IAEA
Atoms for Peace

Board of Governors
General Conference

GOV/2008/34-GC(52)/2
Date: 6 August 2008

General Distribution
Original: English

For official use only

Item 13 of the Conference's provisional agenda
(GC(52)/1)

Measures to strengthen international cooperation in nuclear, radiation and transport safety and waste management

Report by the Director General

Summary

Pursuant to resolution GC(51)/RES/11, a report including the following subjects is submitted to the Board of Governors and the General Conference for their consideration:

- Global nuclear safety regime (including the Agency's safety standards and education and training);
- Emergency preparedness and response;
- Civil liability for nuclear damage
- Nuclear installation safety;
- Radiation safety;
- Safety and security of radioactive sources;
- Safety of radioactive waste management;
- Safe decommissioning of nuclear facilities and other facilities using radioactive material;
- Remediation and rehabilitation of contaminated sites; and
- Transport safety.

Recommended Action

- It is recommended that the Board of Governors and the General Conference consider and take note of this report.

Measures to strengthen international cooperation in nuclear, radiation and transport safety and waste management

Report by the Director General

A. Global nuclear safety regime

A.1. Overview

1. The global nuclear safety regime is being continuously improved to maintain a high level of safety worldwide. The following sections of this report highlight results of Agency activities relevant to strengthening the principal elements of the global nuclear safety regime: support for the implementation of international instruments, development and application of the Agency's safety standards, and support for the strengthening of national safety infrastructures including capacity building and safety networking.

2. The international safety commitments have been effectively strengthened through the review meetings of the contracting parties of the safety conventions and experience sharing in the areas covered by codes of conduct. The Agency safety standards have set the global reference for the high safety level required for the use of nuclear power and other applications. The transparency of the international safety reviews carried out by the Agency based on its safety standards and of its related safety actions has contributed to enhancing nuclear safety at the national and global level. Regional safety networks have improved the sharing of knowledge and experience and are being increasingly used to support capacity building in Member States. The latter is of particular importance for Member States embarking on nuclear power to establish the required safety infrastructure and for Member States with mature nuclear programmes to maintain a competent workforce.

A.2. Safety conventions and codes of conduct

3. The Contracting Parties to the Convention on Nuclear Safety held their 4th review meeting in April 2008. Efforts are made to increase the number of Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Information exchange on secure websites managed by the Agency is aimed to ensure continuity between the triennial Review Meetings. Under the Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, a unified global system is being developed to streamline communication among Member States. Countries also exchange experience related to the application of the Code of Conduct on the Safety and Security of Radioactive Sources and the Code of Conduct on the Safety of Research Reactors.

A.3. Development of safety standards

A.3.1. Long term structure for the safety standards

4. At the end of 2007, the four safety standards committees and the Commission on Safety Standards (CSS) finished their fourth terms. During these terms, the implementation of the Action Plan for the Development and Application of IAEA Safety Standards — approved by the Board of Governors in March 2004 — was completed. The committees and the CSS have been re-established for their fifth terms, with the chairman of INSAG participating in the CSS as an observer for the first time.

5. At its meeting in May 2008, the CSS approved the road map for the development of a long-term structure for the safety standards, which will be developed based on a top-down approach to ensure a logical relationship between the Agency's Safety Fundamentals No. SF-1, *Fundamental Safety Principles*, and the Safety Requirements. Central to the long term structure is the establishment of a general Safety Requirements document integrating all thematic areas in a coherent and harmonized set of publications, complemented by a series of facility and activity specific Safety Requirements. The complete set of Safety Requirements will address all radiation exposure situations (actual and potential) and cover all facilities and activities. The treatment of naturally occurring radioactive material, radon and medical activities will be carefully considered and enhanced as appropriate.

6. The long-term structure will keep the 'fundamentals, requirements, guides' categorization and take into account the need for stability in regulatory approaches. The future collection of safety standards should also be 'user friendly' with a manageable number of publications, each as concise as possible and addressing essential safety issues.

7. It is recognized that the process leading to the long-term structure should be stepwise and flexible. It should include an evaluation of the overall impacts of any changes for the Member States and the Secretariat and of the resources needed.

A.3.2. Revision of the Basic Safety Standards

8. The Agency, in collaboration with the co-sponsors and potential co-sponsors, continued its work on the revision of the *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* (BSS). Following a technical meeting held in July 2007 in Vienna, the Secretariat prepared a first draft which was discussed in broad terms at the safety standards committee meetings in late 2007. The safety standards committees endorsed the decisions made at the technical meeting regarding the proposed structure of the revised BSS and the 2007 recommendations of the International Commission on Radiological Protection (ICRP). Further drafting and review meetings with potential joint sponsoring organizations were held in November 2007, and in March, April and May 2008, and draft 1.0 of the revised BSS was available at the end of June 2008. Draft 1.0 will be considered by the safety standards committees at their autumn 2008 meetings. As requested by the General Conference in resolution GC(51)/RES/11, the Agency has prepared a document to justify potential changes from the current BSS, which will be reviewed by the safety standards committees.

A.4. Application of the safety standards

9. The Agency supports Member States in applying the safety standards through its safety review and advisory services, education and training opportunities, and networking activities. Further detail on the application of safety standards is discussed in the relevant sections of this report.

A.4.1. Integrated Regulatory Review Service

10. The Integrated Regulatory Review Service (IRRS), the Agency's legal and governmental infrastructure related peer review service, continues to provide Member States with advice and assistance in strengthening the effectiveness of their regulatory infrastructures. The service utilizes a modular approach such that Member States can select the appropriate areas for detailed and thorough review. The use of senior regulators from Member States as peer reviewers provides for sharing information and experiences regarding various regulatory approaches as well as contributing to the harmonization of regulatory systems worldwide. A vital and integral part of the IRRS process is the regulatory self-assessment against international safety standards. Member States can thus take corrective actions as necessary to enhance the overall regulatory effectiveness and ultimately improve nuclear safety.

11. In order to optimize resources and to provide a better service to Member States in an integrated and harmonized manner, the former Radiation Safety and Security of Radioactive Sources Infrastructure Appraisal (RaSSIA) missions are now offered as part of the IRRS service, allowing Member States without nuclear power programmes to benefit from IRRS missions.

12. Over the period covered by this report, the Agency conducted three IRRS missions to countries with mature nuclear power programmes, including a mission to Spain that was the first to include nuclear security as one of the review areas. Several reviews of reduced scope have also been conducted in countries building radiation and waste safety regulatory systems.

13. The Spanish Nuclear Safety Council (CSN), in cooperation with the Agency, has agreed to conduct a workshop on "Lessons Learned from the IRRS Mission to Spain" in November 2008. This workshop will follow up on the March 2007 workshop in Paris.

14. Senior regulators had previously recognized the value of establishing a network for exchanging regulatory experiences and practices to enhance safety. Since January 2008, the Agency has been developing a regulatory information sharing network. The scope of the network and the information platforms are currently being finalized. The results of IRRS missions will be made available through the network.

A.5. Capacity building

A.5.1. Introduction

15. Safety is a precondition for the sustainable use of nuclear technology. The Agency continued to support Member State efforts to establish the required competent workforces, leadership and management for safety. Capacity building is addressed at organizational, national and regional levels, and includes specific advisory services. Opportunities for sharing knowledge and experience are provided by the Agency through safety reviews conducted at the request of Member States, training courses and workshops, and national and regional networks. The Agency is also assisting Member States to identify knowledge gaps and to develop national programmes for sustainable education and training programmes, as identified in the strategic plan endorsed by the General Conference in resolution GC(45)/RES/10.C.

A.5.2. Education and training in nuclear safety

16. Education and training courses and workshops are based on identified needs and priorities of Member States for the development of competence in nuclear safety. This includes the preparation and maintenance of training materials based on the Agency's safety standards, and support for the establishment of national and regional training centres and knowledge networks. The Agency also

supports the development of harmonized training methodologies and policies for competence development at national and regional levels.

17. In 2007, the Agency launched a multimedia based project aimed at capturing and disseminating the knowledge of experts and experience of Member States in implementing the Agency's safety standards. A set of video lectures and associated training material was produced in support of the safety standards for management systems. Agency workshops on selected subjects were videoed and, with the PowerPoint presentation files, copied onto CDs for Member States.

18. In the framework of the Asian Nuclear Safety Network, a strategy was agreed for harmonizing the evaluation of training needs and training implementation based on the Agency's safety standards. It was also agreed that information sharing and prioritizing nuclear safety aspects for building competence at a regional level needs to be improved. A common general framework for training will serve as a reference and basis for harmonized national training frameworks. The services and training courses available on the Internet have been assessed and will be enhanced with account taken of feedback and recommendations from Member States.

19. Particular attention has been given to identifying competence, training and human resource development needs for regulatory bodies. A technical meeting on training for regulatory bodies in countries operating nuclear power plants was held at the end of 2007 in Vienna. Meeting participants encouraged the Agency to hold similar meetings regularly to identify Member States' needs and challenges, as well as to share experience and knowledge, and to promote regional cooperation. The Agency also provided, on request, advice to a number of regulatory bodies on building and maintaining knowledge and competence, with a view to developing the necessary safety infrastructure.

A.5.3. Education and training in radiation, transport and waste safety

20. A steering committee oversees the implementation of the Agency's education and training activities in the area of radiation, transport and waste safety.

21. A detailed Education and Training Appraisal (EduTA) mission took place in Morocco, which hosts the Agency postgraduate educational course in radiation protection and the safety of radiation sources as well as other specialized courses in French for the Africa region. The appraisal confirmed that the Agency training delivered at the training centre follows international standards, and that the centre demonstrates good practices indicating sustainability for education and training programmes in the region.

22. A long-term agreement in the area of education and training between the Agency and Argentina is at an advanced stage of development and is expected to be finalized by the end of 2008. Similar agreements are expected in the future with Regional Training Centres hosting Agency postgraduate educational and specialized training courses in other countries.

23. A systematic assessment was made of training needs for radiation safety in Member States, in order to have a global understanding of these needs and also to encourage all Member States to develop and implement strategies for building competence in radiation safety.

24. An inter-centre network to share information and experience between the Agency and steering committee members (representing regional, collaborating and many national training centres) is now operational and its layout and functions have been improved to facilitate its use.

25. The Agency continued its efforts towards capacity building in Member States by running postgraduate educational courses in radiation protection and the safety of radiation sources in Argentina, Belarus, Greece, Malaysia, South Africa and Syrian Arab Republic, as well as many short courses in specialized aspects of radiation safety. Material was made available for participants prior to

attending the postgraduate courses, and training material for lecturers was made available in Arabic, English, Russian and Spanish. A standard syllabus and teaching aids were developed for radiation protection officer training and a number of train-the-trainers workshops were run.

26. Additional training modules, based on the Agency safety standards, were developed for the remediation of contaminated sites, decommissioning of nuclear facilities, safety of predisposal and disposal waste management, management of mining and milling waste, and management of naturally occurring radioactive material residues. More than 30 training packages on a wide range of radiation safety topics are now complete and have been validated by the steering committee. Thirty per cent of the validated training packages have been translated to all Agency official languages. A large number of training packages were disseminated to Member States on request. The six training packages for regulatory inspectors have been updated.

27. Material developed under a Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Safety and Technology (RCA) project on distance learning in radiation protection and the safety of radiation sources is now available in Web format and is available for implementation of e-learning. A workshop is planned for 2008 to train the representatives of the Regional Training Centres on the implementation of e-learning in cooperation with the Research Centre for Energy, Environment and Technology (CIEMAT) in Spain.

28. Under the Action Plan for Occupational Radiation Protection, illustrative materials in radiation protection for radiation workers and reference materials for labour instructors have been developed and are under review.

29. The Agency organized over 20 regional training events relating to radiation, transport and waste safety within the framework of technical cooperation regional projects, national projects and regional cooperation agreements during the reporting period.

30. The Ghana Atomic Energy Commission requested a formal appraisal of the radiation protection education programme at the School of Nuclear and Allied Sciences to qualify as an Agency Regional Training Centre to contribute towards meeting the needs of English speaking countries in Africa.

31. An education and training support group has been established in the Secretariat to provide in-house coordination and advice on education and training activities delivered by the Agency to Member States, from the planning stage through implementation, to reporting and evaluation. This will avoid duplication, optimize the use of resources, and continuously improve the effectiveness of the Agency's education and training activities. Working groups will address specific aspects of education and training.

A.5.4. Education and training in emergency preparedness and response

32. To support the implementation of the Agency's *Manual for First Responders to a Radiological Emergency*, training materials were developed, translated into French, Russian and Spanish, and successfully used in all regions. The same materials are now being transferred in Web format for implementation through e-learning.

33. The Agency offers training in different aspects of emergency preparedness and response utilizing standardized set of training materials. In 2008, the Agency organized over 15 regional and national training events in emergency preparedness and response within the framework of technical cooperation regional and national projects, regional cooperation agreements and other programmes during the reporting period.

A.6. Networking for safety

A.6.1. Global nuclear safety network

34. Thematic and regional safety networks are maturing and are being increasingly used for capturing, analysing and sharing nuclear knowledge. Among them are the Asian Nuclear Safety Network (ANSN) and the Ibero-American Radiation Safety Network. The ANSN is also actively used for planning, implementation and feedback of the Extrabudgetary Programme on the Safety of Nuclear Installation in South East Asia, Pacific and Far East Countries (EBP Asia). Other safety networks and information systems are described on a thematic basis in the following sections of this report.

35. In 2007, the Agency started a broad review of the status and trends of nuclear safety networks to identify opportunities to make better use of the synergies among the networks to continuously enhance nuclear safety. In this context, a global nuclear safety network is emerging based on existing networks and information resources. Work is currently under way to establish a common platform based on the 'Wikipedia' approach to enhance the outreach of existing networks and information resources, both at the national and at the international level.

A.6.2. Asian Nuclear Safety Network (ANSN)

36. The ANSN consists of hubs in China, Japan and Republic of Korea, and national centres in Indonesia, Malaysia, Philippines, Thailand and Vietnam. Australia, France, Germany, Japan, Republic of Korea and the USA provide in-kind and/or financial support. In December 2007, a technical meeting chaired by Japan reviewed the activities implemented under EBP Asia. Results achieved were recognized by the participating countries (Australia, China, France, Germany, Indonesia, Japan, Republic of Korea, Malaysia, Philippines, Thailand, USA and Vietnam) and the work plan for 2008 was agreed. It was also noted with appreciation that the role of the topical groups is increasing, in particular for the implementation of regional activities, the creation of new knowledge to be shared in the ANSN, and the review of self-assessments performed by the member countries in the framework of the integrated safety evaluation.

37. The Agency's ANSN website (www.ansn.org) was developed considerably and now contains more than 5000 files of reference safety material from past EBP Asia activities. Some 1000 users are registered and consulted the network over 600 000 times in 2007.

38. The ANSN has now reached maturity as a network for pooling and sharing nuclear safety knowledge among the scientific technical community. It is also used as a management tool for planning, implementing and assessing EBP Asia activities. Considering the expansion of nuclear power programmes in Asia, and the interest of some countries in the region to embark on nuclear power programmes, the ANSN is expected to play an increasingly important role as a regional forum for senior decision makers to share strategies and experience to enhance nuclear safety. In April 2008, a meeting — ANSN Nuclear Safety Strategy Dialogue — was convened in Vienna by the Agency to explore these ideas. The main topics discussed by senior participants from ANSN countries included: capacity building, safety assessment capability, and emergency preparedness and response. New directions for future ANSN activities were agreed, including the creation of a new topical group focusing on the initial stages of nuclear safety infrastructure development.

39. In January 2008, Agency staff attended a meeting of the Association of Southeast Asian Nations (ASEAN) Nuclear Energy Safety Sub-Sector Network to explore opportunities for the utilization of the ANSN in the frame of ASEAN work.

40. In June 2008, at the ASEAN+3 Forum on Nuclear Energy Safety, the ANSN was discussed extensively. Several countries involved in the development of new nuclear power programmes

indicated that the ANSN was already being used as a significant resource and that they were interested in working with the Agency to enhance it further. Agency representatives expressed the willingness to further develop the ANSN to better meet the needs of the region.

A.6.3. Ibero-American Nuclear and Radiation Safety Network

41. The Ibero-American Nuclear and Radiation Safety Network was developed in the framework of an Agency extrabudgetary programme and the Ibero-American Forum of Radiological and Nuclear Regulatory Agencies. The 2008 plenary meeting of the Forum was held in Montevideo, Uruguay, with the participation of Argentina, Brazil, Cuba, Mexico, Spain and Uruguay. Chile participated as an applicant to join the Forum and was accepted as a member as of 15 May 2008. Argentina assumed the presidency of the Forum for 2008–2009. The Network is now hosted by Brazil and the transfer of the Network to full operation by the Forum was completed in 2008. The Network and results of the various projects under the Forum will be presented at the 12th World Congress of the International Radiation Protection Association (IRPA 12) in October 2008 in Buenos Aires, Argentina.

42. Two projects have been implemented on safety and regulatory control in radiotherapy. The first one on probabilistic safety assessment (PSA) for radiotherapy treatments with accelerators finished at the end of 2007. The second project consists of using operational experience, gained through lessons learned from accidental exposure and from the results of PSAs, to provide safety recommendations for radiotherapy that are applicable at any hospital. In 2007, the safety recommendations for brachytherapy were completed and in 2008 a study for accelerators was initiated that will be finished by October 2008.

43. A project on the continuous improvement of the regulatory control of medical exposure, initiated in 2006, will be completed by October 2008. A group of experts has drafted a document on self assessment of regulatory programmes, containing an analysis of those infrastructure deficiencies that go beyond the responsibilities of individual users of radiation, and, therefore, present an obstacle to compliance with international safety requirements. Some of these deficiencies can be resolved by cooperation between regulatory and health authorities. This cooperation will be explored at an IRPA 12 satellite event and results from the project will also be disseminated at IRPA 12.

44. Following a discussion held between representatives of the Forum and the Agency during the 51st regular session of the General Conference, an activity was approved to disseminate results of the Forum's technical projects and to apply them through pilot studies in other Member States of the region so that other Member States can benefit from the Forum's efforts. This activity will be implemented under a technical cooperation project, starting in the fourth quarter of 2008, and will focus on continuous improvement of the regulatory control of medical exposure and on avoiding accidental exposure in radiotherapy.

45. The first project on nuclear safety was approved by the plenary of the Forum in 2008. It addresses ageing and licensing of life extension of nuclear power plants. The project will benefit from the fact that one nuclear power plant in Spain is undergoing a safety assessment for possible authorization (or operation permit) beyond the current 40 year life. The experience gained from this process provides an opportunity to share knowledge and experience for the benefit of all Forum members.

B. Emergency preparedness and response

B.1. The Agency's Incident and Emergency Centre (IEC)

46. The IEC functions as the global focal point for international preparedness, communication and response to radiation incidents and emergencies. With the charter to respond to both safety and security related radiation events, the IEC provides round the clock services to Member States through the provision of coordinated international response and assistance. Under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Early Notification and Assistance Conventions), the IEC coordinates the actions within the Agency, as well as with other international organizations. In 2008, the Agency initiated the development of the global unified system, which streamlines the Agency's current reporting systems and provides for a reliable and secure means of exchanging and sharing information and data for routine communications, exercises, notifications, alerts and responses to radiation events.

B.2. Long-term sustainability of the international incident and emergency response system

47. The International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies enters its third and final phase with the establishment of the Working Group on Sustainable Development. The Working Group met in June 2008 to determine its roles and activities through December 2009, which are directly related to the long-term sustainability of the international incident and emergency response system. This Working Group is the follow-up to the Action Plan's work on international communication and assistance. In addition, as requested by the General Conference and the competent authorities identified under the Early Notification and Assistance Conventions, meetings of the competent authorities will be held every two years.

B.3. Response Assistance Network (RANET)

48. In 2007, the Agency bolstered the Response Assistance Network (RANET), established to render appropriate and timely assistance to a country affected by a radiation emergency. The Director General sent a letter to Member States encouraging them to register their capabilities, which has received a positive response. To date, more than ten countries with a very broad geographic representation have registered their response capabilities and several others have pledged to do so. All Member States are encouraged to sign on to RANET. The Agency will soon take the next steps in helping to coordinate and harmonize capabilities registered under RANET.

B.4. Strengthening Member States' preparedness for radiation emergencies

49. In 2007, the Agency conducted three Emergency Preparedness Review (EPREV) missions, a service offered to appraise preparedness for radiation emergencies in Member States. Previously, only one EPREV mission per year had been logistically and financially feasible but with additional funding more EPREV missions were successfully carried out. Part of this funding came from the European Bank for Reconstruction and Development, which enabled an EPREV mission to the Murmansk region of the Russian Federation. The Agency encourages further resources to be provided in this area to enable the further provision of this essential service to Member States.

50. In July 2008 the Agency tested the international response to nuclear emergencies in a full-scale nuclear emergency exercise based on simulated nuclear accident at Laguna Verde nuclear power plant in Mexico and referred to as Convention Exercise – ConvEx-3. A total of 75 Member States and nine international organizations[1] joined the 38 hour exercise to evaluate national and international response preparedness. The exercise helped to identify shortcomings in the Agency's, national and international emergency response systems that might hamper the response to minimize the consequences of a nuclear accident. Findings and lessons identified will further improve the international nuclear emergency response system.

B.5. Preparing first responders to a radiological emergency

51. The *Manual for First Responders to a Radiological Emergency* continues to be one of the most downloaded publications on the Agency's website and is being translated into several languages (the latest being Arabic and French) and converted to various formats to make it more accessible to Member States. A recent improvement to the personal digital assistant (PDA) version is the introduction of a web browser based tool enabling more user-friendly access while in the field. The manual provides practical guidance for those who will respond during the first few hours to a radiological emergency and for national officials who would support this early response. The manual is co-sponsored by the International Technical Committee for the Prevention and Extinguishing of Fires (CTIF), Pan America Health Organization (PAHO) and World Health Organization (WHO). A website[2] based on the manual has been created and a 'first responders' suite' containing the manual and other training material is under development.

B.6. International Nuclear Event Scale (INES)

52. INES has been used for more than 15 years and during this period has been extended and adapted to meet the growing need for communication of the significance of all events associated with the transport, storage and use of radioactive material and radiation sources. In July 2008, *The International Nuclear Event Scale (INES) User's Manual*, which consolidates additional guidance, a clarification document, examples and comments on the continued use of INES, was endorsed by the INES Advisory Committee and the INES national officers representing INES Member States.

C. Civil liability for nuclear damage

53. The 8th meeting of the International Expert Group on Nuclear Liability (INLEX), established by the Director General, met from 21–23 May 2008 at IAEA Headquarters in Vienna. The opening day of the meeting was marked by an important milestone in the field of international nuclear liability; namely the deposit by the US of its instrument of ratification of the Convention on Supplementary Compensation for Nuclear Damage (the CSC).

54. Major topics discussed during the meeting included, inter alia, INLEX outreach activities, the ongoing EC Impact Assessment on Nuclear Liability and the German proposal to allow Contracting

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[1] European Commission; European Police Office; Food and Agriculture Organization of the United Nations; International Civil Aviation Organization; International Criminal Police Organization; Nuclear Energy Agency of the OECD; World Health Organization; World Meteorological Organization; Pan American Health Organization.

[2] http://www-ns.iaea.org/tech-areas/emergency/iec/frg/

Parties to exclude certain small research reactors and nuclear installations being decommissioned from the scope of application of the Vienna Convention (and possibly also the CSC).

55. On the outreach activities, the meeting reviewed the results of the third Regional Workshop on Liability for Nuclear Damage held in Sun City, South Africa, 11–13 February 2008 and noted the growing interest expressed by workshop participants on the mechanisms associated with developing implementing national nuclear liability legislation in accordance with the international nuclear liability instruments. Efforts will be made to include further detail on this issue in future workshops and some follow-up mechanism such as the provision of tailored bilateral assistance to countries that are contemplating the introduction of nuclear power programs will have to be enhanced. In this context, the Secretariat has suggested that the next workshop should be organized for countries that have expressed an interest in launching a nuclear power program.

56. Since December 2007 the Secretariat has been involved in discussions with the European Commission on an ongoing study launched by the Commission aimed at identifying the possible impacts of the different policy options that are open to the Commission with respect to trying to achieve a uniform EU regime on nuclear third party liability. With a growing number of European countries having recently requested the Commission to give its opinion on the construction of new nuclear power plants and the current state of the nuclear liability regime within the EU, the matter of harmonization has resurfaced in the EU.

57. The meeting expressed concern over the current alternatives proposed by the European Commission, especially the suggestion that Euratom could adopt a separate Directive on liability. The meeting agreed that the Secretariat should continue to follow up this matter and encourage the European Commission to continue to look at all the possible avenues available, including those that would contribute to strengthening the global nuclear liability regime such as the CSC or the Joint Protocol.

58. Regarding the German proposals to allow Contracting Parties to exclude certain small research reactors and nuclear installations being decommissioned from the scope of application of the Vienna Convention (and possibly the CSC as well), the meeting took note that similar proposals had also been introduced by Germany in the framework of the Paris Conventions on nuclear liability adopted under OECD/NEA auspices. The meeting agreed that a uniform approach between the Paris regime and the Vienna regime should be pursued and called for continued cooperation between the OECD/NEA and the Agency. As a next step, the German proposal will be forwarded for technical evaluation to the fall meetings of the Agency's Waste Safety Standards Committee (WASSC) and Radiation Safety Standards Committee (RASSC).

D. Nuclear installation safety

D.1. 4th Review Meeting of the Convention on Nuclear Safety

59. The Agency gave support to the Contracting Parties to the Convention on Nuclear Safety (CNS) for their Organizational Meeting in September 2007 and the Review Meeting in April 2008. At the request of the 3rd Review Meeting of the CNS, the Agency also provided Contracting Parties with a report entitled *Major Issues and Trends in Nuclear Safety*, which summarizes the significant issues, developments and trends in enhancing nuclear safety derived from the Agency's safety review services over the past three years. This report was intended to help the Contracting Parties to prepare their national reports. The Agency also produced and distributed a report to Contracting Parties

entitled *Synopsis of the relevant IAEA Safety Requirement Statements* reflecting the issues addressed by Articles 6 to 19 of the Convention on Nuclear Safety.

60. In 2004, the Agency introduced a secure website for the CNS, and based on feedback from Contracting Parties, a number of upgrades were made in 2007 and 2008. The website is now a well established tool for communication in the peer review process, with over 4000 questions and answers provided electronically.

61. The Review Meeting emphasized nine issues in the Summary Report: legislative and regulatory framework; independence of the regulatory body; safety management and safety culture; staffing and competence; probabilistic safety assessment; periodic safety review; ageing management and life extension; emergency management; and new NPPs. For all of these issues, Agency safety standards have either already been published, or are in an advanced state of preparation or planned. It was recognized that the Agency's Safety Requirements and their supporting guides are not only increasingly referenced by the Contracting Parties, but are also more and more implemented in national regulations. However, from the Agency's perspective, application of the safety standards needs to be further facilitated with respect to implementing them in the peer review process.

62. Many Contracting Parties reported on their positive experiences with Agency missions, especially Operational Safety Review Team (OSART) and IRRS, and recognized their importance. Contracting Parties that have not received these missions were encouraged to invite such missions.

63. For the next review meeting in April 2011, Contracting Parties again requested that the Agency produce a report on major trends and issues in nuclear safety and distribute this report before Contracting Parties start to prepare their national reports. The Agency was also requested to prepare a brochure introducing the CNS and its associated rules of procedure and guidelines. This brochure is intended to give basic information — in the sense of maintaining knowledge — to those who are new to the CNS and the peer review process.

D.2. Operational safety

64. Member States continue to request the Agency's OSART service, which can provide important input on a variety of issues, including:

- International, independent assessment to assist in the continuous improvement of operational safety programmes,
- Regulatory and national programme requirements,
- Periodic safety review input,
- Life cycle extension input,
- International peer reviews following event-related issues.

65. Follow-up missions determined that more than 95% of the recommendations and suggestions resulting from OSART missions were adequately addressed by Member States within 18 months of the original mission. These results give a clear indication of the importance and value which OSART recommendations and suggestions have with respect to the commitment of NPP management to improve their operational safety performance. In many cases, recommendations and suggestions are implemented not only in the particular NPP but throughout the company.

66. Good practices shared with the international nuclear community through the OSMIR (OSART Mission Reports) database include the following:

- Using all sources of internal operating experience for determining reliability data for plant-specific probabilistic safety analysis (PSA);
- Local and full-scope simulators widely used in NPPs, both for initial training and for acquiring skills for safe work on plant process systems and activities;

- Computerized monitoring of safety functions and operating status checks;
- Effective management programmes for fire cells in order to prevent the spread of fires and associated fumes.

67. A number of proposals for improvements in operational safety have been offered by OSART missions, including:

- Improving the current infrastructure in the field of emergency preparedness and response to be consistent with the Agency's safety standards;
- Enhancement of the implementation and control of modifications and configuration required to ensure that the original functions, as designed, are not compromised;
- Identification and systematic inspection, testing and maintenance of fire zone boundaries in the plant. Development of a comprehensive fire hazard analysis for the identification of potential fire risk;
- Enhancing the use of human error prevention techniques and tools to improve human performance;
- Strict application of the control and review process of operational documentation, emergency preparedness procedures and operator aids;
- Establishment and implementation of appropriate control of fire loads, especially in the areas containing the safety systems.

68. The OSART service has a high degree of industry credibility and ensures compliance with the Agency's safety standards. Many Contracting Parties to the Convention on Nuclear Safety use OSART results as an important input when preparing their national reports.

69. The OSART programme is the cornerstone of the Agency's effort to improve the operational safety of nuclear installations worldwide and is recognized as having made a significant contribution to the enhancement of nuclear safety worldwide. However, severe resources constraints in implementing OSART services remain a problem and limit the number of missions that can be undertaken.

D.3. Operating experience feedback

70. Operating experience feedback is now recognized as being very important by Member States and every OSART mission includes an operating experience review module. In addition, Peer Review of Operational Safety Performance Experience (PROSPER) missions are conducted on request. The Agency and the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA) jointly manage the Incident Reporting System (IRS) and 2007 was the first complete year for the Web-based version of the IRS. Users reported that the system was more powerful and user friendly than previous versions.

71. Several Member States have not yet established efficient programmes for the reporting and assessment of minor incidents and near misses, which are potentially significant. In addition, several Member States report very few, if any, events to the IRS.

72. The operating experience feedback system should be improved both to provide greater focus on corrective actions and to ensure the sharing of information on implementation of those actions. The international operating experience feedback system should be enhanced to provide information on good practices and thereby facilitate the application of the lessons learned by other facilities.

73. Areas for improvement with operating experience feedback include the necessity to have full implementation of a comprehensive system to report, track and trend low level events in order to have the opportunity to identify precursors to more significant events. It was also found that there was a

need to organize and implement a system for regular training and retraining of personnel involved in event root cause analysis and the operating experience feedback process.

D.4. Management systems

74. The recently published Safety Requirements No. GS-R-3: *The Management System for Facilities and Activities* and Safety Guide No. GS-G-3.1: *Application of the Management System for Facilities and Activities* reflect the key characteristics of a strong safety culture and the broad agreement that has emerged on the relationship between management systems and safety culture.

75. The Agency organized workshops on the Agency's safety standards on management systems in November 2007 and on further needs in the area of management systems in April 2008. The workshops concluded that:

- the Agency's safety standards are very beneficial for Member States;
- the integrated approach to management systems results in an increased focus on safety and safety culture;
- there is a need for additional guidance from the Agency on the transition to an integrated system, the management of large projects such as the construction of new NPPs, the introduction of strong safety culture in countries embarking on nuclear power, and on the assessment by regulators of integrated management systems; and
- the Agency needs to provide examples of good practices on the application of the Agency's safety standards on management systems.

76. From 19 to 30 November 2007, the Agency conducted a Safety Culture Assessment Review Team (SCART) mission, the first to an NPP, to the Santa Maria de Garona NPP in Spain. The SCART review was based on the 37 safety culture attributes clustered into five characteristics that have gradually emerged in recent years and which are documented in Safety Guide No. GS-G-3.1. Both the team members and facility management accepted the methodological approach and process of SCART and acknowledged the benefit of this review process for identifying and prioritizing safety culture improvements. One good safety culture practice identified by the SCART team was an innovative internal assessment of safety culture using group dynamics in structured representative discussion groups.

D.5. Nuclear safety infrastructure for countries embarking on a nuclear power programme

77. The Agency continues to provide advice and support for Member States considering embarking on a nuclear power programme. In July 2007, at a seminar hosted by the Republic of Korea and attended by some 30 Member States, the Agency made a presentation on national requirements for a nuclear safety infrastructure. In October 2007, the Agency presented a final pre-feasibility study on the conditions under which nuclear power would be a reasonable pursuit for the States members of the Gulf Cooperation Council. This study included requirements for the necessary infrastructure to support a sustainable nuclear power programme built on a strong commitment to safety.

78. In November 2007, the Agency organized a workshop on nuclear power infrastructure assessment, attracting more than 50 Member States with expressed interest in nuclear power development. Specific sections were devoted to building the required safety infrastructure. In January 2008, the Agency conducted a mission to the Philippines to assist in developing an understanding for infrastructure requirements to support a nuclear power programme. In addition, the Agency conducted a preliminary assessment of the feasibility of rehabilitating the Bataan NPP, which has never operated and has been mothballed for over 20 years.

79. From 1 to 3 July 2008, the Agency conducted a workshop in Vienna on the roles and responsibilities in relation to safety of vendor countries and countries embarking on nuclear power programmes, with participants from 43 countries. The workshop provided a forum for vendors, utilities, regulatory bodies, and industry organizations to share their experiences regarding challenges encountered during the development of nuclear power programmes from financial, project management, construction management, regulatory, and operational perspectives.. Countries interested in embarking on nuclear power were encouraged to utilize these experiences in their planning.

80. Work continues on the development of a Web-based tool, the Safety Analysis Report Review Plan (SARRP), which will provide guidance to designers, regulators and the Agency in the preparation and review of safety analysis reports for NPPs, in conducting engineering review services based on the Agency's safety standards, and in collecting feedback from these services. SARRP is envisioned to have 15 modules, with 9 already developed to date and in beta testing. The programme will be operational by 2009.

81. The International Nuclear Safety Group (INSAG) continued to develop a draft document on nuclear safety infrastructure based on the Agency's Safety Fundamentals No. SF-1: *Fundamental Safety Principles*, to be published in 2008. The Agency is also preparing a Safety Guide on nuclear installation safety infrastructure that will assist Member States in using the Agency's safety standards effectively during the development of a nuclear power programme.

D.6. Natural events and seismic safety of NPPs

D.6.1. Kashiwasaki-Kariwa NPP and the earthquake on 16 July 2007

82. In a prompt response to the Niigataken Chuetsu-Oki earthquake in Japan on 16 July 2007 and upon request from the Government of Japan, an Agency expert mission was sent to the Kashiwazaki-Kariwa NPP, the largest nuclear power plant in the world, from 6 to 10 August 2007. The objective was to conduct a fact finding mission and to identify the lessons learned that might have implications for the nuclear safety regime and to share them with the international nuclear community. This mission was followed by a second mission from 28 January to 1 February 2008, and by two meetings between Agency and Japanese experts in May and June 2008. A comprehensive cooperation plan was agreed with the Government of Japan for sharing lessons learned from this severe natural event in order to assess the evaluation of its impact on complex nuclear installations.

83. Although this earthquake significantly exceeded the seismic input level taken into account in its original design, the installation behaved in a safe manner during and after the earthquake. In particular, the automatic shutdown of the reactors of Units 3, 4 and 7, which were operating at full power, and of the reactor of Unit 2, which was in the start up mode, was performed successfully. Safety related structures, systems and components of the plant proved to be in a much better general condition than might be expected for such a strong earthquake, probably due to the safety margins introduced at different stages of the design process. The combined effects of these conservatisms were apparently sufficient to compensate for the uncertainties which led to the underestimation of the original seismic design input. However, the potential existence of active faults underneath the site and the possibility that long-term operation of components could be affected by hidden damage from this event will have to be taken into account. On the basis of all studies and investigations being conducted by Japanese organizations, including other considerations such as public acceptance, a decision on the future of the plant is expected to be taken by the Government of Japan during 2008.

84. An international workshop — hosted by the Nuclear and Industrial Safety Agency (NISA), Nuclear Safety Commission (NSC) and Japan Nuclear Energy Safety Organization (JNES) in Kashiwazaki —was organized by the Agency from 19 to 21 June 2008 to share recent technical

knowledge and approaches on designing and maintaining the robustness of NPPs to safely withstand such severe external hazards. The design of a new generation of NPPs was a primary topic of discussion, along with the concept of 'back-checking' — a process of examining the structural integrity, functionality and seismic safety of existing facilities. Key conclusions of the workshop included:

- Seismic hazard evaluation continues to be a key element of assuring seismic safety of NPPs;
- Site-specific information and a full understanding of the geological and tectonic features of an NPP site are critical to seismic safety;
- Design and safety regulations play a critical role in maintaining NPP robustness; and
- Information from the Kashiwazaki-Kariwa NPP experience is providing valuable input to the Agency Safety Standards.

85. A related Agency-led workshop on the effects of tsunamis on NPPs was held on 23–24 June 2008 in Daejon, Republic of Korea.

D.6.2. International Seismic Safety Centre

86. Since the 1980s, the Agency has devoted considerable effort to the seismic safety of nuclear installations, covering areas related to the seismic hazard evaluation at a site, the seismic design and qualification of new NPPs, and seismic re-evaluation of structures, systems and components of existing NPPs. The recent occurrence of severe earthquakes that have affected NPPs beyond their original design levels has raised significant safety issues, impacting the operation, economics and public credibility of these installations. Resolving these complex multidisciplinary issues will require the experience and contribution of the entire international scientific community. For this reason, an extrabudgetary project on seismic safety was launched in 2007 that to date has received contributions from 40 institutions of 19 Member States.

87. The Agency has started planning for the creation of an International Seismic Safety Centre (ISSC). The purpose of the ISSC will be to consolidate experience and expertise, share this with the international community and respond to the corresponding needs of Member States.

D.7. Design safety of new reactors

88. As a response to renewed interest in the development of nuclear energy capacity across the globe, vendors are designing new reactors to meet the growing demand for safe and economical nuclear power generation. Regulatory bodies will be conducting detailed evaluations of these designs to support licensing decisions. Building upon its design review services conducted over the past 20 years, the Agency has developed a tailored safety assessment project framework to provide Member States with an early evaluation of how a vendor's submission of a new NPP design, including the technical documents pertaining to the reactor design and supporting evidence of its safety features, compares against the Agency's Safety Fundamentals and Safety Requirements. Further development and use of the Agency's Centre for Advanced Safety Analysis Tools (CASAT) as a collaboration space for information exchange has been initiated to support the new reactor safety reviews. The Agency has already conducted evaluations of the European pressurized water reactor (EPR), AP1000, European simplified boiling water reactor (ESBWR), ACR1000 and ATMEA designs.

89. The Agency recognizes and supports the increasing value and international use of integrated risk informed decision making (RIDM) for nuclear safety. RIDM integrates risk information with insights and inputs from deterministic safety assessments, compensatory measures, mitigating measures, operational experience, probabilistic safety assessments (PSAs), etc. to arrive at optimum and safe

decisions. Current activities include collecting experience of Member States and performing pilot applications in order to determine the possible content of a future Safety Guide on the subject.

90. In response to the increased worldwide expansion of nuclear power programmes, enhancement of nuclear safety assessment capacity building is a major focus for the Agency. Ongoing programmes for strengthened training activities and information exchanges include the development of a comprehensive safety assessment curriculum for regional and national competency building, extension of the use of CASAT to simulation training on computer codes, and fostering the exchange of information on topical issues in nuclear safety through an international conference on ensuring safety for sustainable nuclear development. A draft Safety Requirements document on the safety assessment of facilities and activities, which forms the basis for training and capacity building activities in nuclear safety assessment, will be considered by the Commission on Safety Standards at its meeting in September 2008.

D.8. European Commission–IAEA–Ukraine Joint Project on the Safety Evaluation of Ukrainian Nuclear Power Plants

91. The objective of this project is to conduct an overall assessment of the compliance of the 15 operating Ukrainian NPPs with the Agency's safety standards in the areas of design safety, operational safety, waste management and decommissioning, and regulatory issues. This Joint Project supports the energy cooperation between the EU and Ukraine.

92. Financed by the European Community, this project is a joint management action between the European Commission (EC) and the Agency, which has the responsibility for its implementation. The project is overseen by a steering committee comprising the EC, the Ukrainian counterpart organizations and the Agency acting as its secretariat. During the project period of November 2007 to March 2010, self-assessments based on technical guidelines developed with the Agency and performed by the Ukrainian counterpart organization will be evaluated by an Agency-led team of experts.

D.9. Safety of research reactors

93. The Agency continues to promote the application of the Code of Conduct on the Safety of Research Reactors through assistance in implementation of national safety regulations and to encourage Member States to make full use of the Agency's safety standards relevant to research reactors.

94. A regional meeting on the application of the Code of Conduct on the Safety of Research Reactors for Member States in Latin America was held in December 2007. This meeting was the fourth of a series in response to the recommendation of an open-ended meeting in December 2005. These meetings contributed to enhance the self-assessment capability of the participating Member States and allowed the exchange of information and experience on the application of this Code of Conduct and to identify the necessary improvements in this field. An international meeting on the application of the Code of Conduct on the Safety of Research Reactors will be held from 28 to 31 October 2008 in Vienna.

95. The Agency held, in cooperation with the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), an International Conference on Research Reactors in Sydney from 5 to 9 November 2007 with the participation of 183 delegates from 42 Member States and non-governmental organizations. Besides its role as a forum for exchanging information and experience between research reactor operators, regulators, designers, and suppliers, the Conference discussed important issues related to the safety, security, utilization and fuel management of research reactors. The conference provided recommendations to enhance the safety of research reactors and supported the actions

launched by the Agency, mainly for the promotion of the application of the Code of Conduct on the Safety of Research Reactors and for improvement of networking and regional cooperation. In response to the Conference's recommendations, activities are being implemented to establish a research reactor information network, which will help reduce the isolation of small operating organizations with limited resources.

96. To address the identified common safety issues and trends, the Agency organized, from 3 to 7 December 2007 in Vienna, a technical meeting on safety management and verifications for research reactor safety committees, and a regional workshop for Member States in Asia and the Pacific on the promotion of safety culture in research reactor operating organizations, which was held in Beijing from 29 October to 2 November 2007. The technical meeting on the review and assessment of research reactor safety documents held in Budapest from 30 June to 4 July 2008, and the regional workshop on periodic safety review of research reactors, held in Hanoi from 14 to 18 July 2008 contributed to promoting safety culture and good safety practices and to enhance awareness and capabilities of the participating Member States. As part of the effort to further promote safety culture and the dissemination of operating experience feedback, work is being completed for the preparation of a technical meeting on operational experience feedback for Latin American countries, and a regional workshop for research reactor operating organizations in Eastern Europe countries, to be held in the fourth quarter of 2008.

97. The Agency continues to operate a follow-up system to monitor the safety of research reactors under project and supply agreements. The system is based on the collection and analysis of data on the safety performance indicators and dissemination of operating experience. Since September 2007, the Agency has conducted seven safety review and expert missions to research reactors under project and supply agreements. These missions allowed an update on the safety conditions of the recipient reactors, provided recommendations and suggestions to improve their operational safety and provided practical guidance for the implementation of these recommendations.

D.10. Safety of fuel cycle facilities

98. After the endorsement by the Board of Governors in June 2007 of Safety Requirements No. NS-R-5: *Safety Requirements for Nuclear Fuel Cycle Facilities*, the CSS approved in May 2008 the publication of three new Safety Guides, Safety Guide No. NS-G-5.1: *Safety of Uranium Fuel Fabrication Facilities*, Safety Guide No. NS-G-5.2: *Safety of MOX Fuel Fabrication Facilities* and Safety Guide No. NS-G-5.3: *Conversion and Enrichment Facilities.*

99. The first training course on the safety of fuel cycle facilities took place in China in December 2007. Similar national and regional training courses based on the newly endorsed Agency safety standards are under preparation.

100. The Fuel Incident Notification and Analysis System (FINAS) is a Web-based incident reporting system for fuel cycle facilities developed by the Agency in cooperation with OECD/NEA. FINAS, which uses a common platform with the Incident Reporting System (IRS) and the Incident Reporting System for Research Reactors (IRSRR), will be operational on the common platform in September 2008, in time for the next technical meeting on events significant to the safety of fuel cycle facilities, to be held in Paris in September 2008.

E. Radiation safety

E.1. Radiation protection of workers

101. At a meeting in January 2008, the steering committee for the Action Plan for Occupational Radiation Protection considered that the objectives of more than 50% of the actions had been achieved and these actions have been closed. Productive cooperation with the International Labour Organization (ILO) will be maintained in order to complete the remaining actions and to evaluate the need for defining and developing new actions.

102. The Agency has maintained its efforts for the promotion of occupational radiation safety in Member States by providing support to the new Asia Region ALARA Network[3] (ARAN).

103. The recent establishment of the Information System on Occupational Exposure in the Medical, Industrial, and Research Areas (ISEMIR) in collaboration with other international organizations illustrates the Agency's commitment to harmonized implementation of radiation protection standards. ISEMIR is a tool for the identification of trends and needs that will be expanded to include waste management and decommissioning activities.

104. The Agency has worked constantly to maintain the standards that resulted in the accreditation of its radiation protection monitoring service in 2006. A surveillance audit by the Austrian accreditation authority in November 2007 confirmed the high quality of the service and extended the validity of the accreditation to 2011.

E.2. Radiation protection of patients

105. The Asian Network of Cardiologists in Radiation Protection, established through an RCA project, brought out its first newsletter in August 2007. This newsletter is the first dedicated to radiation protection of any cardiological body and shows its commitment to radiation safety. A total of three issues of the quarterly newsletter have since been brought out. The newsletter is circulated through national and regional cardiological societies to a large number of cardiologists. In addition, the Agency's experience on training cardiologists in radiation protection was published in a number of important medical journals.

106. The Agency has consolidated its training of doctors in radiation protection such as orthopaedic surgeons, urologists, gastroenterologists, neurosurgeons and gynaecologists. Following the first course held in September 2006, three more courses were held in 2007.

107. Children form an important group for radiation protection as they have more expected years of life remaining and are more radio-sensitive than adults. With increasing use of radiological procedures in children, in particular relatively high dose procedures such as computed tomography (CT), information on radiation protection in children is now available on the Agency's public radiological protection of patient website (http://rpop.iaea.org). The website now also includes information on CT colonography, cardiac CT, positron emission tomography/computed tomography (PET/CT), bone mineral density using dual energy X-ray absorptiometry (DXA) and dental radiology. Hit rates on the website have doubled in recent months as compared to last year. Member States involved in technical cooperation projects now have access to a protected area on the website for information exchange.

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[3] Membership of ARAN currently comprises Australia, Bangladesh, China, India, Japan, Republic of Korea, Malaysia, Pakistan and Thailand.

108. In recognition of challenges posed by newer medical imaging modalities currently gaining widespread usage, such as PET/CT and multi-detector computed tomography (MDCT), the Agency is planning, in cooperation with organizations such as ICRP, WHO, and a number of professional bodies, to prepare new guidance documents and training material.

109. Data are now becoming available from many Member States on radiation doses to patients, allowing comparison with international standards. Recently, the Agency published a report in the American Journal of Roentgenology based on initial data on patient doses in common radiographic procedures in 12 developing countries. The report shows that radiation doses to patients are not higher than those in developed countries. However, poor image quality constitutes a major source of unnecessary radiation to patients in developing countries. The Agency, through the International Action Plan for the Radiological Protection of Patients, has made substantial progress in patient protection around the world. With continued effort in coming years, it is hoped that the safety of patients will continue to improve worldwide.

E.3. Implementation of the Plan of Activities on the Radiation Protection of the Environment

110. The international coordination group on the radiation protection of the environment established by the International Plan of Activities on the Radiation Protection of the Environment held its third annual meeting in June 2008 with participation from Brazil, Canada, France, Japan, Norway, UK, USA, EC, ICRP, International Union of Radioecology (IUR), OECD/NEA, and the Agency. Participants reported progress on projects and activities associated with radiation protection of the environment and the group identified a number of opportunities for collaboration.

E.4. International Conference on the Radioecology and Environmental Radioactivity

111. The International Conference on the Radioecology and Environmental Radioactivity was held in Bergen, Norway from 15 to 20 June 2008. It was organized by Norwegian Radiation Protection Authority and the French Institute for Radiation Protection and Nuclear Safety in cooperation with the Agency, the International Commission on Radiological Protection, the International Union of Radioecology, the Journal of Environmental Radioactivity, OECD/NEA and WHO. The Conference provided a forum for experts from industry, government, international organizations and non-governmental organizations to identify environmental risk assessment needs and requirements and included sessions devoted to environmental protection, risk assessment, emergency preparedness and rehabilitation, naturally occurring radioactive material, radioactive waste, and radiation and society.

112. Participants expressed diverse opinions, particularly regarding the integration of radiation protection principles and methodologies with those of environmental protection. Participants supported an integrated approach to protection of the environment that takes into consideration both non-radiological and radiological factors. The Conference highlighted the importance of the Agency’s effort to coordinate approaches and methodologies for radiation protection of both humans and the environment and identified the needs for effective knowledge management and a new generation of experts.

F. Safety and security of radioactive sources

F.1. Code of Conduct on the Safety and Security of Radioactive Sources and its supplementary Guidance on the Import and Export of Radioactive Sources

113. An increasing number of countries recognize that the Code of Conduct on the Safety and Security of Radioactive Sources (the Code) provides the foundation for radioactive source safety and security. As of 15 July 2008, 92 States have made a political commitment to implement the Code, of which 46 have additionally notified the Director General of their intention to act in a harmonized manner in accordance with the Code's supplementary Guidance on the Import and Export of Radioactive Sources (the Guidance). A total of 71 States have nominated points of contact for the purpose of facilitating the export and import of radioactive sources and have provided the details to the Agency. In addition to this widespread acceptance of the Code and the Guidance on a national level, they are also supported by several groups of countries such as Asia-Pacific Economic Cooperation (APEC), European Union, G8 and the Organization for Security and Co-operation in Europe (OSCE). This very strong support shows that the Code is now considered politically binding by the majority of Member States and that the Code and the Guidance are well established references.

114. As a follow-up to the first international meeting on sharing information about States' implementation of the Code held in Vienna in 2007, the Agency held an open-ended meeting of technical and legal experts for sharing information on lessons learned from States' implementation of the Guidance in Vienna from 26 to 28 May 2008. The meeting was attended by 167 experts from 88 Member States and by observers from the EC, the OSCE and the International Source Suppliers and Producers Association. Canada and the USA provided extrabudgetary funding to support the participation of experts from States that otherwise could not have attended. The report of the Chair of the meeting is available as a Note by the Secretariat (2008/Note 26).

F.2. Orphan source search and secure project

115. The objective of this project is to assist countries in establishing their capabilities to search for and secure orphan radioactive sources and establish verified source inventories. The necessary capabilities include the establishment of a national strategy to search for and secure orphan sources based on verified national source inventories, qualified and trained staff capable to implement search campaigns, and adequate technical means such as hardware and software for the inventory and search equipment. Assistance, including expert advice on procurement of search equipment and services, was provided to establish these capabilities in Burkina Faso, Cameroon, Democratic Republic of Congo, Kenya, Mali, Nigeria and Zambia.

F.3. Regulatory Authority Information System (RAIS)

116. To support Member States as they continuously improve their regulatory control and inventory of radiation sources, the Agency has been regularly upgrading the Regulatory Authority Information System (RAIS), taking into considerations Member States' feedback and suggestions. The current version, RAIS 3.0, which was extended for implementation on SQL servers in 2006, is in use, to varying degrees, in more than 90 Member States.

117. The next stage of improvement, the 'RAIS Web Portal', is currently under development and is expected to be released in 2008. The RAIS Web Portal will provide a web interface for RAIS 3.0, which could be used, for example, by inspectors in the field, regional offices of regulatory bodies and by authorized representatives of facilities to access facility data. A technical meeting in Vienna in

August 2008 validated the system. Once officially released, the Agency will organize regional workshops to train users on the RAIS Web Portal.

F.4. Disposal of disused sealed radioactive sources

118. To increase security of disused sealed radioactive sources (DSRS) and to provide a viable option for Member States without an adequate disposal system, a concept for DSRS borehole disposal has been developed under Agency auspices. The concept also includes DSRS conditioning. The Agency has designed an integrated package of documents which will include a Safety Guide, technical guidance, and a generic design and safety assessment of the facility which needs to be adapted to local conditions in interested Member States. The implementation of DSRS borehole disposal has been promoted through technical cooperation projects, and Member States from Africa, Asia and Latin America have expressed interest.

G. Safety of radioactive waste management

119. The safety of radioactive waste management continues to be a concern to society in general and efforts are being continued by governments and operator organizations to provide assurance of safety. The significant differences in the approaches to radioactive waste safety adopted in Member States has been identified as a major factor in this regard and initiatives are under way to work towards international harmonization. In this regard, the Agency's waste safety programme is playing a leading role both in the development of international safety standards and in assisting with the development and implementation of approaches and methodologies for demonstrating compliance with the standards. This includes the processes of international peer review, both through the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and through the Agency's safety review services.

G.1. Application of safety standards on predisposal management of radioactive waste

120. Two significant milestones in the predisposal waste management area are the finalization of the revised Safety Requirements for radioactive waste management and the Safety Guide on classification of radioactive waste. The former provides up to date focused safety requirements which can be used more effectively in national regulatory programmes and in the peer review process. A major demonstration of the use of the new requirements will be the review of radioactive waste and decommissioning arrangements for the 16 operating nuclear power stations in Ukraine being undertaken as part of the joint EC–Agency–Ukraine project on nuclear safety (see Section D.8).

G.2. Safety assessment of predisposal management of radioactive waste

121. The Safety Requirements for radioactive waste management prior to disposal emphasize the need for safety demonstration by developing safety cases and supporting safety assessments. The International Project on Safety Assessment Driven Radioactive Waste Management Solutions (SADRWMS) has been providing a forum for intercomparison and harmonization of safety assessment methodologies. Under the project, a software tool called SAFRAN has been developed to assist with safety assessments and the development of safety cases. SAFRAN guides the safety assessment process, captures all related data and assumptions, and provides a record of assessment iterations, in addition to providing the results of the assessment. SAFRAN is available at no cost and

its application to a range of activities and facilities is being tested in several Member States. Work is also in progress to broaden the scope of application of SAFRAN to decommissioning activities and to improve the user interface.

G.3. Foundation for disposal of radioactive waste

122. The final step in the management of radioactive waste that does not decay to insignificant levels within a few years is disposal. To provide coherence in the safety standards for radioactive waste disposal, an approach was adopted whereby a single Safety Requirements document would be developed to cover the disposal of all waste types. This document would then be complemented by a number of Safety Guides providing up to date guidance on best practice for complying with the Safety Requirements for different disposal options. The development of this single Safety Requirements document has presented significant challenges in view of the fundamental difference in disposal options and in the waste types suitable for the various options. However, good progress is being made through consultation with Member States, recognized experts in the field and international bodies such as the ICRP.

G.4. Disposal of intermediate level radioactive waste

123. The work on disposal of radioactive waste, combined with the work undertaken in revising safety standard 111-G-1.1, *Classification of Radioactive Waste,* has identified that the disposal of intermediate level waste (ILW) warrants further consideration. ILW is not suitable for disposal in near surface facilities, but does not necessarily warrant the degree of containment and isolation provided by geological disposal. A number of Member States are investigating options for disposal of ILW and have identified the possibility of disposal at intermediate depths between those used for near surface disposal and those used for geological disposal. An international workshop in the Republic of Korea from 8 to 12 December 2008 will review work undertaken in Member States, including what can be credited in terms of containment and isolation; what work is necessary to substantiate such claims; and what host geological environments may be of interest and which would not be suitable. On the basis of the workshop outcome, proposals will be formulated for new safety standards in this area if deemed necessary.

G.5. Demonstrating the safety of geological disposal

124. Significant work is now going on in the area of geological disposal in a number of Member States and the demonstration of safety and licensing feature prominently in all projects. A number of international initiatives are also being undertaken to support the development of geological disposal including the work of the OECD/NEA Integration Group for the Safety Case and the EC's PAMINA project. Within the Agency, work is under way on a Safety Guide on geological disposal.

125. A number of regulatory authorities from countries within Europe interested in geological disposal launched an initiative to explore the development of a common approach to safety demonstration for geological disposal. As part of this initiative, a pilot study was undertaken on the regulatory review of the safety case for geological disposal with a view to using the Agency's Safety Requirements No. WS-R-4, *Geological Disposal of Radioactive Waste.* Based on the results of the pilot study, the countries concerned decided to continue with the initiative. The participants also concluded that there would be considerable benefit in exposing their work to a broader international audience. To this end, the Agency has established the International Project on Demonstrating the Safety of Geological Disposal (GEOSAF), which commenced in 2008.

G.6. International low level waste disposal network

126. To build credibility in national low level waste disposal programmes, the Agency is creating a non-commercial network as a forum for the prompt, open and efficient transfer and exchange of knowledge gained. Member States with less advanced programmes will benefit from the experience of organizations with advanced designs and disposal facilities in operation.

G.7. Remediation strategies and long term management of radioactive waste after accidental radioactive releases to the environment

127. Twenty years after the Goiânia accident, the Technical Meeting on Remediation Strategies and Long Term Management of Radioactive Waste after Accidental Radioactive Releases to the Environment, held in Brazil in October 2007, considered the concepts and ideas that form the basis for the long term planning and management of consequences of accidental releases of radioactivity to the environment. The meeting provided an international forum for working towards an internationally harmonized basis for remediation strategies and radioactive waste management policies that provide for high levels of long term safety. It underlined the need to define clear policies and strategies for radioactive waste management, in particular those resulting from remediation activities, including allocation of resources for supporting remedial activities. There were discussions on the application of the concept of clearance as a means of minimizing the waste generated through remediation activities. The meeting also addressed the importance of cooperation mechanisms between neighbouring countries and the harmonization of regulatory frameworks considering the transboundary implications that radiological accidents may have. The final session included participants of the 2007 International Nuclear Atlantic Conference. The combination of the two meetings — the workshop dealing with lessons learned from the past and the conference dealing with the future nuclear development — reinforced the importance of a strong nuclear safety culture.

G.8. Database on Discharges of Radionuclides to the Atmosphere and Aquatic Environment (DIRATA)

128. The updated Web-based version of the Agency's DIRATA was launched in 2007 (http://dirata.iaea.org). The development of procedures for long-term cooperation on data exchange with the EC and other international organizations is now under way.

G.9. Net Enabled Waste Management Database (NEWMDB)

129. The NEWMDB was originally launched in 2000 and has been collecting annual radioactive waste management data from Member States since 2001 (http://newmdb.iaea.org). In 2007, the Agency completely redesigned and expanded NEWMDB to include tools to help Member States to develop inventory reports and to help harmonize the international reporting of radioactive waste management information. Discussions with both the EC and the OECD/NEA have been initiated to support data harmonization and a proposal will be made to the Organizational Meeting for the Joint Convention concerning digital submission of standardized data for national reporting.

H. Safe decommissioning of nuclear facilities and other facilities using radioactive material

130. There is a need to increase awareness among governments and interested parties on early planning, adequate funding, governmental support and long term strategies for decommissioning. One way to achieve this could be a more effective use of the Joint Convention peer review mechanism. The most important challenge is to maintain adequate and qualified resources for decommissioning projects while the nuclear industry is expanding.

H.1. International Decommissioning Network (IDN)

131. As a 'network of networks', the IDN was formed to coordinate and build efforts aimed at assisting Member States in the sharing of practical decommissioning knowledge. Within the IDN, organizations with a demonstrated record of excellence in a wide range of areas offer to share their experience. In 2008, the IDN organized a workshop hosted by Spain on waste management and clearance, and a workshop hosted by Belgium on size reduction for decommissioning of nuclear facilities.

H.2. Research Reactor Decommissioning Demonstration Project

132. In 2006, the Agency initiated the Research Reactor Decommissioning Demonstration Project to assist Member States in adequate planning and implementation of safe decommissioning of research reactors. Through this project, the Agency is providing assistance to both the operators and regulators in a number of Member States with research reactors undergoing decommissioning. The project aims to demonstrate the application and use of the Agency's safety standards during the actual decommissioning of facilities from the planning stage through to the termination of decommissioning. Experts from more than 13 Member States are participating in the project. In the current reporting period, Australia hosted a technical meeting on the transition phase of the Australian Nuclear Science and Technology Organisation's (ANSTO's) HIFAR research reactor, and Philippines hosted a technical meeting on the characterization survey of the Philippine Research Reactor (PRR). Consideration is also being given to expand the project to include the Chinese heavy water research reactor as another demonstration facility.

H.3. Remediation of contaminated sites in Iraq

133. The Agency project to assist the Government of Iraq in the evaluation and decommissioning of the former facilities that used radioactive materials has progressed well and continued support is being given by experts from France, Germany, Italy, UK, Ukraine and the USA. Project information and results are available on the Agency's website. A draft nuclear law has been prepared and work on the drafting of regulations covering decommissioning, radiation protection and waste management continues. The primary legislation has passed through the first stage of Iraq's legislative process, and may be expected to be enacted within a year. The project has enabled Iraqi experts to draft policy and strategy documents for the management of radioactive waste, but these have yet to be endorsed by Iraq's regulatory community. Despite the delay in consolidating the regulatory situation, independent scrutiny and challenge is occurring and work is due to start on decommissioning one of the lightly contaminated sites in line with the prioritization of decommissioning activities agreed in 2007. Support for this decommissioning was provided to Iraq via a practical training programme conducted at Pripyat, Ukraine during June 2008.

H.4. The Agency's new review service on decommissioning

134. In response to increased requests from the decommissioning industry for independent technical reviews, the Agency has launched a new review service for planned and ongoing decommissioning projects. Designed to complement the Agency's OSART service, the international decommissioning review service will provide an independent review of the activities associated with the planning and implementation of decommissioning in accordance with the international safety standards, other relevant recommendations and good practice in Member States. The first review was performed at the Bradwell site (Magnox NPP) in UK in June 2008. The outcomes of this review will be presented and discussed at a technical meeting at Agency Headquarters in November 2008. A similar review is planned to commence in 2008 for the decommissioning planning of water cooled water moderated power reactor (WWER) units in Ukraine.

I. Safety in uranium mining and processing and remediation of contaminated sites

I.1. Safety in uranium mining and processing

135. As noted by the Board of Governors in March 2008 during the discussion on the *Nuclear Safety Review for the Year 2007*, there has been a rapid expansion in Member State requests for assistance related to the growth of the uranium mining industry.

136. An issue of increasing concern is the provision of staff to ensure the safe and secure development for all uranium mining operations. The availability of external experts of suitable knowledge and experience is decreasing rapidly due to a combination of the ageing of the working population in this specific area and the growing demand from industry. Many of the current staff are close to retirement. With the rapid expansion of activities, finding suitable people for the industry will become more and more difficult. As the industry seeks to recruit, the regulatory systems in existing and new producer countries will find it hard to attract personnel. Therefore, the training of sufficient numbers of staff to ensure the safe and secure development of the expanding uranium mining industry is an area in which the Agency can assist. The Agency could also undertake expert missions and fact-finding missions to ascertain the activities that will need to be undertaken to support the safe expansion of uranium resource development.

137. In order to be able to respond to requests for assistance in connection with the anticipated expansion of activity in the whole of the uranium mining cycle, a major effort will be required on the part of the Agency. Presently, the Agency has only limited staff available to deal with enquiries and requests for assistance from Member States. In order to assure Member States that the Agency will be able to adequately support the safe and secure operation of the uranium mining industry, the Agency should consider increasing the resources available for such tasks.

I.2. Cooperative activities in uranium mining safety

138. The Agency continues to support remediation related activities in Azerbaijan, Kyrgyzstan and Tajikistan. There are existing links with multilateral agencies that are either already funding activities or are being asked for support by Member States from the region. Examples include: a recent request for assistance from Kyrgyzstan directed to the UNDP to deal with uranium mine legacy sites; World Bank funding of safety related work in the relocation of uranium mill tailings at one legacy site in

Kyrgyzstan; and a request from Tajikistan seeking aid to develop an appropriate safety regime to support a programme of reprocessing uranium mill tailings and the eventual remediation of the associated legacy site. The OSCE and North Atlantic Treaty Organization (NATO) are partners in a programme in Central Asia to assist in the planning for remediation of uranium mining legacy sites. The Agency liaises with these organizations to ensure that the technical assistance effort for the region is optimized.

139. The Agency has also been proactive in bringing together regulators and operators from the major uranium mining countries to produce a code of practice in radiation, environmental and occupational safety. This is intended to provide new junior partners in the uranium resource development industry with a set of principles by which they can abide to ensure that appropriate standards are met.

I.3. International Conference on Remediation of Land Contaminated by Radioactive Material and/or Residues

140. An International Conference on Remediation of Land Contaminated by Radioactive Material/Residues will be held in Astana, Kazakhstan in May 2009. Central Asia is a region with abandoned uranium mining and production operations and their associated residues, which in some cases pose a variety of serious environmental challenges. The conference will provide a forum for the concerned States involved in the remediation of contaminated sites to gather and exchange ideas, review progress and new developments, and disseminate information and experience. It will also promote the application of international standards and best practices.

I.4. Management of naturally occurring radioactive material (NORM) residues from the phosphate industry

141. To discuss broader aspects of the global phosphate industry related to regulation, radiological safety, and the management and use of products and residues, an international meeting on regulation in the management of NORM residues from the phosphate industry was held jointly by the Agency and the Florida Institute of Phosphate Research in the USA in June 2007. The meeting resulted in the establishment of a phosphate industries working group and a later series of meetings in Brazil and Vienna involving the Agency, institutes, universities and producers to plan the way forward. A series of consultants meetings was held in July 2008 on the use of phosphogypsum residues in roads, construction, landfill and agriculture. The primary intent of these meetings was to review the current global situation and to identify knowledge gaps (technical, procedural and situational). An additional important outcome of the meetings was to map out common ground and understanding in order to begin developing an internally consistent global model of good practice that is acceptable to regulators, operators, users and the public.

I.5. Report on the new UN Action Plan on Chernobyl

142. The UN General Assembly, in resolution A/RES/62/9, inter alia noted with satisfaction the assistance rendered by the Agency to Belarus, the Russian Federation and Ukraine on remediation, countermeasures and the monitoring of human exposure in areas affected by the Chernobyl disaster; welcomed the efforts of the international community to complete the nuclear safety projects at Chernobyl in accordance with international standards; proclaimed 2006–2016 as the Decade of Recovery and Sustainable Development of the Affected Regions; and requested the drafting of an UN Action Plan for Chernobyl recovery up to 2016 in support of national strategies of the affected countries. The Agency has developed its contribution to the UN Action Plan and continues its assistance to the affected countries.

J. Transport safety

143. The Agency continued implementing the action plan of the International Steering Committee on Denials of Shipment of Radioactive Material and organized — in cooperation with concerned Member States and international governmental and non-governmental organizations — regional workshops on denials of shipment in Uruguay (July 2007), Italy (May 2008), United Republic of Tanzania (June 2008), Madagascar (June 2008) and China (June 2008). These workshops resulted in the creation of regional action plans and networks to address key issues.

144. The Committee held its 3rd meeting in January 2008 and concluded that regional networks are an important step towards solving denials problems and stressed the expectation of the formation of regional networks. The Committee also suggested a session on denials of shipment be included in the forthcoming IRPA 12 scheduled for October 2008 in Argentina.

145. In September 2007, a group of several shipping and coastal States concerned with ensuring the safety of maritime transport, with the Agency's assistance, held a third round of informal discussions in Vienna with a view to maintaining dialogue and consultation aimed at enhancing mutual understanding, building confidence and improving communication in relation to safe maritime transport of radioactive material. At this meeting a draft outline of a document (being developed jointly by a shipping State and a coastal State) relating to how a State could respond to a maritime emergency near its territory was presented. A further meeting took place between a coastal State, a shipping State and the Agency in March 2008 to explore the potential for ensuring that essential information on packages used in transport was readily available to any State requiring it.

146. The Agency established a database of national focal points and a list of local competent authorities for transport safety. The Committee has recognized the need to record cases where denials were avoided through preventive actions and, in cooperation with the International Maritime Organization (IMO) and International Civil Aviation Organization (ICAO), a test database on instances of denials of shipment was developed and is now in use.

147. An instructional video was also developed that provides an overview of the uses and shipping requirements of radioactive material, and the regulatory and safety requirements for the transport of radioactive material. Representatives of the Agency attended other UN specialized agencies' meetings to provide clarification on the Agency's *Regulations for the Safe Transport of Radioactive Material* (Transport Regulations).

148. The Agency continues to work with the UN in harmonizing the Transport Regulations with UN regulations regarding the safe transport of dangerous goods. This effort will be reflected in, inter alia, the IMO International Maritime Dangerous Goods (IMDG) Code and ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air.

149. To assist in the implementation of the Transport Regulations, all associated training material is now available in the six official languages of the UN. The Agency also introduced material on denials of shipment to its training courses on safe transport of radioactive material.