and criteria for use in planning response to emergencies (replacing 109) are being developed.

Management System

Safety Series	
No.50-C/SG-Q	Quality Assurance for Safety in Nuclear Power Plants and other Nuclear Installations (2001) under revision.
Safety Guides (2001)	
Q1	Establishing and Implementing a Quality Assurance Programme

Q2	Non-conformance Control and Corrective Actions
Q3	Document Control and Records
Q4	Inspection and Testing for Acceptance
Q5	Assessment of the Implementation of the Quality Assurance Programme
Q6	Quality Assurance in the Procurement of Items and Services
Q7	Quality Assurance in Manufacturing
Q8	Quality Assurance in Research and Development
Q9	Quality Assurance in Siting
Q10	Quality Assurance in Design
Q11	Quality Assurance in Construction
Q12	Quality Assurance in Commissioning
Q13	Quality Assurance in Operation
Q14	Quality Assurance in Decommissioning (under revision)

Six new Safety Guides on management system (for regulatory bodies, technical services in radiation safety, radiation safety for users, waste disposal, treatment of waste and nuclear facilities) are being developed.

Assessment and Verification

GS-G-4.1	Format and Content of the Safety Analysis report for NPPs (2004)

A new Safety Requirement on safety assessment and verification is being developed.

Site Evaluation

NS-R-3	Site Evaluation for Nuclear Installations (2003)
NS-G-3.1	External Human Induced Events in Site Evaluation for Nuclear Power Plants (2002)
NS-G-3.2	Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants (2002)
NS-G-3.3	Evaluation of Seismic Hazard for Nuclear Power Plants (2003)
NS-G-3.4	Meteorological Events in Site Evaluation for Nuclear Power Plants (2003)
NS-G-3.5	Flood hazard for Nuclear Power Plants on Coastal and River Sites (2004)
NS-G-3.6	Geotechnical Aspects of NPP Site Evaluation and Foundations (2005)

Radiation Protection

115	International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (1996) **Co-sponsorship:** FAO, ILO, OECD/NEA, PAHO, WHO
RS-G-1.1	Occupational Radiation Protection (1999) **Co-sponsorship:** ILO
RS-G-1.2	Assessment of Occupational Exposure due to Intakes of Radionuclides (1999) **Co-sponsorship:** ILO
RS-G-1.3	Assessment of Occupational Exposure due to External Sources of Radiation (1999) **Co-sponsorship:** ILO
RS-G-1.4	Building Competence in Radiation Protection and the Safe Use of Radiation Sources (2001) **Co-sponsorship:** ILO, PAHO, WHO
RS-G-1.5	Radiological Protection for Medical Exposure to Ionizing Radiation (2002) **Co-sponsorship:** PAHO, WHO
RS-G-1.7	Application of the Concepts of Exclusion, Exemption and Clearance (2004)
RS-G-1.8	Environmental and Source Monitoring for Purposes of Radiation Protection (2005)
RS-G-1.9	Categorization of Radioactive Sources (2005)

Two new Safety Guides on: safety of radiation sources; and naturally occurring radioactivity are being developed.

Radioactive Waste Management

WS-R-2	Predisposal Management of Radioactive Waste, including Decommissioning (2000) (under revision)
111-G-1.1	Classification of Radioactive Waste (1994)
WS-G-2.3	Regulatory Control of Radioactive Discharges to the Environment (2000)
WS-G-2.5	Predisposal Management of Low and Intermediate Level Radioactive Waste (2003)
WS-G-2.6	Predisposal Management of High Level Radioactive Waste (2003)
WS-G-2.7	Management of Waste from the Use of Radioactive Materials in Medicine, Industry and Research (2005)

Three new Safety Guides on: safe management of naturally occurring radioactive materials in the environment; storage of spent fuel; and storage of radioactive waste are being developed.

Decommissioning

WS-G-2.1	Decommissioning of Nuclear Power Plants and Research Reactors (1999)
WS-G-2.2	Decommissioning of Medical, Industrial and Research Facilities (1999)
WS-G-2.4	Decommissioning of Nuclear Fuel Cycle Facilities (2001)

One new Safety Requirements on decommissioning of nuclear facilities and one Safety Guide on release of sites from regulatory control upon the termination of practices is being developed.

Rehabilitation

WS-R-3	Remediation of Areas Contaminated by Past Activities and Accidents (2003)

One Safety Guide on implementation of remediation process for past activities and accidents is being developed.

Transport Safety

TS-R-1	Regulations for the Safe Transport of Radioactive Material 2005 Edition (2005)
TS-G-1.1	Advisory Material for the Regulations for the Safe Transport of Radioactive Material (2002)
TS-G-1.2	Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material (2002)

One Safety Guide on management systems for the safe transport of radioactive material is being developed.

Facility Specific Safety Standards

Design of Nuclear Power Plants (NPPs)

NS-R-1	Safety of NPPs: Design (2000)

NS-G-1.1	Software for Computer Based Systems Important to Safety in NPPs (2000)
NS-G-1.2	Safety Assessment and Verification for NPPs (2002)
NS-G-1.3	Instrumentation and Control Systems Important to Safety in NPPs (2002)
NS-G-1.4	Design of Fuel Handling and Storage Systems in NPPs (2003)
NS-G-1.5	External Events Excluding Earthquakes in the Design of NPPs (2004)
NS-G-1.6	Seismic Design and Qualification for NPPs (2003)
NS-G-1.7	Protection Against Internal Fires and Explosions in the Design of NPPs (2004)
NS-G-1.8	Design of Emergency Power Systems for NPPs (2004)
NS-G-1.9	Design of the Reactor Coolant System and Associated Systems in NPPs (2004)
NS-G-1.10	Design of the Reactor Containment Systems for NPPs (2004)
NS-G-1.11	Protection Against Internal Hazards Other than Fire and Explosions (2004)
NS-G-1.12	Design of the Reactor Core for NPPs (2005)
NS-G-1.13	Radiation Protection Aspects of Design for NPPs (2005)
79	Design of Radioactive Waste Management Systems at NPPs (1986)

Operation of NPPs

NS-R-2	Safety of NPPs: Operation (2000)
NS-G-2.1	Fire Safety in Operation of NPPs (2000)
NS-G-2.2	Operational limits and conditions and operating procedures for NPPs (2000)
NS-G-2.3	Modifications to NPPs (2001)
NS-G-2.4	The Operating Organization for NPPs (2002)
NS-G-2.5	Core Management and Fuel Handling for NPPs (2002)
NS-G-2.6	Maintenance, Surveillance and In-Service Inspection in NPPs (2002)
NS-G-2.7	Radiation Protection and Radioactive Waste Management in the Operation of NPP (2002)
NS-G-2.8	Recruitment, Qualification and Training of Personnel for NPPs (2003)
NS-G-2.9	Commissioning of NPPs (2003)
NS-G-2.10	Periodic Safety Review of NPPs (2003)
93	System of Reporting Unusual Events in NPPs (1989) (under revision)

One new Safety Guide on conduct of operations is being developed.

Research Reactors

NS-R-4	Safety of Research Reactors (2005)
35-G1	Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report (1994)
35-G2	Safety in the Utilization and Modification of Research Reactors (1994)

Six new Safety Guides on: commissioning; maintenance, periodic testing and inspection; operational limits and conditions; operating organization, recruitment, training and qualification; radiation protection and waste management; and core management are being developed.

Fuel Cycle Facilities

116	Design of Spent Fuel Storage Facilities (1995)
117	Operation of Spent Fuel Storage Facilities (1995)

One Safety Requirements on safety of fuel cycle facilities, and three Safety Guides on: safety of uranium fuel fabrication; MOX fuel fabrication; and conversion facilities are being developed.

Radiation Related Facilities

107	Radiation Safety of Gamma and Electron Irradiation Facilities (1992)
RS-G-1.6	Occupational Radiation Protection in the Mining and Processing of Raw Materials (2004)

Waste Treatment and Disposal Facilities

WS-R-1	Near Surface Disposal of Radioactive Waste (1999) (under revision)
WS-G-1.1	Safety Assessment for Near Surface Disposal of Radioactive Waste (1999)
WS-G-1.2	Management of Radioactive Waste from the Mining and Milling of Ores (2002)
111-G-3.1	Siting of Near Surface Disposal Facilities (1994)
111-G-4.1	Siting of Geological Disposal Facilities (1994)
108	Design and Operation of Radioactive Waste Incineration Facilities (1992)
99	Safety Principles and Technical Criteria for the Underground Disposal of High Level Radioactive Wastes (1989) (under revision)

Four Safety Guides on: geological disposal of radioactive waste; borehole disposal of radioactive waste; near surface disposal of radioactive waste; and monitoring and surveillance of disposal facilities are being developed.

Annex 3

Civil Liability for Nuclear Damage International Expert Group on Nuclear Liability (INLEX)

A. Introduction

The International Conference on the Safety of Transport of Radioactive Material (the International Conference), which was held in Vienna, Austria, from 7 to 11 July 2003, found that "there remains considerable uncertainty and debate related to the implementation of a comprehensive regime to deal with the legal liability resulting from an accident during the transport of radioactive material. There are a number of liability-related conventions, to which many States are parties but many others are not." Further, it found that "the provisions of the liability conventions, and the relationships between them, are not simple to understand" and, accordingly, "the preparation of an explanatory text for these instruments would assist in developing a common understanding of what are complex legal issues, and thereby promote adherence to these instruments. The Agency Secretariat should prepare such an explanatory text, with the assistance of an independent group of legal experts appointed by the Director General."

The Director General, in the light of the aforementioned findings and with a view to fostering a global and effective nuclear liability regime, announced on 8 September 2003 to the Board of Governors and on 15 September 2003 to the General Conference the establishment of the International Expert Group on Nuclear Liability (INLEX).

On 19 September 2003, the General Conference, in resolution GC(47)/RES/7.C, stressed "the importance of having effective liability mechanisms in place to ensure against harm to human health and the environment as well as actual economic loss due to an accident or incident during the maritime transport of radioactive materials", acknowledged the International Conference President's conclusion that "the preparation of explanatory text for the various nuclear liability instruments would assist in developing a common understanding of the complex issues and thereby promote adherence to these instruments", and welcomed "the decision of the Director General to appoint a group of experts to explore and advise on issues related to nuclear liability".

Following the adoption of resolution GC(47)/RES/7.C, INLEX which consists of expert members from nuclear power and non-nuclear power countries and from shipping and non-shipping States, has held five meetings; all at the Agency's Headquarters in Vienna. The first meeting was held from 16 to 17 October 2003, the second from 22 to 26 March 2004, the third from 13 to 16 July 2004, the fourth from 7 to 11 February 2005 and the fifth from 11 to 14 July 2005.

B. Work undertaken

During the course of its five meetings, INLEX has explored and advised on issues regarding the existing international liability regime for nuclear damage, in particular, concerning the international liability instruments adopted under Agency auspices. Information concerning some of INLEX's work completed to date and its on-going work are set out below:

B.1. Explanatory texts

Further to General Conference resolution GC(47)/RES/7.C, INLEX finalized the discussion and review of explanatory texts (including an overview of those texts) on the nuclear liability instruments adopted under Agency auspices in 1997, as a comprehensive study and authoritative interpretation of the Agency's nuclear liability regime. These explanatory texts have been made available to Member States in English (GOV/INF/2004/9-GC(48)/INF/5) and have also been translated into the other official languages of the Agency: these translated texts are available on the Agency's website: http://www.iaea.org/About/Policy/GC/GC48/Documents/gc48inf-5.pdf. The texts will also be published as part of the IAEA International Law Series, later in 2006.

B.2. Possible gaps and ambiguities

During its various sessions, INLEX discussed and reached conclusions and recommendations on a number of possible gaps and ambiguities in the scope and coverage of the existing international nuclear liability instruments. While some of the conclusions and recommendations were addressed through the explanatory texts and are also reflected in the Group's outreach activities,[24] the Group decided that others should be reflected more specifically in a report to the Director General and ultimately the wider IAEA audience for consideration. While it should be noted that INLEX's work is still ongoing, those conclusions and recommendations reached to-date are set out below:

B.2.1. Complexity and diversity of obligations under the international regime

The Group noted that countries might adhere to four base conventions i.e. the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy, the revised Paris Convention, the 1963 Vienna Convention on Civil Liability for Nuclear Damage and the revised Vienna Convention, as well as to the 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (the Joint Protocol) that links these base conventions and to the Convention on Supplementary Compensation (the CSC) that provided the basis for a global regime to include all countries that adhere to one of the base conventions or adopt national law that complies with the provisions of the Annex to the CSC. In this regard, the Group recognised that, until all countries belonged to the CSC as a global regime, there were some inevitable complexities resulting from the existence of these different instruments.

The Group concluded that the elaboration of a new overarching international nuclear liability instrument was not necessary since the CSC had been adopted for that purpose and required the same

[24] Conclusions and recommendations identified for being reflected in the Group's outreach activities included those relating to the issue of compensation for general degradation of the environment, difficulties in the pursuit of claims and the possible inadequacy of the amount of compensation.

treatment by States with respect to minimum compensation amounts, jurisdictional rules and the definition of nuclear damage. The Group also concluded that widespread adherence to the global regime should be promoted through adherence to the revised Vienna and Paris Conventions or the adoption of national law based on the Annex to the CSC. Similarly, other countries should be encouraged within the context of their respective national laws to adopt provisions on compensation, the definition of nuclear damage and jurisdiction similar to those required by the CSC in order to help move to wards a more harmonized global regime. The Group also noted that the Joint Protocol was an important measure in building a link between countries that adhere to the Vienna and Paris Conventions (as revised), especially in the interim before widespread adherence to the CSC was achieved.

B.2.2. Compensation for economic loss sustained as a result of perceived risk in a situation where there has been no actual release of radiation

The Group noted that the Vienna and Paris Conventions (as revised) and the CSC contained a revised definition of "nuclear incident" to include situations where there was no release of radiation but where there existed a "grave and imminent threat" of nuclear damage. While noting that this matter had already been partly addressed in the explanatory texts, the Group concluded that in situations such as those above, the cost of preventive measures and any further costs or damage related thereto were covered by the revised definition of "nuclear damage". At the same time, the Group recognised the importance of the operator and the Installation State working closely with the concerned State or communities in a given situation to try to minimize any unfounded perceptions and to alleviate any economic loss associated with such situations. The Group also noted that the IAEA might have a role to play in such situations, in providing a source of independent advice on the level of risk, if any, that might exist. The Group also noted that, leaving aside the issue of preventative measures, if there were no basis for the competent court to determine the existence of a nuclear incident, then the conventions would not come into effect and general tort law would apply.

B.2.3. Difficulties in pursuit of claims

The Group recognised that through the channelling of jurisdiction to a single designated court which may be located in a foreign country there could be difficulties for claimants in pursuing claims. It concluded that these difficulties could be minimised by provisions which permit a State to bring claims on behalf of its nationals and, in particular, the likelihood that most claims could be resolved through an insurance claims adjustment process without resort to the court system. The Group noted that resort to judicial proceedings would likely only be needed where there was a dispute as to whether a particular type of damage was covered by the competent court.

B.2.4. Requirement to establish domestic legislation

The Group recognised that for those States which have no nuclear industries, the requirement to enact implementing national nuclear liability legislation may constitute a disincentive to adhere to the Conventions. The Group concluded that it would be useful to develop guidelines or generic minimum legislation for both nuclear and non-nuclear States and to make this draft legislation available, in particular, during the outreach activities of the Group. In this context, the Group recommended that in preparing such draft legislation, attention should be given to whether there were any differences necessitated because a State was a party to the Vienna or Paris Conventions or the Annex to the CSC and also whether the requirements were less for States that permit self-executing treaty obligations. The Secretariat is currently preparing such draft legislation for consideration by INLEX.

B.2.5. Possible inadequacy of compensation

Despite revisions to the relevant international liability instruments and the fact that the CSC would provide a system of supplementary compensation, the Group recognised that there was concern that the levels of compensation under the existing Vienna and Paris Conventions remained inadequate. The Group concluded that adherence to the global regime was the best way to ensure adequate compensation and that all States should be encouraged within the context of their national law to adopt compensation amounts similar to those required by the global regime.

B.2.6. The different time limits applying

The Group recognized that the different periods of extinction and prescription in the various nuclear liability instruments resulted from attempts to balance the constraints imposed by the availability of insurance (in most cases limited to ten years) and the desire to ensure compensation for victims with latent injuries. The Group further concluded that all the nuclear liability instruments had sufficient flexibility to permit claims for latent injuries beyond ten years. The Group encouraged all States to use this flexibility to ensure compensation for latent injuries and noted that both the revised Vienna and Paris Conventions specified 30 years as the period in which claims for latent injuries could be brought.

B.3. Outreach activities: Regional workshops on liability for nuclear damage

In order to provide a platform for both fostering adherence to the international nuclear liability regime and to provide a forum for open discussions on possible difficulties, concerns or issues States may have with the regime, INLEX entered into a number of outreach activities, including the development of standard training material in the area of nuclear liability and the organization of regional workshops. These activities have been recognized by the General Conference in resolution GC(49)/RES/9 which, inter alia, "look[ed] forward to the continuation of INLEX's work, in particular its outreach activities [...]".

B.3.1. Regional Workshop on Liability for Nuclear Damage, Sydney, Australia

The first Regional Workshop on Liability for Nuclear Damage, in the context of INLEX's outreach activities, was held in Sydney, Australia, 28-30 November 2005. The workshop was attended by 49 participants from 14 IAEA Member States in the Asia-Pacific region and 12 non-IAEA Member States who are Member States of the Pacific Islands Forum. Two representatives of the Pacific Islands Forum Secretariat also attended the workshop. It followed a standard programme developed by INLEX.

The main purpose of the workshop was to provide information on the existing international liability regime for nuclear damage. In this respect, presentations during the workshop included: an overview of the recent developments of the international legal instruments governing the safe and peaceful uses of nuclear energy; a presentation on why there is a need for a special international liability regime; an overview of the relevant instruments of the regime; and a presentation on the main features of the Convention on Supplementary Compensation (the CSC). The workshop also included presentations on some of the special aspects of nuclear liability, including the principles of liability during transport and insurance of nuclear risks. A presentation was also given on the development of implementing national nuclear liability legislation to reflect the principles and norms of the international liability regime. Although not included in the programme, pursuant to a request of participants, a short presentation was given to identify the types of damage covered in other relevant international instruments *vis-à-vis* the nuclear liability regime.

An additional purpose of the workshop was to provide for the possibility to exchange information on possible difficulties, concerns and key issues that States may have with the existing international liability regime. A case study of a hypothetical accident occurring during the course of transport of nuclear material set the stage for these discussions.

Issues seen as creating potential difficulty which were raised in the discussions included the complexity of the regimes and the disparate adherence by different States (e.g. those involved in transportation thorough the Pacific), the different extinction periods applying between the conventions and the possible inadequacy of compensation limits especially under the old instruments, and the exclusion of claims for general degradation of the environment and economic losses suffered in a situation of no release. These issues did not, however, detract from the major effort made to improve the early instruments and move towards a situation where there was a single comprehensive system such as the CSC that could provide reassurances to non-nuclear States that, if an accident happened and harm occurred, appropriate compensation would be available.

In the participants' view, the workshop provided a very useful forum to provide information and clarity on the international liability instruments, in which participants could become aware of the ways in which the various instruments would operate in the event of an incident. To this end, participants expressed appreciation for the ongoing efforts to create regional awareness, in a clear and comprehensive manner, of the international liability regime.[25]

B.3.2. Regional Workshop on Liability for Nuclear Damage, Lima, Peru

The second regional workshop is scheduled to be held in Lima, Peru, later in 2006. The workshop is open to representatives from Member States in Latin America. The workshop will follow the same standard programme as the first workshop but will also reflect lessons learnt.

C. Future work

INLEX continues to carry out its three main functions, and the Director General recently extended its term. It is scheduled to meet once a year in the future. INLEX will continue to be a forum of expertise for discussions between shipping and coastal States and to provide authoritative advice on the nuclear liability instruments adopted under Agency auspices.

The Group will continue to consider the need to further develop the nuclear liability regime, in particular, by further discussing and analyzing possible gaps and ambiguities in the scope and coverage of the existing liability instruments. In addition, INLEX will analyze the disadvantages of not adhering to a global nuclear liability regime, in particular, the possible difficulties of obtaining compensation outside the regime. INLEX will also assist in the development and strengthening of the national nuclear liability legal frameworks in Member States. Finally, a number of the nuclear liability instruments adopted under Agency auspices foresee a role for the Board of Governors and for which future action may be required: for example, the establishment of the maximum limits for the exclusion of small quantities of nuclear material from the scope of application of the relevant instruments. INLEX will, through the Director General, make recommendations to the Board of Governors in respect of this and other relevant issues as appropriate.

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[25] A note on the workshop prepared by the Secretariat is available, on request, from the IAEA Office of Legal Affairs.

The next meeting of INLEX is scheduled for May 2006.