Nuclear Safety Review for the Year 2010

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Nuclear Safety Review
For the Year 2010

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Foreword

The *Nuclear Safety Review for the Year 2010* contains an analytical overview of the status of worldwide efforts to strengthen nuclear, radiation, transport and radioactive waste safety and emergency preparedness. The analytical overview is supported by two Appendices: Safety Related Events and Activities Worldwide during 2010 (Appendix 1) and The Agency's Safety Standards: Activities during 2010 (Appendix 2).

A draft version of the Nuclear Safety Review for the Year 2010 was submitted to the March 2011 session of the Board of Governors in document GOV/2011/4. The final version of the *Nuclear Safety Review for the Year 2010* was prepared in light of the discussions during the Board of Governors.

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Executive Summary

The Agency, as a leading organization for promoting international cooperation among its Member States, is in a unique position to observe global trends, issues and challenges in nuclear safety and security through a wide variety of activities related to the establishment of safety standards and security guidelines and their application. The contents of this *Nuclear Safety Review* reflect the emerging nuclear safety trends, issues and challenges for 2010, as well as recapitulate the Agency's activities intended to further strengthen the global nuclear safety and security framework in all areas of nuclear, radiation, waste and transport safety.

The accident at the Fukushima Daiichi Nuclear Power Plant, caused by the extraordinary disasters of the earthquake and tsunamis that struck Japan on 11 March 2011, continues to be assessed. As this report focuses on developments in 2010, the accident and its implications are not addressed here, but will be addressed in future reports of the Agency.

The international nuclear community maintained a high level of safety performance in 2010. Nuclear power plant safety performance remained high, and indicated an improved trend in the number of emergency shutdowns as well in the level of energy available during these shutdowns. In addition, more States explored or expanded their interests in nuclear power programmes, and more faced the challenge of establishing the required regulatory infrastructure, regulatory supervision and safety management over nuclear installations and the use of ionizing radiation.

Issues surrounding radiation protection and radioecology continued as trends in 2010. For example, increased public awareness of exposure to and environmental impacts of naturally occurring radioactive material (NORM) as well as nuclear legacy sites has led to increased public concern. In addition, human resources in radiation protection and radioecology have been lost as a result of retirement and of the migration of experts to other fields. It is clear that safety continues to be a work in progress.

The global nuclear power industry continued to require substantial efforts by designers, manufacturers, operators, regulators and other stakeholders to satisfy diverse quality and safety requirements and licensing processes, along with the recognized need in industry and among regulators to standardize and harmonize these requirements and processes. In some cases, plans for nuclear power programme development moved faster than the establishment of the necessary regulatory and safety infrastructure and capacity. To assist Member States in this effort, the Regulatory Cooperation Forum (RCF) was formed in June 2010. The RCF is a regulator-to-regulator forum that optimizes regulatory support from Member States with advanced nuclear power programmes to newcomer Member States or, on request, to those States that are expanding their nuclear power programmes. The Agency is actively involved in the development of safety goals for a robust and technically consistent framework for nuclear power plants and other nuclear and radiation installations and activities. This requires a holistic consideration of quantitative and qualitative criteria to ensure that no individual bears unacceptable radiation risks, as stated in the Agency's *Fundamental Safety Principles* (IAEA Safety Standards Series No. SF-1).

Fuel cycle facilities, covering a diverse range of installations and processes - from mining to enrichment to fabrication to reprocessing to storage or disposal- present varying degrees of hazards and specific challenges to nuclear safety (e.g., criticality control, chemical hazards, fires and explosions). Many rely on operator intervention and administrative controls to ensure nuclear safety. Events reported in 2010 to the Agency's Fuel Incident Notification and Analysis System (FINAS) indicated that the main root causes of these events were related to organizational and human factors.

Of the 441 reactors currently operating around the world, many were built in the 1970s and 1980s, with an average lifespan of around 35 years. Their decommissioning peak will occur from 2020 to 2030 which will present a major managerial, technological, safety and environmental challenge to those States engaged in nuclear decommissioning. The need for national and international mechanisms for early planning, adequate funding and long term strategies applies not only to decommissioning, but also to radioactive waste management and spent fuel management, including disposal arrangements and clean-up, as well as the preservation of operational knowledge and experience to ensure the safety of these activities. Many of these issues were discussed in depth at the International Conference on Management of Spent Fuel from Nuclear Power Reactors held at the Agency in May, 2010.

The collective dose to workers and patients has the potential to significantly increase as a result of the worldwide expansion in the use of radiation in medical diagnosis and treatment as reported this year. Medical workers performed more than 10 million procedures per day and comprised the largest proportion of workers exposed to ionizing radiation. In addition, there were increased reports of patients undergoing multiple diagnostic computerized tomography (CT) scans within a few years or even in a single year, where the cumulative effective doses for individual patients exceeded 100 mSv, and in some cases 1 Sv.

Recent recommendations by the International Commission on Radiological Protection (ICRP) have been incorporated in the draft of the revised International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS). A key issue in this context is the development of a consistent and harmonized system, applying ICRP recommended principles for radiation protection as well as exposure of non-human species in planned, existing and emergency exposure situations.

While the safety record for the transport of radioactive material remained excellent, denials and delays of shipment of radioactive materials continue to occur, with the most apparent increase in denials of shipment resulting from national variations in regulations. The International Steering Committee on Denials of Shipment of Radioactive Material is coordinating efforts to find solutions related to denials of shipment.

In 2010, the Agency completed a baseline document that identifies the needs and priorities for environmental impact assessments at legacy uranium production sites in Central Asia. The document has been used by various international organizations for providing assistance for remediation projects in the region.

In October 2010, at a technical meeting held in Vienna, the Agency launched the International Working Forum on Regulatory Supervision of Legacy Sites (RSLS), in cooperation with the Norwegian Radiation Protection Authority. This forum will provide support to regulators addressing legacy site issues by promoting an exchange of ideas, information and methods. Initially, the forum will be oriented towards remediation of the uranium mining legacy in Central Asia, but its scope will broaden to cover other types of legacy sites and facilities.

In 2010, regional and international cooperation efforts in the area of emergency preparedness and response have continued, as was demonstrated by Member States' participation in training courses, workshops and exercises offered by the Agency. Pursuing the harmonization of implementation of emergency preparedness and response standards, guidance and training will contribute to efficient and effective response to nuclear and radiological incidents and emergencies.

The International Expert Group on Nuclear Liability (INLEX), established by the Director General in 2003, continues to serve as the Agency's main forum for dealing with questions related to nuclear liability. INLEX aims at contributing to a better understanding of, and adherence to, the international nuclear liability instruments. In 2010, at its tenth meeting, INLEX reported on the status of ratification of the international nuclear liability conventions, and the European Commission (EC) legal study on the harmonization of the civil nuclear liability system within the European Union.

Technical and scientific support organizations (TSOs) continue to provide the technical and scientific basis for the safety related decisions and activities of regulatory bodies. However, there remains a need for enhanced interaction and cooperation among TSOs, regulatory bodies, academia and industry to enhance safety and capacity building.

Many Member States have striven to build capacity and to transfer nuclear safety knowledge in response to the ageing of workforces and declining student enrolments in courses on nuclear science and technology. Consequently, developing adequate resources, training and education networks, and programmes for sharing knowledge and experience were high priority capacity building endeavours in 2010, and will continue to be for the coming years.

Analytical Overview

A. Introduction

1. The *Nuclear Safety Review 2010* presents an overview of worldwide trends, issues and challenges in nuclear, radiation, transport and radioactive waste safety and incident and emergency preparedness, highlighting developments in 2010. Additional documentation supporting the *Nuclear Safety Review 2010* is available through GOVATOM. For the purposes of this document, when the term nuclear safety is used, it encompasses nuclear installation safety, radiation safety, transport safety and the safety of spent fuel and radioactive waste management. This report also discusses nuclear security, but only insofar as it relates to nuclear safety. A separate report in September 2011 will cover nuclear security.

2. As the global demand for energy intensifies and the need to counteract climate change becomes more urgent, many States are exploring or expanding their interests in nuclear power programmes, with countries in Asia leading the way. Moreover, worldwide use of radioactive sources and radiation related technologies continues to increase along with their associated challenges. Overall, this makes it necessary to intensify and improve international outreach, capacity building, knowledge networking, communication and cooperation to ensure that a crucial aspect of this growth — safety and security infrastructure and culture — keeps pace with global demand.

3. The accident at Fukushima Daiichi Nuclear Power Plant, caused by the extraordinary disasters of the earthquake and tsunami that struck Japan on 11 March 2011, continues to be assessed. As this report focuses on developments in 2010, the accident and its implications are not addressed here, but will be addressed in future reports of the Agency.

4. Over the past year, the Agency continued to strengthen synergies and, where justified, integration of its global nuclear safety and security framework through, inter alia, the joint task force of the Advisory Group on Nuclear Security (Ad Sec) and the Commission on Safety Standards (CSS), established in 2009 and assigned the remit of studying, as a long term objective, the feasibility for establishing single standards to cover both nuclear safety and nuclear security. The joint task force is expected to submit its report on this issue to the Director General in 2011.

5. The global nuclear safety and security framework includes international legal instruments, safety standards, security guidelines, peer reviews and advisory services, and knowledge networks, work in synergy to support and strengthen existing national, regional and international safety and security infrastructures with the aim of preventing nuclear accidents and malicious acts, and providing better response and mitigation should any such accident or act occur.

6. A key component of the global safety and security framework is the global experts' community, where much progress has occurred, especially in the area of technical support organizations (TSOs). To further develop this area, the Agency organized the International Conference on Challenges Faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety and Security, which was hosted by the Japan Nuclear Energy Safety Organization (JNES) in October 2010 in Tokyo.

Highlights from this conference focused on Governments' roles and responsibilities in implementing TSO capabilities and policies, and the Agency's role in facilitating the development of the global experts' community through a TSO knowledge network. (see Note of the Secretariat 2011/Note 2).

B. Nuclear safety trends, issues and challenges

B.1. International cooperation and emerging coordination for new and expanding nuclear power programmes

B.1.1. Introduction

7. International cooperative efforts to support new and expanding nuclear power programmes continued to focus on key issues such as: the identification and remediation of gaps in national safety infrastructures; safety and security synergies, and (where justified) integration; and safety responsibilities and capacities for the various individuals in a nuclear power programme.

8. Several countries expanded their current nuclear power programmes. In the Agency's latest projections for nuclear power, the low projection foresaw an installed global nuclear power capacity of about 546 GW(e) in 2030, a 46% increase over the roughly 375 GW(e) currently installed. The high projection foresaw about 803 GW(e), which is more than double the current capacity, and therefore poses a significant safety challenge to the world nuclear community. In addition, plans for some new nuclear power programmes are moving faster than the establishment of the necessary safety infrastructure and capacity.

9. One important effort to enhance international cooperation in 2010 was the establishment of the Regulatory Cooperation Forum (RCF). The Agency facilitates RCF activities based on its safety standards and security guidelines, peer reviews and advisory services (see para. 30).

B.1.2. International efforts for standardizing and harmonizing safety requirements and licensing processes

10. The increasingly multinational nature of today's nuclear business leads to substantial efforts by designers, manufacturers, operators, regulators and other stakeholders to satisfy diverse quality and safety requirements, and licensing processes. As a result, multinational and regional organizations and groups are continuing to pursue standardization and harmonization of these requirements and processes. The Agency's longstanding efforts in developing international safety standards and fostering international cooperation have been crucial in this endeavour. Additional efforts are being directed at harmonizing national nuclear safety requirements to facilitate and streamline the deployment of standardized reactor designs based on the Agency's safety standards.

11. The European nuclear community has been particularly active this year in the area of standardization and harmonization. The European Nuclear Safety Regulators Group (ENSREG) and the Western European Nuclear Regulators' Association (WENRA) have taken important steps in defining safety reference levels and elaborating European directives for safety harmonization on the basis of the Agency's safety standards, thus enhanced safety levels and provided benefits in national

regulatory processes. Also, European utility requirements have been established to define a harmonized set of safety and performance objectives for future reactor designs to be deployed in Europe. As for the European utilities, the European Atomic Forum (FORATOM) has created the European Nuclear Installations Safety Standards (ENISS) initiative, which brought industry and regulators together to discuss standards and their harmonization.

12. The Agency interacted with the Multinational Design Evaluation Programme (MDEP), being implemented with the support of the Organization of Economic Development and Cooperation/Nuclear Energy Agency (OECD/NEA), with the purpose of enhancing and expanding the application of the Agency's safety standards and security guidelines. The work harmonized regulatory approaches in the review and licensing of new reactor designs. Wider efforts included the industry working group on Cooperation in Reactor Design Evaluation and Licensing (CORDEL) that was established within the World Nuclear Association (WNA) to promote the benefits of standardization to reactor vendors and utilities in cooperation with regulators.

13. The Agency's Generic Reactor Safety Review (GRSR) service continued to provide an early harmonized appraisal of the safety case as a potential basis for an individual evaluation of the licensing process. Since its establishment in 2007, six reviews of new reactor designs have been completed and two other reviews of new designs are currently under way; these new designs included: France—EPR; Canada—ACR1000; US—AP1000; US/Japan—ESBWR; France/Japan—ATMEA1; Republic of Korea—APR1400. The experience and lessons learned from these reviews constitute an excellent basis for harmonization of education and training in design review and safety assessment, which is currently being incorporated into the Agency's Safety Assessment Education and Training (SAET) Programme, and is being offered primarily to countries developing safety infrastructure for a new nuclear power programme.

14. The Agency was actively involved in the development of a robust and technically consistent framework for safety goals that broadly defined acceptable levels of radiological risks for installation of nuclear power plants (NPPs) and other nuclear installations. This framework required a holistic consideration of quantitative and qualitative criteria to ensure that no individual bore unacceptable radiation risks (as stated in the Agency's *Fundamental Safety Principles* — IAEA Safety Standards Series No. SF-1).

B.1.3. Regulatory Cooperation

15. One outcome of the International Conference on Effective Nuclear Regulatory Systems held in Cape Town, South Africa, in December 2009, was the agreement to establish a forum of regulators to share regulatory knowledge and experience in an effective and harmonized manner. The Regulatory Cooperation Forum (RCF) was established in 2010 to optimize regulatory resources and assist Member States in their development of independent, effective and robust regulatory bodies for nuclear power programmes. The RCF brings together countries with advanced nuclear power programmes and those countries considering expansion or development of a nuclear power programme for the first time (see Note by the Secretariat 2011/Note 2).

16. Self-assessments and peer reviews played important roles in continuous improvement, knowledge sharing, and mutual learning in relation to the effective independence of regulatory practices and policies. The Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, which oblige Contracting Parties to submit their national reports for peer review, provided opportunities for continuous improvement. Meetings for the exchange of information and experience in implementing

the Code of Conduct on the Safety and Security of Radioactive Sources (see Section N.2) also provided excellent opportunities to carry out self-assessment of the national regulatory system in place. It was widely agreed that self-assessment and peer review of national regulatory safety infrastructures, based on Agency standards and guidelines, were valuable tools for sharpening expertise and enhancing technical, managerial and policy capacity, as well as for assessing the effective independence of the regulatory body. Active participation in such meetings and in the Agency's Integrated Regulatory Review Service (IRRS) were primary mechanisms for nuclear regulatory bodies throughout the world to cooperatively enhance their effectiveness and independence.

17. In pursuing its efforts to cooperate with Member States on strengthening the regulatory infrastructure for nuclear installations and the control of radioactive sources, the Agency released in February 2010 to all Member States the first version of the Self-Assessment Methodology and Self-Assessment Tool. Regional workshops and national experts' missions have been organized to promote their use. This self-assessment methodology and tool included a complete "how-to" description of the approach and methodology (based on safety standards) for conducting a national safety regulatory infrastructure self-assessment. It included a software application to automate the self-assessment in accordance with the methodology, and it generated a self-assessment report, with both qualitative and quantitative evaluations.

18. In line with economic and energy supply growth and environmental quality, a number of Member States have started to consider extended operation of their nuclear power plants beyond the time frame originally anticipated, i.e. long term operation (LTO). Extending NPP life involves many interconnected issues, to include technical, regulatory and legislative issues. A pre-requisite for LTO is a full and comprehensive plant-specific safety assessment, systematically conducted on a periodic basis.

19. The Agency continued to facilitate the process of exchanging technical information on ageing management among regulatory bodies and NPP owners in Member States. The outcome of this exchange will provide future guidance on what constitutes acceptable programmes for specific systems, structures and components, and ageing effects/mechanisms, as well as the tools for assessing existing plant programmes for continued operation. In addition, this exchange will further assist NPP owners and regulatory bodies in understanding and collaborating on issues and challenges related to extended operation.

20. Privatization of electric utilities and deregulation of electricity markets continued as major trends in the global energy and electricity sector this year. This increasingly competitive environment had a significant impact on nuclear power, indicating that generating electricity in LTO of NPPs could be more profitable since the initial investment had already been made. Utilities, therefore, appeared to prefer life extension rather than construction of a new NPP. This trend will require NPP owners and regulatory bodies to work together now and in the years to come to resolve the significant technical and regulatory issues associated with the formal life extension process.

B.2. Long term management of radioactive and nuclear materials

B.2.1. Introduction

21. The technical issues surrounding the safe and secure long term management of radioactive, nuclear materials, spent fuel and nuclear and radioactive waste continued to pose challenges.

B.2.2. Long term management of radioactive sources

22. In November 2010, the European Commission presented a proposal for a Council Directive on the management of spent fuel and radioactive waste. This proposal was largely based on the *Fundamental Safety Principles* (IAEA Safety Standards Series No. SF-1), and the obligations contained in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

23. Complete life cycle management of disused sealed radioactive sources (DSRSs) was not nor has it been considered systematically, as many countries continued to look for a solution for the disposal of DSRSs. Very few countries operated licensed disposal facilities that accepted DSRSs, as indicated in an Agency survey conducted in 2009. Going forward, it is essential that all countries address the long term management of DSRSs in their national policies and strategies for radioactive waste management and that DSRS disposal should be encouraged to increase the sustainability of sealed radioactive source usage. The safety and security of radioactive sources can only be ensured by commitment to and application of continuous control of radioactive sources at every stage of their life cycle.

24. The Agency's safety standards and security guidelines continues to emphasize the necessity of national systems to ensure the safety and security of sources throughout their life cycle. This is, inter alia, provided in the most recent Safety Requirements publication, Governmental, Legal and *Regulatory Framework for Safety* (IAEA General Safety Requirements Part 1), published in October 2010. These safety standards, when incorporated into national legislation and regulations and supplemented by international instruments and detailed national requirements, will establish a basis for the long term management of radioactive sources.

25. As of November 2010, 100 States have explicitly stated their commitment to use the Code of Conduct on the Safety and Security of Radioactive Sources as guidance in the development and harmonization of their policies, laws and regulations. However, there continues to be strong need to strengthen international cooperation and promote wider and fuller implementation of the Code of Conduct.

B.2.3. Spent nuclear fuel and radioactive waste management

26. Although significant progress has been made by Member States in safely managing their radioactive waste, efforts are still needed in a number of countries to develop a comprehensive national strategy, including disposal, and to strengthen their national infrastructure accordingly. Member States embarking on or extending nuclear energy programmes need to develop from the very beginning a radioactive waste and spent fuel management policy.

27. One of the greatest on-going challenges in the management of spent fuel and radioactive waste is the development and implementation of disposal strategies. In particular, geological disposal of

radioactive waste and spent fuel remained a topic of concern. However, progress has been made, in particular on technological and socio-political aspects. The lessons learned showed that progress in implementing disposal strategies required open and transparent dialogue among all interested parties in addition to well-founded scientific investigations and use of appropriate technologies.

28. Disposal of spent fuel and high level waste was a particular challenge and its implementation has been delayed in many countries. This indicated that there was a need for increased storage capacities and that the fuel will be stored for longer periods than initially intended. However, progress was made towards disposal notably in Sweden, Finland and France, where licence applications are expected in 2011, 2012 and 2014, respectively.

B.3. Capacity building

B.3.1. Introduction

29. In 2010, the Agency continued its efforts to provide effective capacity building support to Member States as they developed human resources and built their nuclear safety and security infrastructures. Capacity building for nuclear safety and security is defined as a systematic and integrated approach to develop and continuously improve individual, organizational and regulatory competences and capabilities necessary for achieving and sustaining high levels of nuclear safety and security in Member States. Capacity building efforts addressed all aspects of nuclear safety and security infrastructure development, including nuclear, radiation, transport and waste safety.

B.3.2. Education and training

30. Several Member States had some form of education and training programme in nuclear safety and security; however, not many had established a national strategy for building competence; this is fundamental to sustain nuclear safety. To address this challenge, the Agency issued its updated Strategic Approach to Education and Training in Radiation, Transport and Waste Safety 2011–2020 (see: Note by the Secretariat 2010/Note 44), which provided that a national strategy should consider existing as well as foreseeable needs, and should take into account national capabilities and resources as well as the potential to utilize regional or international resources.

31. In this regard, Agency regional training centres for education and training in radiation safety have been established and their activities were periodically monitored through Education and Training Appraisal (EduTA) missions. There was an increasing interest in EduTA missions, with six EduTA missions carried out in 2010 to Algeria, Brazil, Egypt, Ghana, Morocco and South Africa. A request to host an EduTA mission in 2011 has been received from the Republic of Korea.

32. Following the recommendations provided in the Strategic Approach and on the basis of GC(54)/RES/7 part 9, inter alia, that welcomed the Secretariat's progress toward long term agreements conditional on the outcomes of EduTA missions. In 2010, agreements to provide a general framework for sustainable support to Member States with training centres were discussed — specifically with Brazil, Greece and Malaysia.

33. Interactive video recordings of lectures and workshops were provided to Member States. During 2010, the Agency distributed thousands of training DVDs. New courses were produced on safety infrastructure, safety culture, regulatory experience relating to siting and the construction of new

NPPs; these courses were provided to Member States in the classroom and were very often posted as video lectures on the web.

34. A central web page for all Agency resources on training was designed and put into service during 2010. This provided Members States with improved access to Agency training services, materials and resources[1].

35. The Nuclear Safety and Security Working Group on Coordination of Education and Training (E&T) continued to share methods and good practices for developing curriculum, standardizing syllabi and training material, and developed an E&T knowledge base repository. The group has also coordinated nuclear safety and security input to several education and training activities, such as the School of Nuclear Energy Management (Italy, November 2010), the International Conference on Human Resources Development for Introducing and Expanding Nuclear Power Programmes (United Arab Emirates, March 2010) and the European Nuclear Safety Training and Tutoring Institute (ENSTTI) Summer Course (France and Germany, July-August 2010).

B.3.3. Establishment of national nuclear safety infrastructures

36. In 2010, a draft safety guide on establishing a safety infrastructure for a nuclear power programme was approved and is now in the publication phase. To further assist Member States in developing the required safety infrastructure, a safety package is being developed by the Agency for States considering and embarking on a nuclear power programme. This safety package contains eleven specific modules together with a background module that provides a Basic Professional Training Course on Nuclear Safety.

37. In addition, the Agency continued development of a self-assessment tool based on this draft safety guide for Member States to evaluate progress against the 200 actions considered necessary for establishing their nuclear safety infrastructure.

B.4. Strengthening global and regional networking activities

B.4.1. Introduction

38. In 2010, the Agency's knowledge networking activities, focused on the integration of information from different sources and domains across the global nuclear safety and security framework, with further development of the newly established Arab Network of Nuclear Regulators (ANNuR) and the European Technical Safety Organisation Network (ETSON). In addition, coordination and collaboration among various IT and human networks have progressed significantly to support capacity building and infrastructure development nationally, regionally and globally. However, coordination and cooperation continued to need further strengthening among the global and regional networks.

B.4.2. Global and regional networking

[1] http://www-ns.iaea.org/training

39. The Global Nuclear Safety and Security Network (GNSSN) and the International Regulatory Network (RegNet) were officially launched during the 54th session of the IAEA General Conference in September 2010. GNSSN and RegNet consolidated education and training, the International Nuclear and Radiological Event Scale (INES), and the Integrated Regulatory Review Service (IRRS) with other information resources into two main online areas that provided users with easy access to needed information. A technical meeting was held in December 2010 to promote further development of the GNSSN and RegNet networks.

40. In April 2010, the Asian Nuclear Safety Network (ANSN) developed a generic action plan for establishing a regional capacity building system in Asia; this plan will act as a roadmap to implement the 2020 Vision for the ANSN that was developed in April 2009. The generic action plan also provided details on a state-of-the-art IT network under development. This will include a capacity building module that comprises a dynamic and interactive e-library, an expert pool database and an online planning system; it will facilitate internet video communications through the ANSN website.

41. In October 2010, the ANSN sponsored a round-table discussion on nuclear safety knowledge networking, as well as the Regional Conference on 21st Century Capacity Building and "Virtual TSO" in Asia, held in Tokyo, Japan. The regional conference focused on the challenges of developing a nuclear safety capacity building system and safety infrastructure in 21st century Asia and promoted outreach and collaboration among global and regional knowledge networks.

42. The ANNuR was established in 2010. ANNuR currently comprises nuclear regulatory bodies from 18 Arab States. A three-phased project has been formulated for 2010–2013, to include: (i) production of relevant regulations and guidelines in Arabic; (ii) development of education and training programmes for staff, and (iii) exchange of information and knowledge through expert missions and meetings events.

43. The Ibero-American Forum of Radiological and Nuclear Regulatory Agencies is an association to promote a high level of safety in all practices using radioactive or nuclear materials in certain Ibero-American Member States: Argentina, Brazil, Chile, Cuba, Mexico, Peru, Spain and Uruguay. During the 54th session of the IAEA General Conference in September 2010, a formal arrangement to consolidate the relationship between the Forum and the Agency was signed by the current President of the Forum and the Deputy Director General, Head of the Department of Nuclear Safety and Security. This arrangement will also help promote support for the Forum´s technical programmes. In addition, a project on regulatory issues relating to NPP life extension was completed during 2010 and the final report will be posted on the Forum website.

44. The Latin American heads of State and Government at the XX Ibero-American Summit, held in November 2010, in Mar del Plata, Argentina, welcomed the work done by the Forum in creating a common Latin American working space in the region to consolidate nuclear and radiation safety and security in Latin America.

45. The Forum of Nuclear Regulatory Bodies in Africa (FNRBA) was established in 2009, comprising 33 African nuclear regulatory bodies. FNRBA consists of nine thematic working groups. During the 54th IAEA General Conference in September 2010, an agreement was signed between FNRBA and the Korea Institute of Nuclear Safety (KINS) to seek more support and assistance from outside of Africa. (see Note by the Secretariat 2011/Note 2)

C. Incident and emergency preparedness and response

C.1. Trends, issues and challenges

46. In 2010, a number of Member States effectively strove toward improving and sustaining their emergency preparedness and response programmes. Six Member States (Azerbaijan, Belarus, Philippines, Qatar, Romania and Thailand), compared with two last year, benefited from the Emergency Preparedness Review (EPREV) service, which independently appraised their preparedness for radiation incidents and emergencies. In the future, efforts to maintain and further strengthen national, regional and international arrangements and capabilities in the area of emergency preparedness and response should continue as the international standards, guidance and training are not yet implemented in a harmonized and global way. Regional cooperation in building emergency preparedness and response capacity continued to be encouraged.

47. The Incident and Emergency Centre (IEC) conducted routine exercises with its counterparts in Member States and international organizations. For the ConvEx-1a type exercise, participation increased by 13% in 2010; however, participation was lower in 2010 than in 2009 for the ConvEx-2b type exercise. In addition, a number of Member States informed the Agency that they had carried out a national exercise. In several cases, IEC staff was invited to observe these exercises and offered feedback regarding strengths and weaknesses in the response systems.

48. In 2010, the IEC was directly informed or indirectly became aware of 148 events which involved or were suspected to involve ionizing radiation. In 18 cases, the Agency took action, it authenticated and verified information with external counterparts, shared and provided official information, and/or offered the Agency's services. In three cases in Latin America, assistance missions for medical advice and treatment and for the safe recovery and secure storage of a radioactive source were coordinated by the IEC upon request; the Response and Assistance Network (RANET) was used for this purpose.

49. Various radiation events such as detection of orphan sources in scrap metal or severe radiation burns following negligence and improper handling of industrial radiography sources continued to occur. In addition, it has become clear that natural disasters always require a response from the Agency regarding the safety of radiation facilities and practices in the countries affected.

50. Three new Member States registered their national assistance capabilities in RANET: Austria, Japan and the Russian Federation. This raised the total number of RANET-registered Member States to 19. Even though regional cooperation through RANET has grown, a greater commitment from Member States is strongly encouraged.

C.2. International activities

51. Thirty-eight national, regional and interregional training courses and workshops were conducted in 2010 to improve emergency preparedness and response capabilities in Member States.

52. The Unified System for Information Exchange in Incidents and Emergencies (USIE) replaced and combined two existing reporting systems: the Early Notification and Assistance Conventions Website (ENAC) and the Nuclear Events Web-based System (NEWS). USIE was trial-released to all users at the end of 2010. Upon full release of USIE, ENAC and NEWS will be discontinued; this is scheduled for 31 March 2011.

53. The IEC proposed the development of a global emergency radiation monitoring information system based on the European Radiological Data Exchange Platform (EURDEP). Full operation of a new system enabling online, globally-shared data monitoring is scheduled for 2012 and Member States will be invited to join the system.

54. The Working Group on Preventing and Responding to Weapons of Mass Destruction Attacks of the United Nations Counter-Terrorism Implementation Task Force (CTITF) prepared and issued a report entitled Interagency Coordination in the Event of a Nuclear or Radiological Terrorist Attack: Current Status, Future Prospects (CTITF Publication Series, August 2010); it acknowledged the Agency's primary role in prevention, preparedness and response to such nuclear-related events. In particular, it pointed out the importance of the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) for which the IEC continues to serve as the coordinator.

55. The IEC conducted two Emergency Notification and Assistance Technical Operations Manual (ENATOM) workshops in 2010. These workshops were designed to improve communication between counterparts from Member States and the IEC in accordance with ENATOM. The first workshop was organized 20-22 September 2010 in Pretoria, South Africa for participants from six African States. The second workshop was held in Vienna 27-29 October 2010 for 10 Member States from the Asia and Latin America regions.

D. Civil liability for nuclear damage

D.1. Trends, issues and challenges

56. The importance of having effective civil liability mechanisms in place to insure against harm to human health and the environment, as well as economic loss caused by nuclear damage, remains a subject of increased attention among States.

57. The International Expert Group on Nuclear Liability (INLEX), an advisory body to the Director General, has served since 2003 as the Agency's main forum for dealing with questions related to nuclear liability and aims to contribute towards a better understanding of, and adherence to, the relevant international nuclear liability instruments.

D.2. International activities

58. Major topics discussed by INLEX at its tenth meeting from 12 to 14 May 2010 included the status of ratification of the international nuclear liability conventions, the European Commission (EC) legal study on the harmonization of the civil nuclear liability system within the European Union, the proposals by Germany to allow Contracting Parties to exclude certain small research reactors and nuclear installations being decommissioned from the scope of application of the nuclear liability instruments, as well as future INLEX outreach activities.

59. INLEX members reaffirmed their support for working towards establishing a global nuclear liability regime and in that connection provided some insight on the latest efforts made at the national level towards reaching this objective. They noted the usefulness of having the Secretariat request

Member States to provide it with copies of their respective national nuclear liability legislation for the purpose of creating a domestic legislation database.

60. With respect to the EC legal study, concerns raised at previous INLEX meetings on the possibility of the European Union adopting a separate nuclear liability regime were addressed and the Group was advised and reassured that the EC would not pursue any option which would impede the future creation of a global regime through the Convention on Supplementary Compensation for Nuclear Damage (CSC) and that any EC proposal would work on the basis of the current nuclear liability principles. During a workshop organized by the EC and the Brussels Nuclear Law Association on the prospects for a civil nuclear liability regime in the framework of the European Union, held in Brussels 17–18 June 2010, the Agency reiterated the concerns of INLEX and highlighted the importance for the EU of establishing treaty relations with non-EU countries — an issue which would become even more relevant than before with the 'nuclear renaissance' and increasing international trade and economic relations in the nuclear field.

61. The proposals by Germany to allow Contracting Parties to exclude certain small research reactors and nuclear installations being decommissioned from the scope of application of the relevant nuclear liability instruments (the Vienna Convention on Civil Liability for Nuclear Damage as amended by the 1997 Protocol and the 1997 Convention on Supplementary Compensation for Nuclear Damage) were considered by a working group established by the relevant Agency technical advisory committees (the Radiation Safety Standards Committee (RASSC) and the Waste Safety Standards Committee (WASSC)). The working group and subsequently RASSC and WASSC at their joint meeting, held from 28 June to 1 July 2010, endorsed a draft position paper proposing three specific exclusion criteria with regard to the German proposals. As a next step, INLEX will consider the issue at its meeting in May 2011, after which it will be forwarded to the Board of Governors for consideration, as foreseen under the aforementioned nuclear liability instruments.

62. As part of INLEX's regular outreach activities, a regional workshop on civil liability for countries in Eastern Europe and Central Asia was held in Moscow from 5 to 7 July 2010. During the workshop, presentations were made on various aspects of the international nuclear liability regime, including the insurance of nuclear risks, and extensive discussions took place on the need for a uniform international nuclear liability regime and on how such a regime might be best reflected in corresponding national laws.

63. With the Moscow workshop, INLEX's regional outreach activities have come to a close after events held in Sydney, Australia in November 2005 for Member States of the Asia and the Pacific region; in Lima, Peru in December 2006 for Members States of the Latin America region; in Sun City, South Africa in February 2008 for Member States of the Africa Region; and in Abu Dhabi, United Arab Emirates in December 2009 for Member States having expressed an interest in launching a nuclear power programme. INLEX will now continue its outreach activities with a more targeted approach consisting of missions to individual countries or to small groups of countries.

E. Nuclear power plant safety

E.1. Trends, issues and challenges

64. As the trend of countries expressing interest in developing nuclear power continued, so did the challenges of developing the necessary nuclear safety and security regulatory infrastructure and ensuring that it was in place prior to making siting and licensing decisions. Lessons learned this year reiterated the need to further explore ways of capturing knowledge from mature nuclear power countries to share with those countries embarking on nuclear programmes.

65. In 2010, two new guidance documents were prepared application of the Agency safety standards during the various licensing phases of a nuclear power programme: *Licensing Process for Nuclear Installations* (Specific Safety Guide No. SSG-12); and *Establishing a Safety Infrastructure for a National Nuclear Power Programme* (to be published in 2011).

66. In 2010, the Agency's Integrated Regulatory Review Service (IRRS) assisted regulatory bodies in Member States in carrying out an increasing number of self-assessments to evaluate the degree of application of Agency safety standards in their safety regulations. A small number of recommendations and suggestions were made and a considerable number of good practices identified and shared with Member States. A thorough self-assessment means that during an IRRS mission, both a general overview can be obtained as well as an in-depth focus on specific regulatory body issues and challenges. More regulators from embarking countries have also started to use self-assessment IRRS missions to evaluate their safety infrastructures.

67. Nuclear power plant safety performance remained high during 2010. Performance indicators compiled by the Agency obtained from the Power Reactor Information System (PRIS) database for operational power reactors show an improving trend in the number of unplanned automatic scrams as shown in Figure 1.

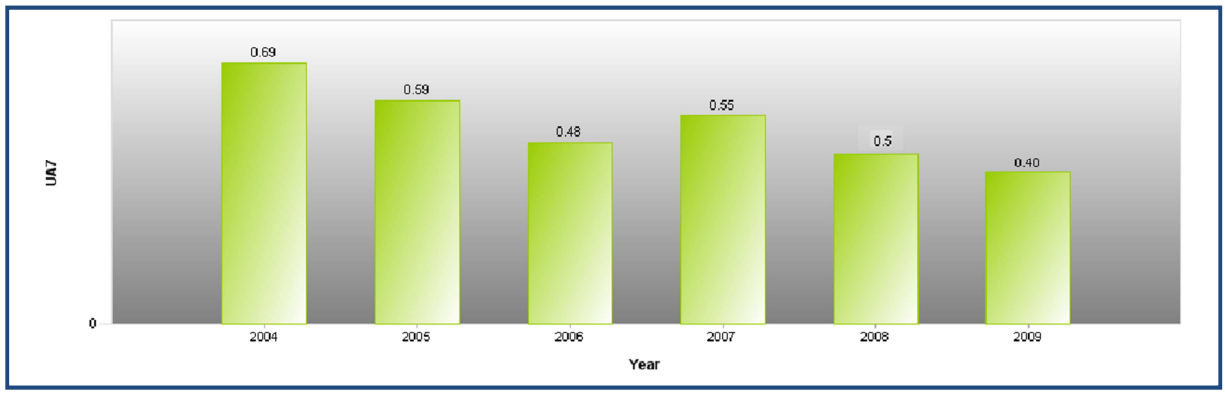

Figure 1: Unplanned Automatic Scrams per 7,000 Hours (source: 2010 Performance Indicators, World Association of Nuclear Operators)

68. The forced loss rate, as shown in Figure 2, can be defined as the percentage of energy generation during non-outage periods that a plant is not capable of supplying to the electrical grid because of unplanned energy losses, such as unplanned shutdown or load reductions. As with the number of unplanned automatic scrams, a low value indicates that important plant equipment is well maintained and reliably operated.

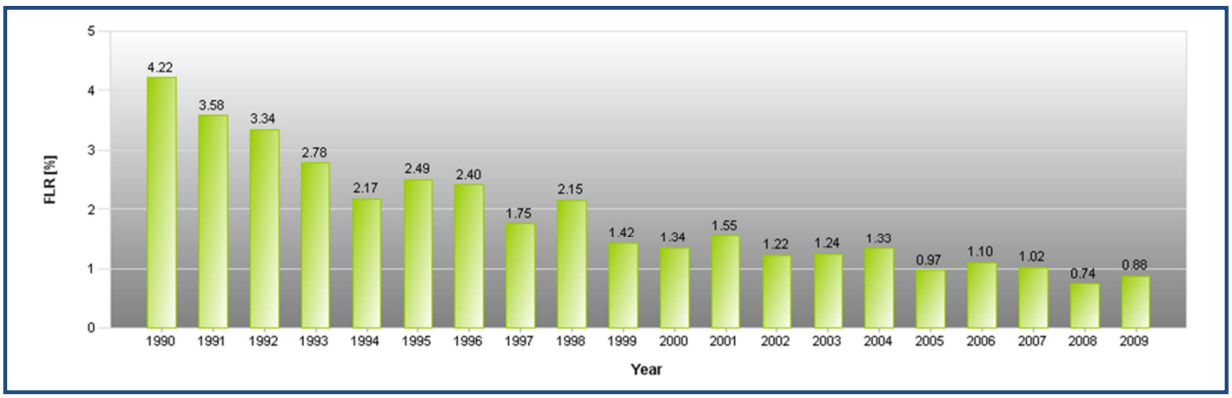

Figure 2: Forced loss rate data (source: *2010 Performance Indicators*, World Association of Nuclear Operators)

69. An area of increased importance for many nuclear power plants around the world involved long term operation (LTO) and ageing management. According to the PRIS database, as of the end of 2010, of the 441 nuclear power plants operating in the world, 152 had been in operation for more than 30 years, and 358 for more than 20 years. The number of NPPs that are eligible for operating life extension is growing; hence, the LTO issue must be systematically addressed and integrated in all aspects relevant to safety. A full and comprehensive plant-specific safety assessment, systematically conducted on a periodic basis, is a key element for ensuring safety during LTO.

70. In Operational Safety Review Team (OSART) missions the Agency coordinates internationally-based teams of experts who conduct reviews of operational safety performance at nuclear power plants. The reach of OSART is expansive: to date, OSARTs have visited nearly every major type of nuclear reactor, with 159 reviews having been conducted since the programme´s inception in 1982. OSART findings have begun to show that fewer recommendations and suggestions are being identified during missions, reflecting an increased level of compliance with the Agency's safety standards in the plants reviewed. The average number of good practices identified per mission also decreased; this was attributed to the tendency of good practices being incorporated and regarded as standard practices today.

71. OSART mission results and reviews of events as reported by Member States in the International Reporting System for Operating Experience (IRS) during 2010 indicated strong nuclear safety performance, with no serious accidents reported or significant radiation exposure to workers or the public. However, operations field personnel did not identify and report field deficiencies in a systematic manner. Some plants also needed to improve their maintenance programmes and reinforce their implementation to ensure that systems and equipment were well maintained. In addition measures for preventing the spread of contamination are not sufficient and chemistry control programmes are often not comprehensive.

72. Most utilities have effective operating experience programmes in place to learn from events occurring at an individual power plant or at other power plants in the country. In some cases, this also included analysis of and learning from low level events and near misses. Sharing operating experience among Member States via the IRS, and the use of external operating experience information from

other Member States appeared to be more limited. Some Member States shared event information openly and used external event information. However, many Member States were not sharing significant events and the use of external information was not always effective.

73. There was a widespread effort to harmonize safety objectives and safety goals for new reactors. The Western European Nuclear Regulators' Association (WENRA) continued to be very active in this area and released the WENRA Statement on Safety Objectives for New Nuclear Power Plants in November 2010. This document was aimed at further improving the safety of new nuclear power plants through a more effective implementation of the defence in depth concept in the design of new plants. Work was also being carried out under the Multinational Design Evaluation Programme (MDEP) initiative to propose harmonized safety goals for new reactors.

74. The Agency was involved in similar activities through the work of the International Nuclear Safety Group (INSAG). All these activities and the Agency's preparation and updating of safety standards for NPPs contributed to the harmonization of design requirements and licensing regulations worldwide, which continues to be a pressing need. In this connection, the revision of *Safety of Nuclear Power Plants: Design* (Safety Standards Series No. NS-R-1) was approved by the Nuclear Safety Standards Committee (NUSSC) for submission to the Commission on Safety Standards (CSS) in May 2011.

75. During recent years, a number of severe natural events, such as earthquakes, tsunamis and volcanic eruptions have attracted the attention of the world's nuclear community as well. As a first step towards collecting earthquake event data, the External Events Notification System continued to be developed. This system gathers real time information from existing worldwide seismological networks on earthquake occurrences around the world and then provides projected estimates of shaking at NPP sites. This tool will be made available to all Member States, providing them with information on seismic activity on a national, regional and global scale.

E.2. International activities

76. An International Conference on Operational Safety Experience and Performance of NPPs and Fuel Cycle Facilities was held in Vienna, in June 2010. Recommendations were proposed and accepted by the conference participants for the management of safety, safety culture, operating experience, newcomers, international peer reviews, application of the Agency's safety standards and long term operation (see Note by the Secretariat 2011/Note 2).

77. A training course on Regulation of Nuclear Power Plants and a workshop on Experience from Construction and Regulatory Oversight of Nuclear Power Plants were both held in Helsinki, Finland, from 23 – 27 August and 30 August to 3 September 2010. The events were organised by the Radiation and Nuclear Safety Authority, Finland (STUK) in cooperation with the Agency. The training course was organized to address important safety and regulation issues for nuclear power plants (both new plants and operating plants) with a specific focus on establishing a nuclear safety infrastructure in countries embarking on nuclear power for the first time. The workshop was organized to address the safety principles and requirements for new nuclear power plants, feasibility studies for new nuclear power plants, key issues during construction phase, and lessons learned. It further highlighted relevant Agency activities including its draft safety report on regulatory oversight of construction of new nuclear power plants.

78. The Agency and the Japan Nuclear Energy Safety (JNES) organization co-sponsored the First Kashiwazaki International Symposium on Seismic Safety of Nuclear Installations from 24 – 26 November 2010, held at the Niigata Institute of Technology, Kashiwazaki in Niigata, Japan. The symposium was attended by 568 representatives from 28 countries. The theme of the symposium was "Mission for Technology Innovation toward Next Generation" and focused on the dissemination of the Kashiwazaki earthquake experience and the innovations to mitigate the consequences of the earthquake. This resulted in many Member States implementing the procedures developed for better estimation of earthquake hazards.

F. Research reactor safety

F.1. Trends, issues and challenges

79. Research reactors around the world continued to be operated safely in 2010; there were no significant incidents. Although improvements have been made in a number of ageing management programmes, further improvements were still needed.

80. Many facilities worldwide remained in 'extended shutdown' with no clear plans for their future utilization or decommissioning. Adequate management of the safety of these facilities and the lack of financial resources continued to be important issues. A number of Member States were planning their first research reactor, which will involve the development of the necessary national technical and safety infrastructures prior to embarking on a nuclear power programme.

81. In the second half of 2010, the High Flux Reactor (HFR) in Petten, the Netherlands, and the National Research Universal (NRU) reactor in Chalk River, Canada (two of five major radioisotope producing reactors in the world) were both put back into operation after being shut down for repairs. The worldwide supply of medical radioisotopes, in particular molybdenum-99 has improved. However, radioisotope production requires continued attention since shortages may arise again if one or more of the five major producers have a long, unexpected shutdown.

F.2. International activities

82. The Agency conducted assessment missions in Jordan, Lebanon, Saudi Arabia and Sudan in relation to the establishment of new research reactors in these Member States. Special tailored assistance was provided to assess needs and to establish the necessary safety and technical infrastructures.

83. Supported by the Global Threat Reduction Initiative (GTRI) and the Russian Research Reactor Fuel Return (RRRFR) programme, the Agency conducted eight safety missions to the Vinča Institute of Nuclear Sciences in Serbia to advise on the safety of the repackaging, loading and shipment of the spent fuel back to the Russian Federation. The spent fuel was successfully shipped and arrived at its final destination at the end of December 2010.

84. In relation to the safety issues associated with the production of medical radioisotopes and to review the final repair plan, the Agency conducted an international peer review mission to the HFR in Petten, the Netherlands. A safety review mission for the ETRR-2 reactor in Egypt was conducted to review the safety aspects of the associated medical radioisotope production programme.

85. An international workshop on synergy between safety and security of research reactors was held in Vienna, from 31 May to 4 June 2010. This workshop addressed ways of better managing the risks associated with nuclear safety and security at research reactors and contributed to a better understanding of the need to increase synergies in improving safety and security without compromising either in the process.

86. From 5 to 9 July 2010, the Agency held a regional workshop in Australia on research reactor ageing management. The meeting identified current issues and challenges related to ageing management in Member States in Asia and provided recommendations to address them based on the Agency's safety standards.

87. From 13 to 17 December, the Agency held the Technical Meeting on the Safety of Experiments of Research Reactors. The meeting addressed all safety related aspects of the utilization of research reactors.

G. Fuel cycle facility safety

G.1. Trends, issues and challenges

88. Fuel cycle facilities cover diverse installations, including conversion, enrichment, fuel fabrication, spent fuel storage, reprocessing and associated waste management facilities. These facilities present varying degrees of hazards and call for a graded approach in applying safety requirements. Some of the fuel cycle facilities present specific nuclear safety challenges such as criticality control, chemical hazards, and susceptibility to fires and explosions and many rely heavily on operator intervention and administrative controls to ensure nuclear safety. The reliance on operator control continued to be significant in the safe operation of fuel cycle facilities. Events reported to the Agency's Fuel Incident Notification and Analysis System (FINAS) indicated that the root causes of the majority of these events were related to organizational and human factors. Operational safety will continue to need improvement through the dissemination of operating experience and good practices, including the reporting of safety-related events, their causes and lessons learned. Member States' use of the Safety Evaluation of Fuel Cycle Facilities During Operation (SEDO) peer review mission and the FINAS event reporting system remained limited. The set of safety guides covering all types of fuel cycle facilities remained incomplete. The Agency will continue to promote the benefits and support of these services, and work toward completion of the remaining safety guides.

G.2. International activities

89. The Agency operates FINAS in collaboration with the OECD/NEA and held a joint meeting of FINAS national coordinators from 5 to 6 October 2010. The meeting identified poor safety culture and reliance on manual actions as significant contributing factors to the majority of events. The FINAS national coordinators acknowledged the importance of FINAS as the unique international reporting system for fuel cycle facilities and committed themselves to make greater use of it.

90. In October 2010, the Agency conducted a SEDO follow-up mission to the Brazilian fuel fabrication facility in Resende to assess the implementation of the recommendations of the SEDO mission originally conducted in April/May 2007. Also, a preparatory SEDO mission was carried out in

Romania, September 2010, in preparation for a full scope SEDO mission to the fuel fabrication facility in Pitesti in 2011.

91. In 2010, the Agency held two fuel cycle-related international conferences. The International Conference on Management of Spent Fuel from Nuclear Power Reactors addressed regulatory and technical matters and the strategic issues related to the increase in the timescale for interim storage. In June 2010, the International Conference on Operational Safety Experience and Performance of NPPs and Fuel Cycle Facilities combined, for the first time, the exchange of operational safety experience from across the nuclear power and fuel cycle facility industry. The conference addressed leadership, safety culture and the use of international peer reviews. During both conferences, the Agency presented activities covering the safety of fuel cycle facilities (see Note by the Secretariat 2011/Note 2).

H. Occupational radiation exposure

H.1. Trends, issues and challenges

92. Exposure to natural radiation sources and the exposure of patients in medical diagnosis and treatment represented over 95% of the worldwide collective dose from all sources of radiation. The remaining contribution came from artificial sources of radiation and occupational exposure that can arise from the use of radiation and radioactive sources in medicine, industry and research. While the collective dose from these exposure pathways was not large compared to other contributions, the total number of individuals exposed was a small percentage of the population and these workers may have received higher radiation doses as part of their work than from other sources. This will continue to require constant vigilance through on-going assessment and monitoring of doses received.

93. Medical workers comprised the largest proportion of workers exposed to artificial sources of radiation. New and emerging medical procedures tended to deliver higher radiation doses to patients than conventional technologies, and there was thus a corresponding potential for increased exposure of medical professionals. The worldwide expansion in the use of radiation in medical diagnosis and treatment has the potential to significantly increase the collective dose to workers from such applications. Proper training of medical professionals and continuous development and use of tools and techniques to minimize doses will be crucial for occupational radiation protection in this expanding area.

94. Exposure of workers to naturally occurring radioactive material (NORM) continued to be an emerging industrial issue, for example in the extraction of rare earths, the zircon and zirconium industries, coal-fired electricity generation and the phosphate industry. According to the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), currently about 13 million workers are exposed to natural sources of radiation. Historically, such industries have not always been subject to the same strict regulation regime as is the case with artificial sources, but the application of standard occupational health procedures, such as the use of protective clothing and masks can significantly reduce radiation doses. As the regulatory infrastructure and control of these industries is further strengthened, reduction in individual doses will become an important issue.

H.2. International activities

H.2.1. Action Plan for Occupational Radiation Protection

95. The Fourth Meeting of the Action Plan for Occupational Radiation Protection Steering Committee was held in Vienna, in February 2010. The Steering Committee decided that the Action Plan should continue for another eighteen months to permit completion of planned activities and pending actions. Participants discussed new challenges within the occupational radiation protection area, and they provided the Agency with recommendations on important future activities and the steps needed to address these new challenges.

H.2.2. Information System on Occupational Exposure (ISOE)

96. The Agency supported the 2010 ISOE International ALARA Symposium, held in Cambridge, United Kingdom, in November 2010. Highlights of this symposium, including acceptance of the national regulatory body: the China National Nuclear Safety Administration as an ISOE member. Discussions also took place on the issues and challenges of occupational radiation protection, not only during the operational lifetime of facilities but also for design, construction and decommissioning.

H.2.3. Occupational Radiation Protection Networks (ORPNET)

97. In September 2010, the Occupational Radiation Protection Networks (ORPNET) was launched under the Action Plan for Occupational Radiation Protection to act as a focal point for occupational radiation protection. Regional ALARA networks were fully operational in Europe and Asia, but have not yet been established in the Africa and Latin America regions.

H.2.4. Regional European and Central Asian ALARA Network (RECAN)

98. RECAN completed six annual workshops on varied topics, with its sixth workshop held in Larnaca, Cyprus, in September 2010, on essential education and training for implementing occupational radiation protection. The seventh workshop, planned for Georgia, on the implementation of occupational radiation protection programmes in NORM industries, will take place at the end of 2011.

H.2.5. Asia Region ALARA Network (ARAN)

99. An ARAN workshop on occupational exposure in medical applications and a Steering Committee meeting were held in Adelaide, Australia, in October 2010 to share knowledge and expertise with a focus on topics of interest regarding occupational exposure in medical applications.

H.2.6. Information System on Occupational Exposure in Medicine, Industry and Research (ISEMIR)

100. ISEMIR continued into its second year, with the formation of a second Working Group on Industrial Radiography to complement the first Working Group on Interventional Cardiology. The ISEMIR project provided for an international database of occupational exposures in very specific

work areas so that on-going data analyses could be performed; it provided feedback to facilitate optimization of occupational radiation protection.

H.3. Other international activities

101. The European Conference on Individual Monitoring of Ionizing Radiation was held in Athens, Greece, in March 2010; 273 individuals from over 40 countries from all regions attended. It was organized by the Greek Atomic Energy Commission (GAEC), under the auspices of the European Commission and in cooperation with the Agency and the European Radiation Dosimetry Group (EURADOS). The Conference discussed issues and challenges, shared knowledge, exchanged experiences and promoted new ideas in the field of individual monitoring.

102. In cooperation with the Agency, the International Radiation Protection Association (IRPA) held its regional congress for Latin America in Medellin, Colombia, in October 2010; 321 individuals from over 20 countries from Latin America, North America and Europe attended. A round-table discussion on occupational radiation protection in medical practices analysed the current situation in the region and identified actions for the future.

103. A session on radiation protection in medical applications was organized in the framework of the International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry held in Vienna, Austria in November 2010. Increasing medical worker awareness, worker safety and minimizing worker risk from the use of radiation in medical procedures were some of the topics of discussion during this conference (see Note by the Secretariat 2011/Note 2).

I. Medical radiation exposure

I.1. Trends, issues and challenges

104. The extent of medical radiation exposure has considerably increased in recent times and the doses involved were large compared to occupational exposures. In some countries, the population dose from medical exposures rivalled that from natural background radiation, and globally accounted for more than 98% of the contribution from all artificial sources. It has been estimated that the number of medical procedures using ionizing radiation grew from about 1.7 billion in 1980 to almost four billion in 2007. The global figure for the effective dose per capita from medical exposures was estimated by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) to have increased from 0.3 mSv in 1993 to 0.4 mSv in 2000, to reach the current value of more than 0.6 mSv (2008). These figures can be seen as an indication that access to radiation in medicine increased for the global population. However, about 25% of the world's population in developed countries received around 75% of the medical procedures utilizing ionizing radiation.

105. Diagnostic radiology procedures, involving radiographic procedures, fluoroscopic procedures, computed tomography (CT) scans and interventional procedures, were performed globally more than 10 million times per day. CT scanners were increasingly used for radiological imaging procedures throughout the world. The contribution from CT to the global collective effective dose from diagnostic radiology was 43%, a figure that has risen sharply over the past number of years. There were also increasing reports of patients undergoing several CT scans within a few years or even in a single year,

with the cumulative effective doses for individual patients exceeding 100 mSv, and in some cases 1 Sv, had been reported

106. Nuclear medicine procedures, involving the administration of unsealed radioactive pharmaceuticals for either diagnostic or therapeutic purposes, were performed globally around 100 000 times per day. Combinations of diagnostic and nuclear medicine equipment (i.e. hybrid equipment) such as combined positron emission tomography/computed tomography (PET/CT) scanners and combined single photon emission computed tomography/CT (SPECT/CT) scanners were being increasingly used in clinical practice.

107. More than 5 million complete radiotherapy courses are given annually; these courses involve the use of either external radiation equipment or internal placement of sealed radioactive sources. Radiotherapy is purposely given at very high dose levels so that it can achieve its treatment objectives. Although this complex treatment modality has a low associated risk of injury or death from adverse events, ensuring safety in radiotherapy will continue to be of key concern.

Figure 3: Two radiologists perform a non-surgical intervention under fluoroscopic guidance at the Christian Medical College, Vellore, India.

I.2. International activities

108. The fourth meeting of the Steering Panel for the International Action Plan for the Radiological Protection of Patients was held in Vienna in March 2010. Representatives from several international and professional organizations (World Health Organization (WHO), UNSCEAR and the European Commission), met with other experts to review progress and recommend continued actions that

included: the creation of electronic social media to further enhance outreach of the guidance provided on the Radiation Protection of Patients website; the promotion of evidence-based referral guidelines for radiation imaging; and the development of an international campaign on AAA — awareness, appropriateness and audit — for strengthening the justification of medical exposures in diagnostic imaging[2]

109. The Scientific Forum held in Vienna in September 2010 in conjunction with the 54th IAEA General Conference, focused on cancer in developing countries. One of the sessions was devoted to safe and appropriate use of new medical radiation technology in new surroundings; it drew attention to the real challenges in ensuring safety and effectiveness when establishing a radiotherapy programme, especially in settings where there were constraints on capacity and infrastructure. Several eminent scientists and regulators discussed evidence-based and cost-benefit issues when introducing new technology, as well as governmental commitment when addressing education and training, and safety culture in medicine.

J. Radiation protection of the public and the environment

J.1. Trends, issues and challenges

110. Recent recommendations by the International Commission on Radiological Protection (ICRP) have been incorporated in the draft of the revised International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS). A key issue in this context was the development of a consistent and harmonized system, applying ICRP recommended principles for radiation protection as well as exposure of non-human species in planned, existing and emergency exposure situations. Since the proposed framework of the ICRP on estimating radiological impacts to non-human species is relatively complex, a number of specific steps must be taken to facilitate compliance with criteria for radiation protection of the environment. The Agency collaborates closely with the ICRP and UNSCEAR on this topic.

111. In many Member States, programmes to develop nuclear energy have been implemented. Furthermore, the awareness of public exposures and environmental impacts from naturally occurring radioactive material (NORM) and legacy sites increased, which led to an increased interest in issues related to public and environmental exposure. Over the years prior to this renewal, expertise was lost in the areas of radiation protection and radio-ecology, owing in part to retirement and also in part to migration to other fields. This will continue to require further efforts on the part of the senior scientists involved to disseminate knowledge and training to young professionals to ensure the transfer of know-how between generations.

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

J.2. International activities

112. A technical meeting was held under the Agency's programme on Environmental Modelling for Radiation Safety (EMRAS II) in Vienna in January 2010; 140 individuals from 42 Member States attended. The EMRAS II programme focused on improving environmental transfer models for assessing exposures to humans and non-human species through the development of harmonized assessment models. A schematic representation of the programme's activities is given in Figure 4. Under EMRAS II, tasks are divided among nine working groups, which help to strengthen the evaluation of the radiological impact that arises from radionuclides in the environment. EMRAS II topics cover a wide range of contamination conditions in planned, existing and emergency exposure situations. The EMRAS II programme will conclude in 2011.

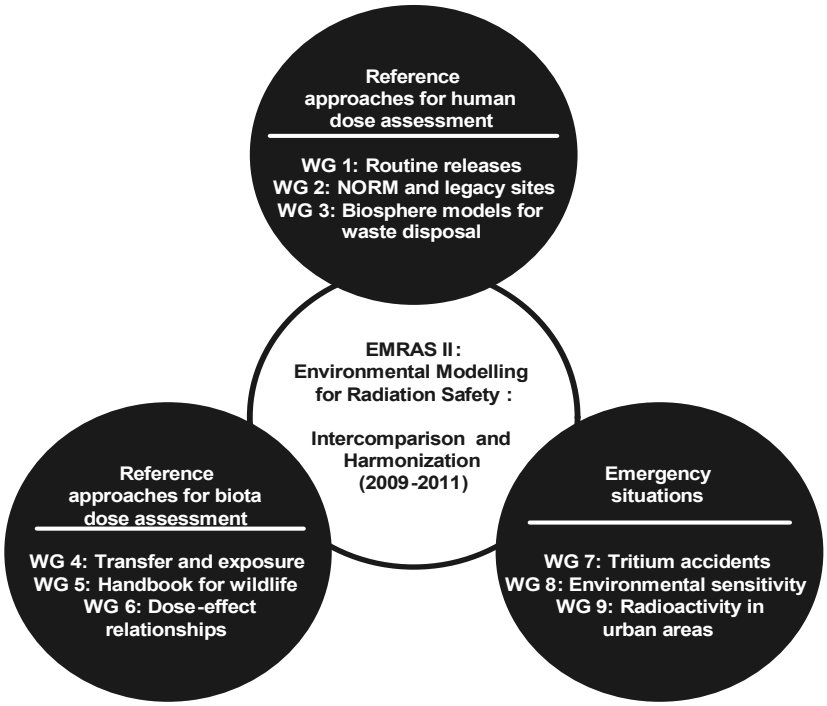

Figure 4: EMRAS II programme activities and associated working groups

113. In February 2010, the Agency hosted the International Chernobyl Research and Information Network (ICRIN) planning and coordination meeting, attended by officials from Belarus, the Russian Federation, Ukraine and representatives from the Agency, the United Nations Development Programme (UNDP) and WHO. ICRIN was launched in April 2009 to implement the UN Action Plan on Chernobyl to 2016 with the objective of disseminating scientifically correct information to the population in the areas affected by the Chernobyl accident; this was a joint activity of the Agency, UNDP, the United Nations Children's Fund (UNICEF) and WHO. The meeting participants approved joint initiatives and actions of the Agency's ICRIN technical cooperation project.

114. In June 2010, at the request of the Government of Kazakhstan, an Agency international review team visited the northern part of the Semipalatinsk test site (STS) since it will be released from regulatory control in the near future. The Agency mission focused on determining whether the release of the northern part of the STS would be in compliance with the Agency's safety standards. A report by the National Nuclear Center of the Republic of Kazakhstan (NNC) summarized the results of comprehensive radio-ecological studies performed in the area and provided the basis for the Agency's review. The review team evaluated NNC samples, preparation and measurement techniques, and approaches used to estimate possible exposures to the public if the site were used for housing, agriculture and industrial activities. The review team provided a detailed report to the Atomic Energy Committee of Kazakhstan and will be one basis for the decision on eventual site release.

115. In July 2010, the Agency presented a detailed report on the dose reconstruction process performed by the Delegate for Nuclear Safety and Radiological Protection for populations in French Polynesia. Between 1966 and 1974, its population became exposed as a direct result of atmospheric nuclear tests conducted by France. The Government of France requested the Agency to conduct a peer review with the objective of obtaining an independent evaluation by international experts on the methodology used by France to assess the radiation doses of exposed population groups. A detailed review report was presented to the French Government in July 2010, and it will be used as one basis for further decisions.

116. The Agency completed formal consultations with Member States in May 2010 on the revision of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (Basic Safety Standards) for the 2012 edition (Safety Standards Series No. GSR Part 3), here in particular the revised requirements focused on the protection of the public and environment. After additional consultations with the co-sponsoring organizations, the final draft was approved by the Agency's Safety Standards Committees and submitted to the Board of Governors for approval in 2011. Additionally, in August 2010, Safety Report Series No. 64, Programmes and Systems for Source and Environmental Radiation Monitoring, was published (see Note by the Secretariat 2011/Note 3).

117. A Safety Guide for the radiological assessment of environmental impacts arising from authorized discharges to terrestrial or aquatic environments was drafted in 2010; its publication is planned for 2011. The preparation of a radiological environmental impact analysis was a key component for demonstrating radiological protection of the environment. This Guide will facilitate the development of a graded standardized approach, promoting common understanding of processes, definitions and methodologies related to the radiological environmental impact analyses and considering all environmental aspects for all facility life-cycle stages.

118. A new version of the Agency's Database on Discharges of Radionuclides to the Atmosphere and Aquatic Environment (DIRATA) was released in 2010; it implemented new functionalities requested by Member States. Improvements included: online search and reporting tools, graphical presentation of time trends, Google Map visualization of information and facilitation of online submission of discharge data. The Agency and UNSCEAR have agreed to jointly maintain and use DIRATA. UNSCEAR will use data on discharges from nuclear fuel cycle installations as input for assessing and reporting on collective effective dose commitments to local, regional and global populations.

119. In September 2010, the Coordination Group on Radiation Protection of the Environment held a meeting in Vienna. Representatives of international governmental organizations (including the EC, ICRP, OECD/NEA and UNSCEAR) and of regulatory bodies and scientific institutions worldwide attended. The Agency received recognition for its development of a data set for nuclide-specific

concentrations in environmental media, which provides specific dose rates to the non-human species proposed by ICRP.

K. Decommissioning

K.1. Trends, issues and challenges

120. Decommissioning and clean-up of the global civil nuclear legacy continued to present a massive managerial, technological, safety and environmental challenge to countries engaged in nuclear decommissioning worldwide. Of the 441 reactors currently operating, many were built in the 1970s and 1980s with a scheduled average lifespan of around 35 years; their decommissioning peak will occur from 2020 to 2030. A supplement to the Nuclear Technology Review 2010 provides a list of all shutdown nuclear power reactors and their decommissioning status, and Table A.1 of the same report provides a list of all nuclear power reactors in operation and under construction worldwide. In addition, decommissioning and clean-up needs have been identified for prototype, test and research reactors, as well as other fuel cycle facilities.

121. In recent years, a variation has emerged in the immediate dismantling strategy for decommissioning. This variation is sometimes called incremental or sequential decommissioning, in which immediate dismantling is undertaken in accordance with available financing. This variation is more difficult to plan and necessarily takes longer than the preferred strategy of immediate dismantling.

K.2. International activities

122. At the annual meeting of the Iraq Decommissioning Project (IDP) from 1 to 4 November 2010, held in Vienna, progress reports were presented, and discussions were held on the first overarching decommissioning plan for the Al Tuwaitha site and plans for the establishment of a near surface disposal facility at Al Tuwaitha. The Agency, through the IDP, will continue to provide assistance to Iraq in the areas of, inter alia, decommissioning, waste management and disposal, and capacity building for human resources and regulatory infrastructure.

123. The Agency initiated the Research Reactor Decommissioning Demonstration Project (R2D2P) in 2006 to assist Member States in planning and implementing safe decommissioning of research reactors. To date, nine R2D2P workshops have been held. The most recent R2D2P workshop was on safety assessment for decommissioning of research reactors held 4–8 October 2010, in Risø, Denmark. Experts from 15 Member States participated in the project with the aim of demonstrating the application and use of Agency safety standards and best practices during the actual decommissioning of facilities, from planning to termination.

124. The Agency launched the International Project on Use of Safety Assessment in Planning and Implementation of Decommissioning of Facilities using Radioactive Material (FaSa) in 2008. The 3rd Joint Meeting of FaSa was held in Vienna from 29 November to 3 December 2010. Experts from 30 countries were involved in this project. FaSa activities were structured into five working groups and four test cases. This project provided practical recommendations on the evolution of the decommissioning safety assessment during facility lifetime and on the use of safety assessment results

in planning and conducting decommissioning. The project is scheduled for completion at the end of 2011.

125. Within the International Decommissioning Network (IDN), considerable progress has been made during 2010 in realizing the three elements of training: hands-on training for decommissioning and dismantling; radiation protection training; and field internships. The IDN-sponsored events held in 2010 included: a specialist workshop on decommissioning costing (Vienna, 1–5 February); a practical training course (Argonne National Laboratory, USA, 12–23 April); and a specialist meeting on use of dose-planning software (Mol, Belgium, 12–15 October).

L. Remediation of contaminated sites

L.1. Trends, issues and challenges

126. The need for remediation of legacy sites resulting from nuclear weapons testing, nuclear accidents, poor practices and abandoned facilities became evident in the late 1980s and continued to be a challenge for many countries this past year.

127. Interest in remediation of former uranium mines in other countries and regions grew, and it was further recognized as called for under IAEA General Conference resolution GC(54)/RES/7 .that development and implementation of appropriate international safety standards in the uranium production cycle needed to be strengthened.

128. Several billion tonnes of phosphogypsum radionuclide residues continued to be stockpiled around the world with significant amounts discharged to the sea. Phosphogypsum contains low levels of natural radionuclides and continues to be widely used in agriculture and construction. In practice, Phosphogypsum residue use is often severely restricted due to concerns over the perceived radiological risks. The Agency formed a working group to discuss the safe use of phosphogypsum residues in accordance with the requirements of the BSS, and to communicate the findings of the working group to the relevant Member States. In connection with these working group activities, the Agency has hosted a series of meetings on the safe reuse of phosphogypsum residues and, in September 2010, hosted a technical meeting on radiological protection aspects of the safe sustainable uses of phosphogypsum residues. The Agency has incorporated input from these meetings into a draft safety report on the phosphate industry. Future work will focus on developing training materials specific to phosphogypsum management and the application of the revised BSS in this and related areas of NORM management.

L.2. International activities

129. In 2010, the Agency completed a baseline document that identified the needs and priorities for environmental impact assessments at legacy uranium production sites in Central Asia. The document has been used by various international organizations for providing assistance for remediation projects in the region.

130. In October 2010, the Agency launched the International Working Forum on Regulatory Supervision of Legacy Sites (RSLS), in cooperation with the Norwegian Radiation Protection Authority, at a technical meeting held in Vienna. This forum will provide support to regulators addressing legacy site issues by promoting an exchange of ideas, information and methods. Initially,

the forum will be oriented towards remediation of the uranium mining legacy in Central Asia, but its scope will broaden to cover other types of legacy sites and facilities.

131. At the request of the Hungarian Atomic Energy Authority and on behalf of MECSEK-ÖKO, the Agency conducted an international peer review of the post-remediation, long term care programme at the former uranium mining and processing sites near Pécs, Hungary. The review meeting was held from 12 to 17 December 2010 and was carried out by a team of five experts from four countries. The findings and recommendations of the review team were aimed at strengthening MECSEK-ÖKO's long term care programme, in particular the passive safety of the sites.

132. The uranium ore mining and processing legacies in Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan resulted in large amounts of uranium tailings and waste rock deposits often dumped in, or close to, inhabited areas. The threats posed by this legacy were and continue to be addressed by a regional project under the Agency's technical cooperation programme, and the Disaster Hazard Mitigation Project for Kyrgyzstan carried out by the World Bank's International Development Association.

M. Safety of radioactive waste management and disposal

M.1. Trends, issues and challenges

133. As the number of States embarking on, or expanding existing nuclear programmes increased, so did the need to develop disposal programmes that provided for safe radioactive waste management, to include disposal arrangements. The Agency's safety standards strongly advise States to develop a radioactive waste and spent fuel management strategy early on in the nuclear programme development cycle.

134. Another important issue in developing or expanding nuclear energy programmes was the need for appropriate human resources with adequate qualifications and expertise to develop and regulate radioactive waste management programmes.

135. There was an urgent need to move towards implementation of disposal programmes, and much progress has been made, primarily in those countries already involved in developing disposal facilities for spent fuel. However, there continued to be issues with the safe geological disposal of radioactive waste.

M.2. International activities

136. One of the outcomes from the International Conference on Management of Spent Fuel from Nuclear Power Reactors, held in Vienna in June 2010, was that countries operating NPPs need access to disposal facilities, whether the country has opted for an open or closed fuel cycle.

137. Some of the other main outcomes from this conference included: (i) final disposal options need to be developed and implemented urgently; (ii) multilateral solutions for storage, reprocessing and disposal where there are sharing mechanisms between countries could be expanded to include and help smaller countries; (iii) ageing management measures and standards should provide more guidance for extended long term storage; (iv) holistic approaches to regulation to accommodate different timescales

for transport and storage licensing were needed; and (v) additional considerations in managing spent fuel for modern fast reactors and advanced fuel cycles, since spent fuel with higher burnups will have to be stored for longer periods than initially intended, (100 years and beyond). The challenges presented by this were compounded by modern fuel being discharged at higher and higher values of burnup.

138. As recommended by the International Conference on Management of Spent Fuel from Nuclear Power Reactors, a joint international working group on guidance for an integrated transport and storage safety case for dual purpose casks for spent nuclear fuel was established in November 2010. As the result of delays in decisions on spent fuel disposal, the volume of spent fuel discharged from reactors needing to be stored is growing and, in an increasing number of cases, exceeding spent fuel pool capacities. The working group aimed at providing guidance to Member States for integrating the safety cases for storage and transport in a holistic manner.

139. In November 2010, the European Commission presented a proposal for a Council Directive on the management of spent fuel and radioactive waste. This proposal was largely based on the Agency's Fundamental Safety Principles and the obligations contained in the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The proposed Directive required that Member States shall, at least every ten years, carry out self-assessments of their national framework, including of the competent regulatory authority and national programme, and its implementation compared to international peer reviews of their national framework, authority and/or programme.

N. Radioactive source safety and security

N.1. Trends, issues and challenges

140. High activity radioactive sources continue to be widely used around the world. Although reliable data on the number of sources in use was unavailable, a 2007 report by the US Nuclear Regulatory Commission estimated that there were 53 700 Category 1 and 2 sources in use in the USA; this could be a point of reference indicating the number of sources existing worldwide. While radioactive sources were being replaced in a limited number of applications with other technologies, such as particle accelerators, in many cases, radioactive sources for medical, industrial and academic applications will continue to be used. In addition, while most Member States recognized the importance of ensuring regulatory control of radioactive sources, there were more than 30 Member States that did not have a fully appropriate regulatory infrastructure in place to control such sources. Likewise, many States do not have a national register that would ensure regulatory control throughout the life cycle (and beyond) of these sources.

141. Radioactive sources are more likely to escape regulatory control when they reach the end of their useful life. Every year, radioactive sources that are not under regulatory control (orphan sources) are discovered at ports of entry, metal recycling facilities or other sites. Moreover, some Member States do not have sufficient expertise or resources to characterize radioactive material that is found and to re-establish regulatory control over orphan sources.

142. Although the Code of Conduct on the Safety and Security of Radioactive Sources and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management provide established principles and objectives for the safe management of disused

radioactive sources, encouraging all possible alternatives (recycling, reuse, repatriation to country of origin, storage and disposal), many countries have not yet defined a proper strategy to manage their current and future disused radioactive sources. This issue was and will continue to be of particular importance for countries that have a low volume of radioactive waste and no nuclear power programme.

143. As of November 2010, 100 Member States have stated their commitment to the Code of Conduct on the Safety and Security of Radioactive Sources. Most Member States use a graded approach, as recommended by the Code of Conduct, for the management of radioactive sources and about 60 Member States are using the Code of Conduct's supplementary Guidance on the Import and Export of Radioactive Sources.

N.2. International activities

144. In May 2010, the Agency held an open-ended meeting in Vienna of technical and legal experts to share information on the implementation of the Code of Conduct on the Safety and Security of Radioactive Sources and the associated Guidance on the Import and Export of Radioactive Sources; it was attended by 160 experts from 93 States, including observers from intergovernmental and non-governmental organizations. A number of conclusions were reached as summarized in the Chair's report[3]. Recommendations from this meeting to the Secretariat include: implementing a review process for the Guidance; organizing a consultancy meeting to discuss issues of managing orphan sources detected at national borders; convening an international follow-up conference based on the findings of the International Conference on the Safety and Security of Radioactive Sources, held in Bordeaux, France, in 2005; and maintaining a high level of awareness of the safety and security of radioactive sources at policy and decision making levels in all Member States.

145. In May 2010, the Agency organized the first school for drafting regulations on radiation safety and the security of radioactive sources in Vienna, within the framework of its technical cooperation programme. This month-long event provided participants from the regulatory bodies of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Latvia, the Former Yugoslav Republic of Macedonia and Montenegro with guidance on Agency and other international standards and guides on the safety and security of sources. In addition, mentoring provided to participants helped them to review, update and complete their national regulatory instruments.

146. The Agency, in collaboration with other international organizations, began drafting a proposal for an international agreement concerning the transboundary movement of scrap metal containing radioactive material, as recommended by the International Conference on Control and Management of Inadvertent Radioactive Material in Scrap Metal, held in Spain, in February 2009 and the General Conference in resolution GC(54)/RES/7. In addition, the Commission on Safety Standards (CSS) has approved a Safety Guide on orphan sources and other radioactive materials in the metal recycling and production industry, which is currently being processed for publication.

147. To further address the issue of long term management of disused radioactive sources, the Agency organized the International Workshop on Sustainable Management of Disused Sealed

[3] http://www.iaea.org/About/Policy/GC/GC54/GC54Documents/English/gc54-8-att1_en.pdf

Radioactive Sources, held in Lisbon, Portugal, in October 2010. This workshop, inter alia, identified common issues (e.g. lack of comprehensive waste management policies covering disused sources, lack of central storage facilities, and absence of disposal routes); it also provided recommendations for future international activities to establish long term storage and disposal routes for the safe management of disused sources. In particular, strong support was expressed for the development of additional projects related to the construction of borehole facilities through international cooperation.

148. In addition to the promotion of sustainable solutions, the Agency, with the assistance of donor countries, provided support to condition and possibly remove disused sources from users' premises for storage in a suitable facility within the country or for shipment to another country (not necessarily the country of origin). Shipment of old sources to other countries was often difficult because of the lack of transport containers, the high level fees for disposal charged by some countries, and the lack of infrastructure in some developing countries. The Agency will continue to actively address these constraints with the assistance of donor countries.

O. Safety of transport of radioactive material

O.1. Trends, issues and challenges

149. Denials and delays of shipment of radioactive materials continue to occur, with the most apparent increase in denials of shipment resulting from national variations in regulations. Variations in regulations can create a level of complexity for different modes of transport that can increase the risk of undeclared dangerous goods, or miss-declared dangerous good creating problems for all parties involved in the supply chain[4].

150. The International Steering Committee on Denials of Shipment of Radioactive Material database (hosted by IMO as part of the GISIS database system) assists in identifying these specific 'hot spots', allowing regional networks to respond. These networks have become increasingly active over the past year, and have provided a wide range of additional benefits.

151. Cooperation with other United Nations bodies associated with the transport of dangerous goods

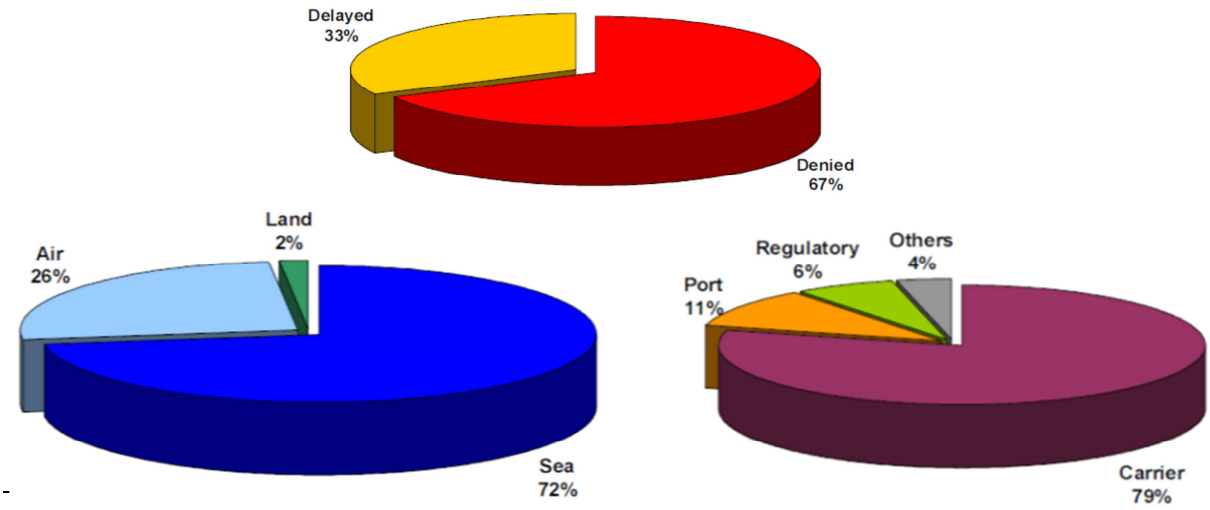

Figure 5: Example of GISIS data indicating difficulty type, conveyance mode affected, reason for delay; it can also show regions and countries affected.

is developing rapidly. In this move toward harmonization, several provisions have been identified this year relating to the transport of radioactive material, which have been put in place without full review. As provided in its mandate, the Agency will need to review these provisions to ensure that safety is not compromised.

152. As of 2009, many countries were party to one or more of the 20 international or regional instruments facilitating the safe movement of goods, including radioactive materials. However, some conventions overlap and cover the same aspects of the transport journey. This is one cause of the denial registered in 2010. The extent to which a simplified global system can be achieved will be examined in the planned IAEA Conference in October 2011. This would be especially beneficial to national regulators of shipping States, or States potentially affected by shipments, as well as industries making shipments responding to the issues raised when shipping radioactive material.

153. The Agency had launched an initiative to identify the potential issues associated with transportable nuclear power plants (TNPPs), with particular attention given to floating reactors, which are designed to meet the energy needs of islands or remote areas. Construction of a floating nuclear power plant equipped with two small PWR reactors (150 MWt each) is underway in the Russian Federation This initiative will identify potential issues associated with TNPPs and assess whether the current international legal framework and safety standards are applicable and appropriate for this technology. The preliminary assessment results are summarized in the paper entitled Issues Related to Barge Mounted Transportable Reactors that was prepared by the Agency and presented to the Committees and Commission for Safety Standards (CSS) in its 28th meeting from 30 September to 1 October 2010. The CSS agreed that it would be premature at this stage to develop a safety guide on Barge Mounted Transportable Reactors and requested more information on legal and institutional issues involved as well as detailed design of the reactor.

154. An Agency technical document, *Legal and Institutional Issues of Transportable Nuclear Power Plants*, is being developed under the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) and is expected to be published by the end of 2011.

O.2. International activities

155. The International Steering Committee on Denials of Shipment of Radioactive Material continued to guide related international activities in 2010.

156. In February 2010, the Agency hosted a series of technical meetings focusing on the Denial of Shipment of Radioactive Material. These meetings brought together regulators, members of industry and other international organizations to discuss denial of shipment, evaluate previous actions taken and to provide guidance and training to assist in the reduction of denial occurrences.

157. The participants reviewed the structure of the International Steering Committee on Denials of Shipment of Radioactive Material and its related networks and recommended a more cohesive approach, comprising national, regional and international government nominated representatives, further augmented by representatives from the transport industry and supplier networks. This will provide a more cohesive, consistent and cooperative approach to responding to the challenge of reducing denials of shipment to an insignificant level by 2013.

158. The second phase of work on resolving denials involves an Agency-led initiative to identify key targets for resolving denials. A management team coordinated and reviewed the activities and work in

progress on a regular basis, including the current development of an action plan to combat denials.

159. The next update to the Regulations for the Safe Transport of Radioactive Material is nearing completion and includes a significant change to the fissile-excepted material requirements, as requested by IAEA General Conference resolution GC(54)/RES/7, for the transport of radioactive materials. The next review will be delayed until a detailed study of the additional requirements introduced by other UN bodies can be made to assess their necessity and whether they compromise safety.

160. In September 2010, the Agency participated in the sixth round of informal discussions in Vienna with a group of coastal and shipping States to continue the dialogue and consultation aimed at improving mutual understanding, confidence building and communication in relation to the safe maritime transport of radioactive material. A presentation and discussion of a hypothetical maritime incident led to increased understanding and confidence building among participants.

Appendix 1
Safety related events and activities worldwide during 2010

A. Introduction

161. This report identifies those safety related events or issues during 2010 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 activities during 2010.

B. International Instruments

B.1. Conventions

B.1.1. Convention on Nuclear Safety (CNS)

162. The first Officers' Turnover Meeting was organized pursuant to the decision taken at the 4th Review Meeting of the CNS on 30 March 2010. The objectives of the meeting were to improve the review process by sharing experience and lessons learned, and to describe the process in detail, including key documents. As such, the meeting served to improve continuity between incoming and outgoing officers.

163. By the end of 2010, the Convention had 71 Contracting Parties and 11 Signatory States that had not yet ratified the Convention. In 2010, five countries namely, Bosnia and Herzegovina, Kazakhstan, Saudi Arabia, Tunisia and Vietnam became Contracting Parties to the Convention.

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)

164. In 2010, the Dominican Republic, Georgia and Kazakhstan acceded to the Convention on Early Notification of a Nuclear Accident. By the end of 2010, there were 109 Contracting Parties to this Convention.

165. Kazakhstan also acceded to the Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency in 2010, bringing the total to 105 Contracting Parties to this Convention.

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

166. In 2010, Gabon, the Republic of Moldova, Kazakhstan and The former Yugoslav Republic of Macedonia became Contracting Parties to the Joint Convention. By the end of the year, there were 57 Contracting Parties to this Convention. Four Signatory States had not yet ratified the Convention.

167. The first Technical Meeting between Joint Convention Contracting Parties and States non-parties focused on the Establishment of Radioactive Waste Management Organizations was held 7 and 9 June 2010 in Paris, France. The event was organized by the Agency, in cooperation with the French Nuclear Safety Authority (ASN), the French National Agency for Radioactive Waste Management (ANDRA) and the Ministry of Ecology, Energy, Sustainable Development and of Sea (MEEDDM) of France.

168. The informal meeting of the Contracting Parties to the Joint Convention to discuss the Secretariat's proposals to promote continuity between Review Meetings and to enhance communications, as requested by the third Review Meeting of the Joint Convention, was held in Paris on 10 June 2010. The meeting was organized by the Agency and hosted by the French Nuclear Safety Authority.

169. The General Committee of the Joint Convention met in Vienna on 24 September 2010. A regional workshop on the Joint Convention was held in Tokyo between 28 and 30 September 2010. Representatives from five Contracting Parties along with nine non-party States participated in the event. The workshop was organized by the Agency in collaboration with the Nuclear and Industrial Safety Agency (NISA) of Japan, the Japan Nuclear Energy Safety Organization (JNES) and the Asian Nuclear Safety Network (ANSN).

B.2. Codes of Conduct

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

170. The Code of Conduct on the Safety of Research Reactors is now widely known and accepted as a principal source for guidance for management of research reactor safety. To support the implementation of the Code, the Agency held three regional meetings (China, Egypt and Slovenia) and one national meeting for Pakistan organized in Vienna on the application of the Code. In total, 65 participants from 27 Member States attended these meetings. The meetings contributed to a better understanding of the code and resulted in several improvement plans for participating Member States.

171. In November 2010, the Agency continued with revising the corpus of Safety Guides for research reactors and with drafting new safety guides. The revised Safety Guide on the Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report was approved for publication. In addition, significant progress was achieved in the development of the three Safety Guides on the application of a graded approach; safety in utilization and modification of research reactors and on instrumentation and control and software important to safety for research reactors.

172. The Agency continued regional activities to examine progress, to promote sharing knowledge and building technical and safety capacities, and to address specific needs of Member States as defined in their self-assessments presented during the international meeting on Application of the Code of Conduct on the Safety of Research Reactors, held in Vienna in October 2008. In 2010, these activities focused on promoting performing periodic safety reviews for research reactors, and improving the

capabilities for preparation, review and assessment of research reactor safety documents, as well as on the need to enhance operational radiation protection programmes and emergency planning and preparedness for research reactors.

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

173. By the end of 2010, 100 States had written to the Director General to express their commitment and intention to work toward following the provisions of the Code of Conduct on the Safety and Security of Radioactive Sources. Also, 60 States had expressed support for the Supplementary Guidance on the Import and Export of Radioactive Sources. A total of 105 States had nominated points of contact for the purpose of facilitating the export and import of radioactive sources and had provided the details to the Agency. The Code and the Guidance are not only widely accepted on a national level, but are supported by several groups of countries.

174. The provisions and guidance in the Code of Conduct have been integrated into appropriate Agency safety review services, such as the Integrated Regulatory Review Service (IRRS), advisory missions on control of sources, technical cooperation projects and extra budgetary programmes. Application of the Code of Conduct is accomplished through implementation of national regulations.

175. In September 2010, at the 54th session of the IAEA General Conference, which noted the recommendations of the Open-ended Meeting of Technical and Legal Experts organized in May 2010, requested by the Secretariat to implement the recommendations—in particular, the recommendation calling for the organization of an international conference on the safety and security of radioactive sources, which is currently planned for 2013.

B.3. International Nuclear Regulators Association (INRA)

176. The International Nuclear Regulators Association (INRA), established in 1997, is a group of the most senior nuclear regulatory figures from the Canada, France, Germany, Japan, Republic of Korea, Spain, Sweden, United Kingdom and USA meeting twice a year. In 2010 the United Kingdom was the host country for INRA and meetings were held in April 2010 (London) and September 2010 (Windsor). Sweden has now taken over as the INRA host and the next meeting is planned for May 2011 in Stockholm.

B.4. G8-Nuclear Safety and Security Group (G8-NSSG)

177. Under the Presidency of Canada, the G8-NSSG met in Toronto from 5 to 6 May 2010. The Agency, the European Commission (EC), the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA) and the European Bank for Reconstruction and Development (EBRD) also attended the meeting as observers. The G8-NSSG meeting focused on, inter-alia, the implementation of the Chernobyl Shelter Fund and Nuclear Safety Account managed by the EBRD; the 3S-based (Safety, Security, Safeguards) Nuclear Energy Infrastructure; and the future of NSSG.

178. The implementation of the Shelter Implementation Plan (SIP), according to the International Advisory Group (IAG), has made a positive impact on safety protection. However, there remain risks to the timely delivery of an operational New Safe Confinement (NSC) that according to the IAG, could be managed by the Project Management Units (ChNPP/PMU), committed and competent contractors and adequately resourced regulators. It was also concluded that that the international community's support for Ukraine enabled the translation of the SIP concept into tangible engineering programmes, which so far have made a major contribution to improving nuclear and radiological safety at Chernobyl and to the protection of the public.

B.5. Western European Nuclear Regulators Association (WENRA)

179. In follow up to a study on safety objectives for new nuclear power reactors published by WENRA in January 2010 and taking into consideration comments received thereon, WENRA adopted a statement on safety objectives for new nuclear power plants in November.

180. WENRA identifies in this statement seven high level qualitative safety objectives and considers that the design of new nuclear power plants should take into account the operating experience feedback, lessons learned from accidents, and developments in nuclear technology and improvement in safety assessment. WENRA is continuing its harmonization work on the basis of these objectives.

181. The WENRA bases its harmonization work for existing and future reactors on the Agency Safety Standards; these standards assist in reinforcing international benchmarks for maintaining and improving nuclear safety worldwide.

B.6. The Ibero-American Forum of Nuclear and Radiological Regulators

182. During the 54th session of the IAEA General Conference in September 2010, a formal arrangement to consolidate the relationship between the Ibero American Forum of Nuclear and Radiation Safety Regulatory Agencies (the FORO) and the Agency was signed by the current President of the FORO and the Deputy Director General of the Department of Nuclear Safety. This arrangement will also help promote support for FORO´s technical programmes.

183. Current FORO projects include: accident prevention in therapeutic medical uses of radiation; collaborative approaches between regulatory and health authorities; life extension licensing of nuclear power plants (NPP); and control of inadvertent radioactive material in scrap metal and recycling industries.

184. In 2010, the project on regulatory issues relating to NPP life extension was completed and the final report will be posted on the FORO web site.

B.7. Cooperation Forum of State Nuclear Safety Authorities of Countries which operate WWER Reactors

185. The 17th Annual Meeting of the Forum of the State Nuclear Safety Authorities of the Countries Operating WWER Type Reactors was hosted by the Hungarian Atomic Energy Authority HAEA from 15 to 17 June 2010. The meeting was attended by senior representatives of the regulatory authorities of countries operating or constructing these reactors, including: Armenia, Bulgaria, China, Czech Republic, Finland, India, the Islamic Republic of Iran, Russian Federation, Slovak Republic and Ukraine. The Agency and Germany's Gesellschaft für Anlagen und Reaktorsicherheit (GRS) attended the meeting as observers. Presentations focused on the most significant issues and developments in the field of nuclear safety and regulation, including those encountered during the construction of the Olkiluoto 3 reactor in Finland.

186. Working groups reported on the activities since the last meeting in 2009. The working groups included regulatory aspects of organizational, management and safety culture-related issues of NPPs; regulatory use of probabilistic safety analysis; and operational experience feedback for improving safety of NPPs. A new working group began work in November 2010 on requirements for quality of fabrication and justification of operation safety of nuclear fuel for WWER reactors, including on the requirements for verification of computer codes. The next meeting of the forum will be hosted by the Slovak Republic in 2011.

B.8. The senior regulators from countries which operate CANDU-type nuclear power plants

187. The Annual Meeting of Senior Regulators of Countries Operating CANDU-type Reactors took place in China, from 8 to 12 November 2010; it was hosted by the National Nuclear Safety Administration Office in Shanghai. The meeting was attended by six countries (Argentina, China, India, Republic of Korea, Pakistan and Romania).

188. The meeting addressed technical and policy regulatory issues, including regulatory framework and oversight for new NPP construction, refurbishment and ageing management together with the applications of probabilistic safety analysis (PSA) in CANDU NPPs. The participants visited the Third Qinshan Nuclear Power Plant and exchanged information on the future development of the nuclear power programme in China and safety aspects of CANDU plants. The next Meeting of Senior Regulators of Countries Operating CANDU-type Reactors will be held in the Republic of Korea, in the fourth quarter of 2011.

189. Upon request, in May 2010 a preliminary Technical Meeting on PSA for CANDU reactors took place in Vienna. A technical meeting was attended by participants from regulatory bodies and industry, as well as representatives from the CANDU Owners Group; they discussed strategy and terms of reference. The next meeting of the PSA working group will be held in Ottawa, Canada, in the second quarter of 2011.

B.9. Forum of Nuclear Regulatory Bodies in Africa (FRNBA)

190. The Forum of Nuclear Regulatory Bodies in Africa (FNRBA) was established in 2009, comprising 33 African nuclear regulatory bodies. FNRBA consists of nine thematic working groups. FNRBA has initiated "Strengthening Radiation Protection Infrastructure" as a model project.

191. Building on the substantial progress that FNRBA has made in realizing the network of regulatory bodies in Africa, a plenary session of the FNRBA was held in Nairobi, Kenya in May 2010. A significant part of the meeting was devoted to structured discussion and adoption of a strategic business plan, the 2010/2011 Action Plan, developed by the Steering Committee for strengthening the programmatic and institutional capacity building aspects of the Forum to effectively implement its medium term strategic plan.

192. Furthermore, the forum also included the import and export control and transport safety and emergency preparedness and response as new areas for the Technical Working Group. In addition, it discussed and adopted the Terms of Reference and working procedures for all Technical Working Groups, passed resolutions on various organizational and programmatic issues, and considered systemic and virtual networking for further development of the Forum web site[5].

193. During the 54th session of the IAEA General Conference in September 2010, an agreement was signed between FNRBA and the Korea Institute of Nuclear Safety (KINS) to seek more support and assistance from outside of Africa.

B.10. Arab Network of Nuclear Regulators (ANNuR)

194. ANNuR held its first meeting in Hammamet, Tunisia in January 2010, where representatives of the Nuclear and Radiation Regulatory Bodies in Arab countries participated. They discussed a three action plan and its implementation. ANNuR's next meeting will be held in early 2011.

B.11. The International Nuclear and Radiological Event Scale (INES)

195. 2010 marked the 20-year anniversary of INES as celebrated during the Biennial Technical Meeting of the INES, held on 11–15 October 2010, in Vienna. The meeting presented successful implementation of INES and discussed its further enhancement. Since 1990, it has increased its initial membership from 31 countries to 69 countries. In 2010, eight countries joined INES: Algeria, Kenya, Indonesia, Latvia, Malaysia, Serbia, Thailand and Zimbabwe.

196. Member States are urged to designate International Nuclear and Radiological Events Scale (INES) national officers and utilize the scale.

[5] www.fnrba.org.

C. Activities of international bodies

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

197. In 2010, the UNSCEAR released its 2008 report on Sources and Effects of Ionizing Radiation Vol. I. With Scientific Annexes: A: Medical radiation exposures and B: Exposures of the public and workers from various sources of radiation.

198. According to the report, medical exposures account for 98 per cent of the contribution from all artificial sources and are now the second largest contributor to the population dose worldwide, representing approximately 20 per cent of the total. Computed tomography (CT) scans were found to be the major contributor to medical exposure, with other significant contributions from diagnostic X-rays, interventional procedures, and nuclear medicine.

199. The UNSCEAR reports provide the scientific foundation for national and international programmes on radiation risk assessment and management, including for example the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS).

200. The fifty-seventh session of UNSCEAR was held 16-20 August, 2010 in Vienna. During the meeting, technical discussions took place on assessment of levels of radiation from electrical energy production, uncertainty in radiation risk estimation, attributing health effects to radiation exposure and the methodology for estimating exposures due to discharges. Improved procedures for data collection, analysis and dissemination were also considered.

201. The UNSCEAR Secretariat has been liaising with other relevant organizations, such as the World Health Organization, the International Atomic Energy Agency, the Nuclear Energy Agency of the Organization for Economic Cooperation and Development and the European Union, with a view to streamlining the collection of data on radiation exposures of the public, workers and patients.

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

202. The ICRP has a policy of making draft publications available online for consultation and all comments received are taken into account in finalizing its recommendations. In 2010 the following documents were issued for consultation: 1) Education and Training; 2) Environmental Protection – Transfer Parameters for Reference Animals and Plants; and 3) ICRP Statement on Radon and Lung Cancer Risk from Radon and Progeny (two related but separate documents).

203. The ICRP was co-author of the ICRU Report 84: Data for the Validation of Doses from Cosmic Radiation Exposure of Aircraft Crew.

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

204. The ICRU manages its work through a Main Commission and 11 Report Committees. It also operates a further two joint committees with the ICRP.

205. The current ICRU programme addresses priority issues in diagnostic radiology and nuclear medicine, radiation therapy, radiation protection and radiation science.

206. The ICRU published the following reports in 2010: Prescribing, Recording, and Reporting Intensity-Modulated Photon-Beam Therapy (IMRT)(ICRU Report 83); and Reference Data for the Validation of Doses from Cosmic Radiation Exposure of Aircraft Crew (ICRU Report 84, jointly with the ICRP).

C.4. International Nuclear Safety Group (INSAG)

207. In 2010, INSAG issued a report entitled INSAG 24: The Interface between Safety and Security at Nuclear Power Plants. The report highlights the importance of a coordinated approach to nuclear safety and security. A second report entitled Framework for Risk Informed Decision Making Process is in the final stage of preparation. The report proposes a methodology to integrate deterministic and probabilistic techniques in a decision making process.

208. As in previous years, the INSAG Forum was held on the sidelines of the 54th session of the General Conference. The Forum was dedicated to highlighting essential messages from previous INSAG reports to countries considering launching a new nuclear power programme.

D. Activities of other international organizations

D.1. Institutions of the European Union

209. In 2010, the European Nuclear Safety Regulators Group (ENSREG), an independent expert body comprising senior officials from the national regulatory or nuclear safety authorities of all 27 EU Member States, held three meetings. Topics discussed in the meetings included: development of two learning processes from the Convention on Nuclear Safety review meetings and from the Agency's International Regulatory Review Service (IRRS) missions to other Member States; the establishment of an expert resource pool and of a network of regulatory contact points needed for the development of an European IRRS programme of peer-reviews; the elaboration of a Memorandum of Understanding between ENSREG and the Agency on the practicalities of a European programme of peer review missions; and the elaboration of key principles for national regulators on common practices for improving transparency.

D.2. Nuclear Energy Agency of the Organisation for Economic Cooperation and Development (OECD/ NEA)

210. The NEA Committee on Nuclear Regulatory Authorities (CNRA) and the NEA Committee on the Safety of Nuclear Installations (CSNI) met in December 2010. The committees reviewed progress on activities from 2010 and forthcoming activities for 2011-2012. Participants from over 22 countries, the European Commission (EC) and the Agency attended the meetings. Major agenda items for both committees included updating operating plans, long-term operation, NEA interactions with emerging nuclear power countries and discussions on the safety of research reactors.

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

211. WANO conducted peer reviews at 36 NPPs during 2010; altogether it has conducted 457 peer reviews since the programme began in 1992. WANO's long-term goal is to conduct a WANO peer review of member nuclear stations such that each nuclear unit is reviewed at least once per six years, either as an individual unit or as part of a peer review that includes other units at a station. In addition, each station is encouraged to host an outside review at least every three years (allowing a WANO peer review to count as an outside review.) An outside review would include Operational Safety Review Team (OSART) missions, WANO follow-up peer reviews, and national organizational reviews such as those conducted by the Institute of Nuclear Power Operations (INPO) and the Japan Nuclear Technology Institute (JANTI).

212. WANO continues to emphasize technical support missions, which focus on providing assistance in selected areas, with almost 200 technical support missions undertaken during 2010. Many of these technical support missions included experts from other WANO regions sharing their experiences to support improvements in operational safety.

E. Safety significant conferences in 2010

E.1. International Conference on Human Resource Development for Introducing and Expanding Nuclear Power Programmes

213. The conference on human resource development held in Abu Dhabi, United Arab Emirates, from 14 to 18 March 2010, brought together over 250 experts, scientists and officials from 62 Member States. The wide participation of Member States and Agency staff enabled the sharing of information and ideas on effective ways to attract and train the human resources required to maintain the vanishing global nuclear workforce. The conference recognized the need for governments to be heavily involved in the development of human resources for a safe, secure and sustainable nuclear power programme and the need to cooperate locally, nationally and internationally in building human resources for a nuclear power programme. It was also commonly agreed that maintaining competence is a national responsibility and that existence of an effective safety culture is a prerequisite for the implementation of a nuclear power programme.

E.2. International Conference on the Management of Spent Fuel from Nuclear Power Reactors

214. The Agency organized this international conference, held in Vienna, 31 May–4 June 2010 with 166 participants from 35 countries. The conference addressed all aspects of spent fuel management from national policy through legal and regulatory aspects, experience with spent fuel storage, reprocessing and recycling options and long term storage and disposal. Key issues in radioactive waste management were highlighted, in particular safety, security and sustainability of storage of spent fuel over time.

E.3. International Conference on Operational Safety Experience and Performance of Nuclear Power Plants and Fuel Cycle Facilities

215. This international conference was held in Vienna from 21-25 June 2010 with 163 participants representing 45 Member States and five international organizations in attendance. There were a total of 49 presentations from operators, international organizations, regulators and technical support organizations. These covered leadership, management of safety, safety culture, operating experience, newcomers with ambitious plans, international peer reviews, application of Agency Safety Standards and long term operation. Recommendations for future work in these areas were proposed and accepted by the conference participants.

E.4. International Conference on Challenges Faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety and Security

216. From 25–29 October 2010, the Agency and the Japan Nuclear Energy Safety Organization (JNES) organized and hosted this second international TSO conference, which followed the first TSO Conference held in Aix-en-Provence, France, in 2007; 229 participants from 46 countries and five international organizations attended and focused on the following: the role and responsibility of Governments in defining and implementing TSO capabilities and policies; the Agency's role as a strong driving force for the development of the TSO knowledge network; and the TSO remit to pursue on-going efforts in improving and optimizing worldwide technical capabilities needed to support nuclear safety and security. The conference concluded with five recommendations, most notably focusing on achieving greater safety and security synergy by extending TSO functions and establishing a TSO Forum that would act as a platform for worldwide cooperation.

E.5. International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry

217. The Radiation Protection in Medical Applications session was held during the International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry (from 9–12 November 2010, in Vienna, with 372 participants attending the symposium from 66 countries). The following issues and challenges, inter alia, were discussed: (i) increasing medical worker awareness and minimizing risk of the deterministic effects from the use of radiation in medical procedures; (ii) implementing individual monitoring of medical staff in full; especially for extremity dosimetry; (iii) implementing radiation protection programs at medical facilities for both worker and

patient protection; (iv) optimizing diagnostic imaging procedures in interventional radiology and nuclear medicine; (v) implementing international standards, guidance and assistance on capacity building and training in radiation protection; (vi) upgrading and/or creating national dose registries at the National/State level.

F. Safety significant events in 2010

F.1. International Reporting System for Operating Experience (IRS)

218. The fundamental objective of the IRS is to contribute to improving the safety of commercial nuclear power plants (NPPs) which are operated worldwide. The IRS provides an essential feedback tool, ensuring proper reporting and feedback of safety significant events such that the causes, the lessons learned and the corrective actions can be disseminated widely. It is an international system jointly operated by the International Atomic Energy Agency and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA).

219. The Incident Reporting System has increased its functionality to include expanded views and to make available operational experience feedback. In addition, the name of the system was revised in 2010 to the "International Reporting System for Operating Experience". The system retains the IRS acronym.

220. The 2010 joint Agency–OECD/NEA meeting of the IRS national coordinators, which was held in Vienna, discussed corrective actions and lessons learned from 27 recent events in nuclear power plants. These events covered a wide range of scope and complexity. Some events had classic initiators, such as: loss of offsite power (with different causes including severe weather conditions); loss of ultimate heat sink; leakage from the pressurizer and internal flooding, and others. Some events were related to human error (staff overriding limitation systems, complacency and maintenance errors), and some events were related to organizational and safety culture issues (oversight of sub-contractors, acceptance of degraded conditions, incomplete design reviews and communication of design changes between different related institutions). However, the majority of events were of a technical nature: several Emergency Diesel Generator (EDG) failures, spare parts problems, material problems in Steam Generators (SG), cracks in pressurizer heaters, problems from original design and construction, high voltage breaker failure, transformer fires and inadvertent control rod insertion.

F.2. Events of interest in 2010

221. **Haiti:** Following the earthquake that occurred in Haiti on 12 January 2010, the Agency took action and provided humanitarian aid in terms of medical X-ray equipment and related medical consumables. The Agency sent an offer of good offices regarding the recovery of radioactive sources which might have been located in areas affected by the earthquake. An offer of good offices was also sent to the Dominican Republic as this country has licensed companies which did operate in Haiti and confirmed that a number of radiation sources were located at the site of a collapsed building in Haiti. As natural disasters might lead to severe radiological consequences, the Agency Incident and Emergency Centre (IEC) will approach affected countries with offers of good offices and will remain in stand-by mode ready to assist, if requested.

222. **Chile:** Following the earthquake that occurred in Chile on 27 February 2010, the Agency requested information from the authorities on the safety and security status of radiation sources possibly located in the area affected by the earthquake. The Chilean counterpart investigated the situation and reported that there was neither safety nor security related consequences arising from radiation sources used for medical purposes in the area affected by the earthquake.

223. **Honduras:** On 28 October 2010, elevated dose rates up to 14 mSv/h were detected from an underground source in a courtyard. Initial actions were taken to shield the area and install appropriate cordons and signs. The IEC received a request for assistance from authorities and deployed an Assistance Mission team, comprising a team leader from the IEC and a RANET team from Mexico. During the initial meeting, it was revealed that a source inventory had been performed after the dose rate detections indicating that a 15mCi 137Cs brachytherapy was missing. The mission team subsequently performed dose rates surveys and safely recovered a source from a depth of approximately 2 cm below the surface. Analysis of the source identified that it was the missing source. Source encapsulation remained intact and it was placed in a dedicated shielding facility with the other brachytherapy sources. Dose reconstruction determined that individual overexposure was extremely unlikely.

224. **Venezuela:** A radiation accident occurred in Turmero, Aragua State, when, on 3 June 2010, after a number of workers handled an unshielded Ir-192 2.4 TBq (64.95 Ci) industrial radiography source. The Agency received a request for assistance on emergency communication channels, and on 14 June 2010, an Assistance Mission was deployed to Venezuela with the objectives to assess the medical condition of the most exposed individuals and to provide medical advice for medical treatment for them. Based on the results of this assistance mission, a request for medical treatment was issued by Venezuela. The IEC facilitated medical treatment in France within the RANET framework. As a consequence of the highly specialized and effective medical treatment, the most exposed person recovered entirely after being subjected to surgery and adjuvant administration of mesenchymal stem cells.

225. **Italy:** According to the information sent by Italy through the emergency communication channels and through the public and media information channel, NEWS, a Co-60 source estimated to be in the range of 150 to 200 GBq was discovered in the port of Genoa, in a container shipment of scrap metal coming from abroad on 20 July 2010. Legal and radiological safety investigations were carried out by the local authorities at the site of the discovery, in line with national legislative provisions and international safety regulations on the matter.

226. **Russian Federation**: In early August, large areas in the Russian Federation, including areas near nuclear power plants and nuclear facilities in Sarov and Snezhinsk were affected by wildfires. This raised concerns regarding the safety of nuclear materials in those facilities and also in the areas contaminated as a consequence of the 1986 Chernobyl accident. The Incident and Emergency Centre was in contact with the official Russian contact point, the Situation and Crisis Centre of ROSATOM. On two occasions, the IEC requested and promptly received information. The information was translated and made available to all contact points by email. In addition, the competent authority of France (ASN) and a technical support organization in Germany (BFS) posted fact sheets on the consequences of fires in contaminated areas, on their respective web sites. Once official information was available, the number of requests both from competent authorities and from the media decreased significantly and no further IEC action was necessary.

G. Safety Networks

227. Sharing Agency nuclear safety information, lessons learned, and subject matter expertise to aid in building capacity in Member States and informing the public at large continues to be a challenge. However, in 2010, the Agency made significant strides in addressing this capacity building and information sharing challenge through fostering development of various nuclear safety and security knowledge networks.

G.1. Asian Nuclear Safety Network (ANSN)

228. From the beginning of 2010, the new ANSN project management team began full operation of managing the ANSN programme activities.

229. In March 2010, the first meeting of the ANSN Capacity Building Coordination Group (CBCG) took place in Tokyo, Japan. At this meeting, the CBCG reviewed and discussed the first draft of the 'Generic Action Plan for establishing the Regional Capacity Building System in Asia' and agreed to submit the draft to the 3rd meeting of ANSN-Nuclear Safety Strategy Dialogue (NSSD) in April 2010. In addition, the CBCG discussed development and implementation of a generic action plan for achieving the 'Vision for the ANSN by the year 2020' (Vision 2020).

230. The 3rd meeting of the Nuclear Safety Strategy Dialogue (NSSD) was held in April 2010, in Yogyakarta, Indonesia. This meeting was attended by 32 participants from 10 ANSN countries, as well as the Association of South East Asian Nations (ASEAN) and the Arab Network of Nuclear Regulators (ANNuR) as observers. The NSSD participants confirmed the necessity of expanding their national education and training centres to national capacity building centres, implementing plans to establish a network of these centres, eventually building a regional capacity building system in Asia.

231. In May 2010, the second meeting of CBCG and the 11th meeting of Steering Committee (SC) took place in Vienna. Following the results of the 3rd meeting of NSSD, the CBCG developed guidance for ANSN Member States to prepare their own national action plans and also identified the need of developing action plans for topical groups to further establish the regional capacity building system in a collaborative and coordinated manner.

232. The SC supported the proposals from the CBCG to develop action plans for capacity building by ANSN Member States as well as the topical group action plans. The SC strongly encouraged the Agency to further develop capacity building IT Modules in cooperation with the IT support group. The SC also agreed to redesign the Country Knowledge Base on the ANSN web site to enhance mutual learning and knowledge sharing under the responsibility of ANSN Member States.

233. During the 54th session of the IAEA General Conference in September 2010, a round table discussion on Nuclear Safety Knowledge Networking took place; 50 attendees from 20 countries participate. The meeting focused on: (1) sharing experience and good practices in developing the future of global and regional knowledge networks; (2) enhancing collaboration and coordination among global and regional networks and capacity building centres; and (3) working with technical and scientific support organizations (TSO) for improving Member States' safety. The participants strongly encouraged the Global Nuclear Safety and Security Network (GNSSN) and the ANSN to further

develop their IT infrastructure as well as share the importance of exploring mutually beneficial ways IT networking among GNSSN, ANSN, FORO, FNRBA, ANNuR and ETSON.

234. In October 2010, the 3rd meeting of CBCG and the 12th meeting of the SC took place in Beijing, China. The CBCG agreed there was a need to provide regional peer reviews and support arrangements for the preparation and implementation of national Action Plans for building capacity in new NPP ANSN countries. The CBCG discussed collaborations among ANSN and other Agency Member States on these international initiatives through, inter alia, the Regulatory Cooperation Forum (RCF), to optimize limited resources nationally, regionally and internationally. The SC suggested that this proposal should be compatible with relevant international standards and guides and existing Agency review services. The SC reviewed and approved the proposed ANSN work plan for 2011 with some modifications.

G.2. Ibero-American Nuclear and Radiation Safety Network (FORO)

235. The FORO now has full responsibility for operation of the network. The development of a second version of the network has been approved by the FORO; this will improve the collaborative tools for further networking.

236. Collaboration of the FORO with the Agency through its Technical Cooperation Programme has made considerable progress in 2010. In September of 2010, as a follow up to the workshop in 2009 on safety assessment in radiotherapy, a second workshop was held in Havana, Cuba. The work completed to date by 12 Member States was reviewed; this included their implementation of lessons learned from accidental exposure and the application of the Risk Matrix Method as a proactive tool for prevention.

237. The FORO has agreed to collaborate with the Agency in capacity building by hosting a workshop in Chile in 2011 on strengthening emergency preparedness and response.

G.3. International Decommissioning Network (IDN)

238. Currently, over 400 professionals in 60 countries participate in the IDN. Participants from Member States with developed decommissioning programmes find the IDN a valuable forum for comparing their approaches and identifying other decommissioning experts with similar challenges.

239. A number of activities were conducted in 2010, including workshops and training courses on decommissioning, using Agency Safety Standards as the basis. Additional improvements highlighted in training include: the use of new media and communication technologies in decommissioning training to improve distance learning; creation of a training video promoting more consistent training; and contributions to very specialized trainings in leading national and international institutions (some were offered cost-free). Other activities in 2010 included most notably:

- Determination of Neutron Induced Activity for Decommissioning Purposes, June, Budapest, Hungary (TC RER3009) WS on Dose Assessment and Dose Optimization for Decommissioning purposes, October, Mol, Belgium (TC RER 3009);
- Decommissioning Safety Assessment, October, Riso, Denmark (R2D2P);
- Release of Sites and Building Structures from Regulatory Control, September, Karlsruhe, Germany (joint R2D2P and TC RER 3009);
- Additional guidance on decommissioning safety assessment provided through the Safety Assessment Results in the Planning and Implementation of Decommissioning (FaSa) Project.

G.4. Disposal of low level radioactive waste (DISPONET)

240. DISPONET has launched a systematic training programme, supporting the development of a disposal facility for very low, low and (when appropriate) intermediate level radioactive waste. The training courses have been or will be organized for the regions of: Asia, Latin America, Africa, and Europe. The initial set of courses are expected to deliver messages at general level: participants are introduced in the waste disposal bases, advised on organizing the repository development project, explained the role of design, siting procedure elements, and relevant safety aspects, and instructed on how to identify and manage stakeholders. Such courses were hosted by the Bhabha Atomic Research Centre in Mumbai, India, (February 2010 - Middle East and Asia countries) and ENRESA, Spain (March 2010 - Latin America countries).

241. DISPONET has also created a forum for sharing proven practices among advanced operators of disposal facilities. The International Workshop on Waste Acceptance Criteria for Disposal of Very Low, Low, and Intermediate Level Waste was hosted by the DBE Technology in cooperation with BfS Salzgitter in Peine, Germany between 28 and 30 September 2010 and provided for 40 experts from 23 countries a forum for sharing experience regarding inter alia establishing a waste acceptance system, discussing challenges in criteria implementation, assessing acceptance procedures for specific waste. The development of the acceptance system is an iterative process that should be carried out in parallel, and in conjunction, with the development of the facility design and safety assessment.

G.5. Global Nuclear Safety and Security Network (GNSSN)

242. The Global Nuclear Safety and Security Network (GNSSN) represent a set of existing knowledge networks and information resources. Significant improvement of this network has been made in 2010.

243. During the 54th session of the IAEA General Conference in September, the new GNNSN public site platform was launched. It uses advanced IT software and SharePoint, merging several technical subject areas into one common platform.

244. A technical meeting on further development of GNSSN and RegNet was held in Vienna from 6 to 10 December 2010. The main purpose of the meeting was to present the current status for the development of GNSSN/RegNet; to demonstrate the inherent potential in the integration of multinational networks; to exchange and share information on good practices in the field of knowledge networking and finally to discuss and agree on further development of GNSSN/RegNet based on the current pilot of GNSSN/RegNet and existing networks.

G.6. International Regulatory Knowledge Network (RegNet)

245. In 2010, the International Regulatory Network (RegNet), a key element of GNSSN, was further developed by the Agency with the aim to establish and maintain common interfaces for direct access to respective information of Member States or International Organizations through links to their web sites. RegNet can also serve as a platform for direct collaboration between interested partners.

246. Future development will include systematic access to existing regional and thematic networks. Special attention will be given to information sharing on IRRS (Integrated Regulatory Review

Service) missions, Generic Safety Issues (GSI) and Country Contribution Sites (CSS) including the Country Nuclear Regulatory Profiles (CNRP).

247. The regional Conference on 21st Century Capacity Building and Virtual TSOs in Asia was held in October in Tokyo, Japan. 60 participants from 20 countries, particularly from those countries participating in nuclear safety regional networks including the ANSN, FNRBA, ANNuR and ETSON attended this conference. The purpose of this regional conference was to strengthen and expand the nuclear safety knowledge networks (both human and virtual), to enhance effective nuclear safety and security capacity building and infrastructure development.

G.7. Regulatory Cooperation Forum (RCF)

248. A major outcome of the 2009 Conference on "Effective Nuclear Regulatory Systems" in Cape Town, South Africa, State regulatory body authorities agreed to establish a forum to facilitate coordination and collaboration on nuclear safety regulatory issues between States developing new nuclear power programmes and States with mature nuclear power programmes.

249. The Regulatory Cooperation Forum (RCF), established in June 2010, provides services and activities as an integral part of the Agency's primary capacity building systems. It also provides support for State education and training programmes and the TSO expert community. It comprises a core group of 15 members with the European Commission and the Nuclear Energy Agency participating as observers. At its first plenary meeting during the 54th session of the General Conference, which was attended by 80 participants representing 40 States, the benefits of the RCF were discussed by both recipient and provider members. In addition, the results of the first phase of an RCF test case mission to the Jordan Nuclear Regulatory Commission (JNRC) were presented. It was agreed to continue the JNRC test case and to have providers fill the regulatory gaps identified during the first phase. The core group will meet in April 2011 to review the results of the JNRC test case. Another RCF plenary meeting is planned to be held during the 55th session of the IAEA General Conference.

G.8. International Safety Assessment Center (INSAC)

250. In 2009, the Agency established the International Nuclear Safety Assessment Centre (INSAC), formed to support Member States with established nuclear programmes as well as those considering starting new nuclear power programmes, with the overall objective of facilitating capacity building based upon the Agency safety standards. For example, using safety standards through validation of technical bases along with tools used for the technical evaluation of safety cases.

251. Through advisory and review services, networking and effective knowledge and information sharing, the INSAC can assist embarking Member States early in the NPP selection process to understand and determine the impacts of various technologies in accordance with the regulations that impact each design. By applying a flexible, graded approach, INSAC can facilitate Member States in any phase of the NPP process.

252. Within the Agency, INSAC services and activities are part of the Agency primary capacity building systems by coordinating and collaborating with Member State education and training programmes, technical and scientific support organizations (TSOs) and the expert community to efficiently and effectively strengthen States' capacity building efforts.

253. The development, in cooperation with G-SAN, of an advisory service for competency building in safety assessment and a methodology for the application of Integrated Risk Informed Decision Making Process are examples of recent achievements. Work continues in the development of methodologies for Safety Performance Indicators and Safety Goals and their Applications

G.9. Global Safety Assessments Network (G-SAN)

254. In 2010, a Global Nuclear Safety Assessment Network (G-SAN) was set up to facilitate focused collaboration on safety assessment capacity building in support of strengthening global nuclear safety; especially in the expanding and developing nuclear programmes worldwide, including: a) support to Member States in safety assessment knowledge management and capacity building based on Agency Safety Standards; and b) fostering safety assessment knowledge and experience exchange among Member States and cooperation on safety assessment issues important for nuclear power programmes.

255. The G-SAN web-based system provides organized access to technical references through links to appropriate websites, to databases or directly to materials stored on GSAN servers. From this, an expert forum is facilitated for discussion on important technical topics, focusing on questions faced by countries developing safety infrastructure and competency. The discussions on topics addressed are answered by leading experts in the field.

256. G-SAN organizes safety assessment projects with the goal of furthering safety assessment knowledge. Through active participation in the projects Member States have the opportunity to engage their technical staff in collaboration on global issues important to safety assessment methods and applications.

257. G-SAN also addresses the education and training needs in the area of safety assessments. Periodic training courses are provided as well as courses and workshops, based on specific needs that can be conducted over the internet to increase the audience and provide wider access to tools such as analytical training simulators.

G.10. Underground Research Facilities Network (URF)

258. Advanced Conceptual and Numerical Methods for Modelling Subsurface Processes training was provided by Sandia National Laboratories and US DOE (Albuquerque, USA, 18–25 June 2010); it included a site visit to the WIPP (Waste Isolation Pilot Plant) disposal facility. The Agency in cooperation with Japan Atomic Energy Agency (JAEA), and with support from ITC School of Underground Waste Storage and Disposal, Switzerland, prepared a course on Fundamentals of Geological Disposal (Horonobe and Tokai, Japan, 8–17 September 2010). Strengthening National Competencies in the Area of Stakeholder Dialogue for Radioactive Waste Disposal was subject of the workshop held in Las Vegas, USA (6–10 December 2010) and organized by Sandia National Laboratories. It was designed to enhance the human resource capabilities of Member States and their capacity to manage repository development programmes by understanding stakeholder concerns. The Annual General Meeting of the Network was held in Vienna from 2 to 4 March 2010.

G.11. Network on Environmental Management Remediation (ENVIRONET)

259. The Agency has launched the ENVIRONET (Network on Environmental Management and Remediation) in 2009. It is an information network dealing with legacy sites (existing contaminated sites) as well as life-cycle approaches for minimizing the need for future remediation measures due to

the operations of nuclear facilities and naturally occurring radioactive materials (NORM) industries. Topics to be covered by the ENVIRONET include: life-cycle planning of both facility operations and environmental remediation; project planning (quality control and assurance); data management, integration and communication; site characterization; modelling, risk assessment; remediation technology development and selection; monitoring; stakeholder involvement and communication; regulation and policy development; risk communication; stewardship, institutional control and funding.

G.12. Nuclear Waste Characterization Network (LABONET)

260. In 2010, to improve and further facilitate waste characterization competencies and capacities in Member States the network of laboratories, connecting specialists involved in nuclear waste characterization activities (LABONET) was established. The main objective of LABONET is to coordinate support to organizations or Member States with less advanced programmes on characterization of low and intermediate level waste, by making available the relevant skills, knowledge, managerial approaches and expertise from Member States with mature operating characterization laboratories.

Appendix 2
The Agency's Safety Standards: Activities during 2010

A. Introduction

261. Article III.A.6 of the IAEA Statute authorizes the Agency "to establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property (including such standards for labour conditions), and to provide for the application of these standards to its own operation as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency or at its request or under its control or supervision; and to provide for the application of these standards, at the request of the parties, to operations under any bilateral or multilateral arrangements, or, at the request of a State, to any of that State's activities in the field of atomic energy." The categories in the Safety Standards Series are Safety Fundamentals, Safety Requirements and Safety Guides.

262. One of the main achievements during 2010 was the completion of the first version of the document on Strategies and Processes for the Establishment of the IAEA Safety Standards (SPESS). It implements the roadmap on the long term structure of safety standards that provides for an improved structure and format for the Safety Requirements and a reference set for the collection of Safety Guides. It also includes all policy and strategy papers established by the Secretariat and approved by the Commission on Safety Standards (CSS). The SPESS document[6] describes the strategies, the processes and the associated responsibilities for the planning, development, review and revision, approval and establishment of the IAEA safety standards. The intent is to document and strengthen the process that started with the establishment of the CSS and the Safety Standards Committees (SSCs) in 1996, in order to achieve by the end of 2015 and to maintain beyond this time (1) a genuine integration of all areas in the Safety Standards Series, using a top-down approach based on the unified Safety Fundamentals; (2) a rationalization of the Series with a reasonable and manageable number of Safety Guides; (3) a significant improvement in 'user-friendliness'; and (4) a rigorous and efficient process for the establishment of additional standards and revision of existing ones.

263. Another main achievement was the review and revision by the SSCs and the CSS of the Terms of Reference of the four SSCs for their sixth term from 2011 to 2013. The revised Terms of Reference include a programmatic function to advise the Nuclear Safety Department on the programme for the development, review and revision of standards and on the programme for their application. More emphasis is also placed on the SSCs' role in relation to the feedback from the users of safety standards and the review of feedback reports prepared by the Secretariat.

264. In 2010, the SSCs and the CSS also discussed a proposal from the Secretariat for a more

[6] http://www-ns.iaea.org/downloads/standards/spess.pdf

systematic feedback collection and analysis process and a proposal for an improved review and revision process for the safety standards in the future.

265. A joint task force of the Advisory Group on Nuclear Security (AdSec) and the CSS was established in 2009, co-chaired by the Chairman of AdSec and the Chairman of the CSS, with terms of reference, including short and long term objectives. For the short term, the task force will follow the implementation of the measures to strengthen, and ensure the transparency of the process for the review and approval of Nuclear Security Series publications and will propose steps to establish in a progressive manner the necessary interface between draft nuclear safety and draft nuclear security related publications, including their cross-verification, to ensure their completeness and consistency. For the long term, the task force will study the feasibility of the establishment of a Nuclear Safety and Security Standards Series that would cover both nuclear safety and nuclear security.

266. The joint task force met in March and September 2010. At the March meeting, the task force concluded that there were no impediments to establishing nuclear safety and security standards, including one set of standards that would cover both nuclear safety and nuclear security in a thematic and application specific manner. The task force launched two preliminary tasks, namely (1) an analysis of the various thematic and operational areas of the nuclear security and nuclear safety domains, in order to determine the areas in which each may be unique or where they may overlap. In the areas where the safety and security domains overlap, the areas should be carefully examined in order to determine where associating the domains might be feasible; and (2) a mapping exercise to determine how to put together the current structure of general and specific safety standards, and the current structure of nuclear security recommendations. At the September meeting, the joint task force established a list of 12 criteria to be used to assess the feasibility of the different possible options for the future of the Nuclear Security Series and the Safety Standards Series. The joint task force also discussed the status and challenges for the establishment of a Nuclear Security Guidance Committee (NSGC).

267. In 2010, the Board of Governors established as Agency safety standards one additional General Safety Requirements in the new structure of safety requirements, Governmental, Legal and Regulatory Framework for Safety (GSR Part 1) and two Specific Safety Requirements, Disposal of Radioactive Waste (SSR-5) and Safety of Nuclear Power Plants: Commissioning and Operation (SSR-2.2).

268. The draft revisions of the International Basic Safety Standards Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources and of the Safety Requirements NS-R-1: Safety of Nuclear Power Plants: Design were approved by the Safety Standards Committees in 2010 for submission to the Commission on Safety Standards in 2011.

269. Regarding the processes associated with the safety standards programme, several significant improvements were observed. In particular, these improvements led to increased levels of openness, transparency and quality of the safety standard review process; greater involvement of the users and interested parties, including collaborators in industry (by participating in drafting meetings and by providing input for Member States' review of standards, and by providing feedback on their use); and greater interaction between the Member States, the SSCs and the CSS. In 2010, this was further complemented by an increased involvement of the Chairpersons of the SSCs and the CSS in the discussion of strategies and policies for the future development of the safety standards series and by increased reporting on the results of the review by the Secretariat's technical editors of the draft

standards prior to their final approval by the SSCs and the CSS. These improvements were facilitated by the use of information technologies and, in particular, the safety standards related web pages[7], which were also modernized in 2010.

270. Since the establishment of the CSS and the SSCs in 1996, 110 standards have been established (one Safety Fundamentals, 14 Safety Requirements and 95 Safety Guides); of these, 106 have been published. Forty-three further standards (three Safety Requirements publications and 40 Safety Guides) are being drafted or revised. A list of published Agency Safety Standards, indicating their status as of 31 December 2010, is attached as Annex I, and an up-to-date status report can be found on the Agency's website[8]. The full texts of published Agency Safety Standards are also available on the website through this status report.

B. Commission on Safety Standards (CSS)

271. The CSS, chaired by Mr Andre-Claude Lacoste, Chair of the French Nuclear Safety Authority, met twice in 2010, in March and in September/October and endorsed the submission of two Safety Requirements to the Board of Governors for approval: Disposal of Radioactive Waste (DS354) and Safety of Nuclear Power Plants: Commissioning and Operation (DS413). The CSS also endorsed eight Safety Guides: Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency (DS44), Geological Disposal of Radioactive Waste (DS334), Storage of Spent Fuel (DS371), Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report (DS396), National Strategy for Regaining Control over Orphan Sources and Improving Control over Vulnerable Sources (DS410), Orphan Sources and other Radioactive Material in the Metal Recycling and Production Industries (DS411), Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (DS417) and Establishing the Safety Infrastructure for a Nuclear Power Programme (DS424).

272. The CSS also approved in 2010 twelve Document Preparation Profiles (DPPs) for Safety Guides on Advisory Material for the forthcoming edition of Regulations for the Safe Transport of Radioactive Material (DS425), Radiation Protection of the Public and the Environment (DS432), Site Survey and Site Selection for Nuclear Installations (DS433), Radiation Safety of Radioisotope Production Facilities (DS434), Instrumentation and Control and Software Important to Safety for Research Reactors (DS436), the forthcoming edition of the Regulations for the Safe Transport of Radioactive Material (DS437), Addendum to NS-R-5, Appendix IV "Reprocessing Facilities" and Appendix V "Fuel Cycle Research and Development Facilities" (DS439), Design of Auxiliary and Supporting Systems in Nuclear Power Plants (DS440), Regulatory Control of Radioactive Releases to the Environment from Facilities and Activities (DS442), Commissioning for Nuclear Power Plants (DS446), Predisposal Management of Radioactive Waste from Fuel Cycle Facilities (DS447) and Predisposal Management of Radioactive Waste from Reactors (DS448).

[7] http://www-ns.iaea.org/standards/

[8] http://www-ns.iaea.org/downloads/standards/status.pdf

C. Nuclear Safety Standards Committee (NUSSC)

273. NUSSC, chaired by Mr Geoff Vaughan of the Nuclear Installations Inspectorate of the United Kingdom, met in June/July and in November of 2010. The first meeting of 2010 included a joint session with WASSC to discuss issues of common interest.

274. At its meetings, NUSSC approved ten draft Agency safety standards for submission to CSS: two Safety Requirements – the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (DS379, revision of the BSS) and Safety of Nuclear Power Plants: Design (DS414, revision of NS-R-1) and eight Safety Guides – Establishing the Safety Infrastructure for a Nuclear Power Programme (DS424); Volcanic Hazards in Site Evaluation for Nuclear Installations (DS405); Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (DS417); The Safety Case and Safety Assessment for Predisposal Management of Radioactive Waste (DS284); Safety Classification of Systems, Structures and Components in Nuclear Power Plants (DS367); Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report (DS396); The Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors (DS351); and Periodic Safety Review for Nuclear Power Plants (DS426).

275. NUSSC also approved three draft Agency safety standards for submission to Member States for comment, namely the forthcoming edition of the Safety Requirements – Regulations for the Safe Transport of Radioactive Material (revision of TS-R-1, DS437); a Safety Guide on Criticality Safety for Facilities and Activities Handling with Fissionable Material (DS407) and a Safety Guide on Safety in the Use and Modification of Research Reactors (DS397). In 2010, NUSSC also approved DPPs for 10 new or revised safety standards.

276. NUSSC reviewed the new Terms of Reference of the SSCs and prepared the 5th Three Year Report on NUSSC's activities in the period 2008–2010.

D. Radiation Safety Standards Committee (RASSC)

277. RASSC, chaired by Mr Sigurdur Magnusson of the Icelandic Radiation Protection Institute, met in June and November/December in 2010. One of RASSC's main tasks in 2010 was overseeing the on-going revision of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS). Following approval of the BSS by both NUSSC and TRANSSC at their meetings in November/December 2010, the joint RASSC/WASSC meeting held on 6-10 December 2010 spent two days discussing additional changes to the draft text. At the end of the meeting, there was a high degree of consensus that all of the technical issues had been adequately resolved and approval was given for the revised BSS to be submitted to the CSS for endorsement.

278. RASSC also approved six further draft safety standards for submission to CSS: the draft Safety Requirements on Safety of Nuclear Power Plants: Design (DS414, revision of NS-R-1) and five draft Safety Guides – Establishing the Safety Infrastructure for a Nuclear Power Programme (DS424); Safety Case and Safety Assessment for Predisposal Management of Radioactive Waste (DS284); National Strategy for Regaining Control over Orphan Sources and Improving Control over Vulnerable Sources (DS410), Orphan Sources and Other Radioactive Material in the Metal Recycling and Production Industries (DS411), Periodic Safety Review for Nuclear Power Plants (DS426).

279. RASSC approved for submission to Member States for comment one draft Safety Requirements, namely the forthcoming edition of the Regulations for the Safe Transport of Radioactive Material (DS437, revision of TS-R-1) and three draft Safety Guides: Criticality Safety for Facilities and Activities Handling Fissionable Material (DS407), Monitoring and Surveillance of Radioactive Waste Disposal Facilities (DS357), and External Expert Support on Safety Issues (DS429). Furthermore, RASSC approved several DPPs for new or revised safety standards.

280. RASSC continues to advise the Agency on emerging and topical issues in radiation protection. One such issue relates to the use of ionizing radiation to prevent malicious acts and terrorism, an example of which is security screening at airports. The current BSS states that such uses of ionizing radiation are deemed to be not justified. RASSC has recognized that a decision on the justification of such exposures is a matter for national governments, who have to take into account issues other than radiation protection in reaching a decision. This will be reflected in the revised BSS.

E. Transport Safety Standards Committee (TRANSSC)

281. TRANSSC, chaired by Mr E. William Brach of the US Nuclear Regulatory Commission, met in June and November/December in 2010, bringing to an end another three-year cycle of the Committee. In 2010 the full suite of transport standards was published for the first time since 1996. The work of TRANSSC now concentrates on reviewing the standards and ensuring they remain up to date, rather than developing new standards.

282. In 2010 TRANSSC approved the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Sources (DS379, revision of the BSS) and Safety of Nuclear Power Plants: Design (DS414, revision of NS-R-1) for submission to the CSS, together with a Safety Guide on Establishing the Safety Infrastructure for a Nuclear Power Programme (DS424).

283. TRANSSC approved to be sent for 120 day Member State comment the Regulations for the forthcoming edition of the Safe Transport of Radioactive Material (DS437, revision of TS-R-1) and three Safety Guides: Criticality Safety for Facilities and Activities Handling with Fissionable Material (DS407), the Advisory Material for the Agency Regulations for the Safe Transport of Radioactive Material (DS425); and External Expert Support on Safety Issues (DS429) The DPP for DS450 Safety Requirements on Decommissioning and Termination of Activities) was approved. Both the DPP for DS451 (addendum to TS-G-1.6) and the draft addendum itself were approved, the draft addendum being approved to send to Member States for 120 day comment.

284. TRANSSC also offered advice on the near term and longer term programme of work for the Agency, and in particular in relation to the safety standards work. A major area of work identified was ensuring harmonization with the provisions of the UN Model Regulations, in particular the common requirements that apply to all dangerous goods. A two year programme of work for 2011 to 2013 was approved.

F. Waste Safety Standards Committee (WASSC)

285. WASSC, chaired by Mr Thiagan Pather of the National Nuclear Regulator of South Africa, met twice in 2010, in June/July and December. The June/July meeting included joint sessions with NUSSC and in the meeting of December there were joint sessions with RASSC to discuss issues of common interest.

286. In 2010, WASSC approved for submission to the CSS two draft Safety Requirements publications: Protection against Ionizing Radiation and for the Safety of Radiation Sources (DS379, revision of the BSS), and Safety of Nuclear Power Plants: Design (DS414, revision of NS-R-1). WASSC also approved for submission to the CSS eight draft Safety Guides: The Safety Case and Safety Assessment for Predisposal Management of Radioactive Waste (DS284), The Safety Case and Safety Assessment for Disposal of Radioactive Waste (DS355, revision of WS-G-1.1), Volcanic Hazards in Site Evaluation for Nuclear Installations (DS405), National Strategy for Regaining Control over Orphan Sources and Improving Control over Vulnerable Sources (DS410), Orphan Sources and Other Radioactive Material in the Metal Recycling and Production Industries (DS411), Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (DS417), Establishing a Safety Infrastructure for a National Nuclear Power Programme (DS424) and Periodic Safety Review of Nuclear Power Plants (DS426).

287. In addition, WASSC approved for submission to Member States for comment the draft Safety Requirement Regulations for the forthcoming edition of the Safe Transport of Radioactive Material (DS437, revision of TS-R-1). WASSC also approved for submission to Member States for comment three draft Safety Guides: Criticality Safety for Facilities and Activities Handling Fissionable Material (DS407), Monitoring and Surveillance of Radioactive Waste Disposal Facilities (DS357), and External Expert Support on Safety Issues (DS429). WASSC also approved seven DPPs in 2010 and provided feedback and comments on several Safety Guides under development.

288. Additionally WASSC provided advice to the International Expert Group on Nuclear Liability (INLEX) on German proposals for the exclusion of small training and research reactors and nuclear installations being decommissioned from the Liability Conventions.

Annex I
The published Agency Safety Standards as of 31 December 2010

A. Safety Fundamentals

SF-1	Fundamental Safety Principles (2006) **Co-sponsorship:** Euratom, FAO, ILO, IMO, OECD/NEA, PAHO, UNEP, WHO

B. General Safety Standards (applicable to all facilities and activities)

GSR Part 1	Governmental, Legal and Regulatory Framework for Safety (2010)
GS-R-2	Preparedness and Response for a Nuclear or Radiological Emergency (2002) **Co-sponsorship:** FAO, OCHA, OECD/NEA, ILO, PAHO, WHO
GS-R-3	The Management System for Facilities and Activities (2006)
GSR Part 4	Safety Assessment for Facilities and Activities (2009)
GSR Part 5	Predisposal Management of Radioactive Waste (2009)
WS-R-3	Remediation of Areas Contaminated by Past Activities and Accidents (2003) (under revision)
WS-R-5	Decommissioning of Facilities Using Radioactive Material (2006)
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 (under revision)
GS-G-2.1	Arrangements for Preparedness for a Nuclear or Radiological Emergency (2007) **Co-sponsorship:** FAO, OCHA, ILO, PAHO, WHO
GS-G-3.1	Application of the Management System for Facilities and Activities (2006)
GS-G-3.2	The Management System for Technical Services in Radiation Safety (2008)
GS-G-3.3	The Management System for the Processing, Handling and Storage of Radioactive Waste (2008)
GSG-1	Classification of Radioactive Waste (2010)
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-1.7	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)
WS-G-2.3	Regulatory Control of Radioactive Discharges to the Environment (2000) (under

	revision)
WS-G-2.5	Predisposal Management of Low and Intermediate Level Radioactive Waste (2003) (under revision)
WS-G-2.6	Predisposal Management of High Level Radioactive Waste (2003) (under revision)
WS-G-3.1	Remediation Process for Areas Affected by Past Activities and Accidents (2007)
WS-G-5.1	Release of Sites from Regulatory Control on Termination of Practices (2006)
WS-G-5.2	Safety Assessment for the decommissioning of Facilities Using Radioactive Material (2008)
WS-G-6.1	Storage of Radioactive Waste (2006)
109	Intervention Criteria in a Nuclear or Radiation Emergency (1994) (under revision)

C. Specific Safety Standards (applicable to specified facilities and activities)

C.1 Nuclear Power Plants

NS-R-1	Safety of Nuclear Power Plants: Design (2000) (under revision)
NS-R-2	Safety of Nuclear Power Plants: Operation (2000) (under revision)
NS-R-3	Site Evaluation for Nuclear Installations (2003)
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-3.5	The Management System for Nuclear Installations (2009)
SSG-12	Licensing Process for Nuclear Installations (2010)
GS-G-4.1	Format and Content of the Safety Analysis report for Nuclear Power Plants (2004)
NS-G-1.1	Software for Computer Based Systems Important to Safety in Nuclear Power Plants (2000) (under revision)
NS-G-1.3	Instrumentation and Control Systems Important to Safety in Nuclear Power Plants (2002) (under revision)
NS-G-1.4	Design of Fuel Handling and Storage Systems for Nuclear Power Plants (2003)
NS-G-1.5	External Events Excluding Earthquakes in the Design of Nuclear Power Plants (2004)
NS-G-1.6	Seismic Design and Qualification for Nuclear Power Plants (2003)
NS-G-1.7	Protection against Internal Fires and Explosions in the Design of Nuclear Power Plants (2004)
NS-G-1.8	Design of Emergency Power Systems for Nuclear Power Plants (2004) (under revision)
NS-G-1.9	Design of the Reactor Coolant System and Associated Systems in Nuclear Power Plants (2004)
NS-G-1.10	Design of Reactor Containment Systems for Nuclear Power Plants (2004)

NS-G-1.11	Protection against Internal Hazards other than Fires and Explosions in the Design of Nuclear Power Plants (2004)
NS-G-1.12	Design of the Reactor Core for Nuclear Power Plants (2005)
NS-G-1.13	Radiation Protection Aspects of Design for Nuclear Power Plants (2005)
NS-G-2.1	Fire Safety in the Operation of Nuclear Power Plants (2000)
NS-G-2.2	Operational limits and Conditions and Operating Procedures for Nuclear Power Plants (2000)
NS-G-2.3	Modifications to Nuclear Power Plants (2001)
NS-G-2.4	The Operating Organization for Nuclear Power Plants (2002)
NS-G-2.5	Core Management and Fuel Handling for Nuclear Power Plants (2002)
NS-G-2.6	Maintenance, Surveillance and In-Service Inspection in Nuclear Power Plants (2002)
NS-G-2.7	Radiation Protection and Radioactive Waste Management in the Operation of Nuclear Power Plants (2002)
NS-G-2.8	Recruitment, Qualification and Training of Personnel for Nuclear Power Plants (2003)
NS-G-2.9	Commissioning for Nuclear Power Plants (2003) (under revision)
NS-G-2.10	Periodic Safety Review of Nuclear Power Plants (2003) (under revision)
NS-G-2.11	A System for the Feedback of Experience from Events in Nuclear Installations (2006)
NS-G-2.12	Ageing Management for Nuclear Power Plants (2009)
NS-G-2.13	Evaluation of Seismic Safety for Existing Nuclear Installations (2009)
NS-G-2.14	Conduct of Operations at Nuclear Power Plants (2008)
NS-G-2.15	Severe Accident Management Programmes for Nuclear Power Plants (2009)
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) (under revision)
SSG-9	Seismic Hazards in Site Evaluation for Nuclear Installations (2010)
NS-G-3.4	Meteorological Events in Site Evaluation for Nuclear Power Plants (2003) (under revision)
NS-G-3.5	Flood hazard for Nuclear Power Plants on Coastal and River Sites (2004) (under revision)
NS-G-3.6	Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants (2005)
SSG-2	Deterministic Safety Analysis for Nuclear Power Plants (2009)
SSG-3	Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants (2010)
SSG-4	Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants (2010)

WS-G-2.1	Decommissioning of Nuclear Power Plants and Research Reactors (1999) (under revision)
79	Design of Radioactive Waste Management Systems at Nuclear Power Plants (1986) (under revision)

C.2. Research Reactors

NS-R-3	Site Evaluation for Nuclear Installations (2003)
NS-R-4	Safety of Research Reactors (2005)
SSG-9	Seismic Hazards in Site Evaluation for Nuclear Installations (2010)
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-3.5	The Management System for Nuclear Installations (2009)
SSG-12	Licensing Process for Nuclear Installations (2010)
NS-G-2.11	A System for the Feedback of Experience from Events in Nuclear Installations (2006)
NS-G-2.13	Evaluation of Seismic Safety for Existing Nuclear Installations (2009)
NS-G-4.1	Commissioning of Research Reactors (2006)
NS-G-4.2	Maintenance, Periodic Testing and Inspection of Research Reactors (2006)
NS-G-4.3	Core Management and Fuel Handling for Research Reactors (2008)
NS-G-4.4	Operational Limits and Conditions and Operating Procedures for Research Reactors (2008)
NS-G-4.5	The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors (2008)
NS-G-4.6	Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors (2008)
WS-G-2.1	Decommissioning of Nuclear Power Plants and Research Reactors (1999) (under revision)
SSG-10	Ageing Management for Research Reactors (2010)
35-G1	Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report (1994) (under revision)
35-G2	Safety in the Utilization and Modification of Research Reactors (1994) (under revision)

C.3. Fuel Cycle Facilities

NS-R-3	Site Evaluation for Nuclear Installations (2003)
NS-R-5	Safety of Nuclear Fuel Cycle Facilities (2008) (under revision)

SSG-9	Seismic Hazards in Site Evaluation for Nuclear Installations (2010)
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-3.5	The Management System for Nuclear Installations (2009)
SSG-12	Licensing Process for Nuclear Installations (2010)
NS-G-2.11	A System for the Feedback of Experience from Events in Nuclear Installations (2006)
NS-G-2.13	Evaluation of Seismic Safety for Existing Nuclear Installations (2009)
SSG-5	Safety of Conversion Facilities and Uranium Enrichment Facilities (2010)
SSG-6	Safety of Uranium Fuel Fabrication Facilities (2010)
SSG-7	Safety of Uranium and Plutonium Mixed Oxide Fuel Fabrication Facilities (2010)
WS-G-2.4	Decommissioning of Nuclear Fuel Cycle Facilities (2001) (under revision)
116	Design of Spent Fuel Storage Facilities (1995) (under revision)
117	Operation of Spent Fuel Storage Facilities (1995) (under revision)

C.4. Radioactive Waste Disposal Facilities

WS-R-1	Near Surface Disposal of Radioactive Waste (1999) (under revision)
WS-R-4	Geological Disposal of Radioactive Waste (2006) (under revision)

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-3.4	The Management System for the Disposal of Radioactive Waste (2008)
SSG-1	Borehole Disposal Facilities for Radioactive Waste (2009)
WS-G-1.1	Safety Assessment for Near Surface Disposal of Radioactive Waste (1999) (under revision)
111-G-3.1	Siting of Near Surface Disposal Facilities (1994) (under revision)
111-G-4.1	Siting of Geological Disposal Facilities (1994) (under revision)

C.5. Mining and Milling

RS-G-1.6	Occupational Radiation Protection in the Mining and Processing of Raw Materials (2004)
WS-G-1.2	Management of Radioactive Waste from the Mining and Milling of Ores (2002) (under revision)

C.6. Applications of Radiation Sources

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 (under revision)
GS-G-1.5	Regulatory Control of Radiation Sources (2004) **Co-sponsorship:** FAO, ILO, PAHO, WHO
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 (under revision)
RS-G-1.9	Categorization of Radioactive Sources (2005)
RS-G-1.10	Safety of Radiation Generators and Sealed Radioactive Sources (2006) **Co-sponsorship**: ILO, PAHO, WHO
WS-G-2.2	Decommissioning of Medical, Industrial and Research Facilities (1999) (under revision)
WS-G-2.7	Management of Waste from the Use of Radioactive Materials in Medicine, Industry, Agriculture, Research and Education (2005)
SSG-8	Radiation Safety of Gamma, Electron and X Ray Irradiation Facilities (2010)

C.7. Transport of Radioactive Material

TS-R-1	Regulations for the Safe Transport of Radioactive Material 2009 Edition (2009) (under revision)
TS-G-1.1 Rev1	Advisory Material for the Agency Regulations for the Safe Transport of Radioactive Material (2008) (under revision)
TS-G-1.2	Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material (2002)
TS-G-1.3	Radiation Protection Programmes for the Transport of Radioactive Material (2007)
TS-G-1.4	The Management System for the Safety Transport of Radioactive Material (2008)
TS-G-1.5	Compliance Assurance for the Safe Transport of Radioactive Material (2009)
TS-G-1.6	Schedules of Provisions of the Agency Regulations for the Safe Transport of Radioactive Material (2005 Edition) (2010)