Overview of the International Legal Framework Governing the Safe and Peaceful Uses of Nuclear Energy – Some Practical Steps –

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Introduction

The accident on 26 April 1986 in unit 4 of the Chernobyl nuclear power plant in the former Ukrainian Republic of the Union of Soviet Socialist Republics, near the present borders of Belarus, the Russian Federation and Ukraine, was categorised at the time as "the most devastating accident in the history of nuclear power".[1] Two decades on, the assessment of the health, environmental and socio-economic impacts of the accident still continues, with the aim of providing definitive and authoritative answers.[2]

In addition, from a legal perspective the accident underlined some significant deficiencies and gaps in the international legal and regulatory norms that had been established to govern the safe and peaceful uses of nuclear energy. At the same time, it stressed the "need for a collective international focus on [nuclear] safety" and, in its wake, prompted a call for "the creation of an international regime for the safe development of [nuclear energy]" under the auspices of the IAEA.[3]

For all its devastating consequences, the accident was in fact a wake-up call for the "international nuclear community" and led to a new era in international nuclear cooperation, involving states which had so far been removed both geographically and technologically from nuclear power. In

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1. See IAEA document "Ten years after Chernobyl: What do we really know?", IAEA/PI/A51E.

2. See, *inter alia*, the Chernobyl Forum which was set up in 2003 by the IAEA in cooperation with FAO, OCHA, UNDP, UNEP, UNSCEAR, WHO and the World Bank, as well as representatives of Belarus, the Russian Federation and Ukraine and which aims at finding authoritative consensus on the effects of the accident. At the IAEA conference "Chernobyl: Looking Back to Go Forwards", organised by the IAEA on behalf of the Chernobyl Forum in Vienna in September 2005, the Forum's findings were presented and subsequently published in digest form together with recommendations for concrete action. A link to the digest Report of the Chernobyl Forum, "Chernobyl's Legacy: Health, Environmental and Socio-economic Impacts and Recommendations to the governments of Belarus, the Russian Federation and Ukraine" (IAEA, September 2005) can be found on www.iaea.org/NewsCenter/Focus/Chernobyl.

3. See the statement of Mr. R. Reagan, President of the United States of America [IAEA document GC(SPL.I)OR.1, para. 82] and Mr. M. S. Gorbachev, General Secretary of the Central Committee of the Communist Party of the USSR, to the Special Session of the General Conference [IAEA document GOV/INF/497, 20 May 1986], on 24 September 1986, respectively. See also IAEA Document GC(SPL.I)/8.

its aftermath, the international nuclear community, in an attempt to allay concerns of the public and political world over the use of the atom as a viable energy source, sought to rebuild confidence in the safety of nuclear energy, primarily through the IAEA, by urgently addressing those main deficiencies in the existing international legal framework that had been exemplified by the accident.

As much has already been written on the substantive provisions and negotiating history of the different international instruments that comprise this legal framework and that were developed under the auspices of the IAEA in the two decades since the Chernobyl accident, this paper only briefly describes their substance and the background leading to their respective development. More importantly, however, this paper highlights some of the practical steps taken since the accident, both by the IAEA and the international community, which underpin this framework. In addition, the paper identifies some of the current challenges and, in a brief outlook, considers some recent multilateral initiatives in the nuclear domain and their possible impact on future developments in nuclear law.

Part I. Overview of the International Legal Framework and Practical Steps

The international community's activities concerning nuclear safety have changed dramatically from those carried out in the early years of the IAEA. In particular, prior to the Chernobyl accident there had been little by way of legally binding international commitments. Nuclear power plant safety had differed in that regard from air safety or safety at sea, where binding international rules had long existed. The difference was not surprising: unlike an airplane or ship, these plants are clearly sedentary, remaining firmly situated in the national jurisdiction of one state.

However, in light of the accident's significant transboundary consequences, the international community no longer considered that the safety of nuclear power plants was strictly of national concern, which in turn led to a strong interest in the maintenance of a high level of safety worldwide and ultimately resulted in the establishment and progressive development of today's "global nuclear safety regime". It is fair to say that the IAEA has been at the forefront of this "revolution" and in fact has set the framework for cooperative efforts to build and strengthen this global regime which, in a nutshell, is based on four principal elements: first, the adoption of and widespread subscription to binding and non-binding international legal instruments which have been adopted since the accident; second, a comprehensive suite of nuclear safety standards that embody good practices as a reference point to the high level of safety required for all nuclear activities;[4] third, a suite of international safety advisory reviews and services, based on these standards; fourth, the establishment of national legal and regulatory infrastructures necessary to implement stringent safety measures, for example, the

4. Under the terms of Article III.A.6 of its Statute, the IAEA is authorised to establish or adopt standards of safety for the protection of health and minimisation of danger to life and property and to provide for the application of these standards to peaceful nuclear activities. To date, the IAEA Safety Standards Series comprises of publications of a regulatory nature covering nuclear safety, radiation safety, transport safety, waste safety, and general safety including the legal and governmental infrastructure for safety, emergency preparedness and response, assessment and verification and management systems. The Safety Standards Series which comprises of approximately 70 standards (with a further number under preparation), superseded the Safety Series, in which over 200 publications were issued. Safety Standards Series publications are categorised into: (1) Safety Fundamentals, stating basic objectives, concepts and principles of safety and protection – they are the "policy" documents of the Series; (2) Safety Requirements, establishing the basic requirements that must be fulfilled to ensure safety for particular activities or applications; and (3) Safety Guides, recommending actions, conditions or procedures for complying with these safety requirements. Safety Guides are issued under the authority of the IAEA Director General and Safety Fundamentals and Safety Requirements require the approval of the IAEA Board of Governors before publication.

establishment of technically competent and independent national nuclear regulatory authorities. Also, a global experts' community of self sustaining safety networks of expert knowledge and experience has been created to facilitate continuous safety improvement and mutual learning.

1. Emergency Preparedness and Response

While work under the auspices of the IAEA in the mid-1960s leading to the adoption of a draft multilateral agreement on emergency assistance was eventually decided as being unattainable,[5] following the 1979 Three Mile Island (TMI) nuclear accident in the United States of America there was, through the IAEA, renewed and increased interest in international cooperation in the event of a nuclear accident.[6] Although the benefits of a binding multilateral agreement in this field was always recognised, it was considered, however, that the negotiation of such an instrument would take time and that advisory norms should therefore be developed first which could possibly be used, at a later stage, for the negotiation of a binding instrument in this field.[7]

However, this "later stage" only occurred some seventeen years after TMI and following the Chernobyl accident in 1986. The first response to the call for an "international regime" was almost instantly answered in the breaking of new ground in the treaty making process, by the unprecedented and prompt successful negotiation in four months of international binding commitments to notify and provide assistance in case of a nuclear accident. The two international IAEA guidelines recommending procedures in the event of a nuclear accident that had been previously developed,[8] were quickly replaced by the Convention on Early Notification of a Nuclear Accident (the Early Notification Convention) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (the Assistance Convention).[9]

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5. See the record of the IAEA Board of Governor's meeting in IAEA document GOV/OR Meeting 386 (34-71), 24 February, 1967.

6. Prior to the TMI accident, the IAEA's role in coordinating emergency planning and preparedness was minor. However, in June 1979 the Board of Governors approved the IAEA Director General's recommendations to include in the IAEA's nuclear safety programme, activities regarding the exchange of nuclear safety information and mutual emergency assistance for radiation accidents [see IAEA document GOV/DEC/103(XXII), No. 27 and also IAEA document GOV/1948]. The TMI accident also led to the establishment of Operational Safety Review Teams (OSART) in 1982 and to the establishment in April 1983 of an Incident Reporting System (IRS).

7. See IAEA document GOV/2069/Rev.1 and paras. 16-74 of GOV/OR.588 concerning the resolution submitted jointly by the Governments of the Netherlands, Sweden and the United States of America requesting the IAEA Director General, *inter alia*, to convene a "Group of Governmental Representatives […] to prepare an international convention on nuclear safety co-operation and mutual emergency assistance in connection with nuclear accidents […]". See also the Report of the Group of Experts which met from 28 June to 2 July 1982 (IAEA document GOV/2093, 16 August 1982).

8. See Guidelines on Reportable Events, Integrated Planning and Information Exchange In Transboundary Release of Radioactive Materials (IAEA document INFCIRC/321 issued in 1985) and Guidelines for Mutual Emergency Assistance Arrangements in Connection with a Nuclear Accident or Radiological Emergency (IAEA document INFCIRC/310, issued in 1984).

9. The Convention on Early Notification of a Nuclear Accident (IAEA document INFCIRC/335) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (IAEA document INFCIRC/336/Add.1) were both adopted by the IAEA General Conference at its Special Session, held from 24 to 26 September 1986, and were both opened for signature at Vienna on 26 September 1986 and at New York on 6 October 1986. They entered into force on 27 October 1986 and

The conventions establish in treaty form the duty of states to notify nuclear accidents with actual or possible transboundary effects, and the duty of states to cooperate in arranging for assistance in the case of a nuclear accident or radiological emergency.[10] States' obligations under these two conventions derive from the conventions' objectives, which are to minimise (and to mitigate the consequences of) the radiological consequences of an emergency and to protect life, property and the environment. In addition, the conventions contain obligations related to emergency plans, notification procedures, the nature of information to be provided and general requirements concerning the provision of assistance.

While the Early Notification and Assistance Conventions are the key elements of the international legal framework for international co-operation and co-ordination in the event of a nuclear or radiological emergency, there have also been a number of events that were outside their strict scope of application. In this respect, a number of practical arrangements and mechanisms have been developed over the years which have contributed to the international nuclear emergency preparedness and response system. In particular, this system includes the IAEA Incident and Emergency Center (IEC), which was established within the Secretariat of the IAEA as a 24-hour warning and operational focal point for acting on notifications and/or advisory messages by states and relevant international organisations, for example, of nuclear or radiological emergencies, as well as responding to requests for information or assistance during such emergencies. In fact, while the Conventions provide that the IAEA has a specific operational role in a nuclear or radiological emergency, something which had been envisaged since its inception, the IEC at present actually facilitates the management of a rapid coordinated response to events that may give rise to radiological consequences irrespective of their cause. Further, the IEC is concerned with promoting, facilitating and supporting co-operation among Parties to the conventions and establishing and maintaining liaison with relevant international organisations.[11]

A second element or mechanism in this field is the Emergency Notification and Assistance Technical Operations Manual (EPR-ENATOM 2004) which, since 1989, documents the practical implementation of those Articles of the Early Notification and Assistance Conventions that are operational in nature. It conceptually links the IAEA, its Member States, Parties to the conventions, relevant international organisations and other states and clarifies the expectations of the IAEA

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26 February 1987, respectively. However, it should be noted that there are also a number of bilateral agreements and one regional agreement: the Nordic Mutual Emergency Assistance Agreement in Connection with Radiation Accidents. This agreement was signed on 17 October 1963 by the IAEA Director General and by representatives of the governments of Denmark, Finland, Norway and Sweden. It entered into force on 19 June 1964 with the deposit of an instrument of ratification by the Government of Norway (see IAEA document INFCIRC/49 and Add.1).

10. The conventions elaborate and expand in the scope of nuclear activities and practices, Principles 20 and 21 of the Declaration of the United Nations Conference on the Human Environment, adopted in 1972 and endorsed by the UN General Assembly. It should be noted that the acceptance by the five Nuclear Weapons States (China, France, UK and USA and USSR) of the obligation to notify and to provide detailed information on all accidents, implicitly includes military nuclear facilities.

11. Prior to 1 February 2005, the centre was known as the Emergency Response Centre (ERC). Its functions have been extended to include: incident reporting, coordinating prompt assistance to requesting states in the case of a nuclear security incident, and to providing coordinated technical support to the IAEA's Division of Public Information in the case of an event of safety or security concern to the media.

Secretariat for the arrangements concerning the issue of requesting and providing assistance in the event of a nuclear or radiological emergency.[12]

There is also the Emergency Response Network Manual (EPR-ERNET 2002) which, since 2000, addresses the practical arrangements concerning the provision of assistance. In particular, it provides for a global event response network of national response capabilities (e.g. national experts and equipment etc.) available to respond rapidly to nuclear or radiological emergencies. Its major objectives are to strengthen the IAEA's capability to provide assistance and advice, to co-ordinate the provision of assistance as specified within the framework of the Assistance Convention, and to promote emergency preparedness and response capabilities for nuclear or radiological emergencies/incidents among IAEA Member States.[13]

In addition, good planning in advance of an emergency and clarity with clear lines of responsibility and authority, with regard to the interactions between various international organisations during an emergency, has been recognised as an important feature of the emergency response system. In this regard, pursuant to the obligations placed on it by the conventions, the IAEA regularly convenes the Inter-Agency Committee on Response to Nuclear Accidents (IACRNA), whose purpose is to co-ordinate the arrangements of the relevant international organisations for preparing for and responding to nuclear or radiological emergencies.[14]

Furthermore, although the conventions assign specific response functions and responsibilities to the IAEA and the Parties to the conventions, a number of international organisations have – by virtue of their statutory functions or of related legal instruments – general functions and responsibilities that encompass aspects of emergency preparedness and response. In this context, the latest edition of the Joint Radiation Emergency Management Plan of the International Organisations (EPR-Joint Plan 2004) describes the inter-agency framework for preparedness for and response to an actual, potential or perceived nuclear or radiological emergency. In particular, it sets out the objectives of response, the

12. The Manual was first published on 18 January 1989 and was republished in December 2000 and December 2004. The 2004 edition reflects, *inter alia*, that emergency situations can arise from both accidents and deliberate acts (malicious acts).

13. The present Manual entered into effect on 1 March 2003. It superseded the previous version – EPR-ERNET (2000). The Manual has been revised and the new Manual, the Response Assistance Network [EPR-RANET (2006)], will become effective on 1 May 2006. It reflects, *inter alia*, the concept of "radiological incidents" occurring from malicious acts.

14. The Inter-Agency Committee for the Co-ordinated Planning and Implementation of Response to Accidental Releases of Radioactive Substances (now renamed as IACRNA) was established following a meeting of representatives of FAO, UNEP, ILO, UNSCEAR, WMO, WHO and IAEA at the Special Session of the IAEA General Conference in September 1986. Currently its members are representatives from the European Commission (EC), the European Police Office (EUROPOL), the Food and Agriculture Organization of the United Nations (FAO), the International Atomic Energy Agency (IAEA), International Civil Aviation Organization (ICAO), the International Criminal Police Organization (INTERPOL), the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), the Pan American Health Organization (PAHO), the United Nations Environment Programme (UNEP), the United Nations Office for the Co-ordination of Humanitarian Affairs (UN/OCHA), the United Nations Office for Outer Space Affairs (UN/OOSA), the World Health Organization (WHO) and the World Meteorological Organization (WMO).

organisations involved in response, including their roles and responsibilities, it clarifies the interfaces among them and states and identifies operational concepts and preparedness arrangements.[15]

Finally, as well as responding to real events, the IAEA regularly tests its capabilities, *inter alia*, by organising and participating in international emergency response exercises. These exercises and their effective evaluation are an essential tool for improving the international emergency response arrangements. The most recent international exercise was ConvEx-3 (2005) which took place from 11 to 12 May 2005. It tested the international information exchange arrangements and mechanisms for providing public information in the early phase of a postulated serious nuclear emergency at the Cernavoda nuclear power plant, in Romania. The exercise provided an opportunity to, *inter alia*, identify possible shortcomings in national and international information exchange and response systems that might hamper the response aimed at minimising the consequences of a nuclear accident.

In addition to the aforementioned practical steps, Article 7 of the Early Notification Convention and Article 4 of the Assistance Convention, respectively, provide for the designation by States Parties of competent authorities to carry out specific functions with respect to issuing and receiving information relating to nuclear and radiological emergencies. Since 2001, the IAEA Secretariat has convened three biennial meetings of such competent authorities.[16] These meetings have resulted in a number of actions that have been considered by the IAEA Secretariat in developing its future plans for strengthening the system. In addition to improvements in the operation of the IEC, a regionally balanced National Competent Authorities' Co-ordinating Group (NCACG) was established in June 2003 which focuses its priorities on strategies for enhancing international communications and assistance while ensuring harmonisation and co-ordination with the IAEA Secretariat. Proposals have also been agreed for enhancing the existing drill and international emergency response exercise regime, recommending that these exercises address both nuclear accidents and radiological emergencies, including those arising from malicious acts. Of particular interest is the recommendation of the last meeting of competent authorities held in July 2005 that the IAEA Secretariat initiate the development of a "Code of Conduct for the International Emergency Management System" as the basis to support the practical mechanisms of the conventions and EPR-ENATOM.[17]

Complementary to the above, the IAEA Board of Governors approved in June 2004 and the IAEA General Conference endorsed the following September, an International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies. The Action Plan covers two main areas: it includes activities concerning international communication and assistance for nuclear and radiological emergencies and attempts to establish a sustainable infrastructure of preparedness and response in such cases.[18]

Finally, the IAEA's principal role with regard to international arrangements for response to a nuclear or radiological emergency is to establish and provide for the application of the relevant

15. These practical arrangements are reflected in the various organisations' own emergency plans. For example, the IAEA's in-house Nuclear and Radiation Event Assistance Plan (NAREAP) and WHO's Radiation Emergency Medical Preparedness and Assistance Network Manual (REMPAN).

16. The first meeting was held from 8 to 22 June 2001, the second from 2 to 6 June 2003 and the third meeting from 12 to 15 July 2005. All meetings have been held at IAEA Headquarters, Vienna.

17. See the Report of the Third Meeting of representatives of competent authorities identified under the Early Notification and Assistance Conventions, held in Vienna from 12 to 15 July 2005 (FINAL NCAM/REP/2005, TM-27206, 2005-08-08).

18. The plan was approved by the IAEA Board of Governors in June 2004 and the IAEA General Conference in resolution GC(47)/RES/7.A of September 2004.

international safety standards.[19] In providing for the application of these standards, international teams of experts conduct reviews on request of Member States preparedness for nuclear and/or radiological emergencies in Emergency Preparedness Review Teams (EPREV).

2. Safety of Nuclear Power Plants

Despite suggestions voiced since the 1960s that an international convention on the safety of nuclear power would create minimum worldwide standards for an activity that rested at the heart of the civilian uses of nuclear energy, the international community was generally disinclined to go beyond the recommendatory nature of the safety standards for nuclear power plants and to work out such a legally binding international instrument. However, the transboundary consequences of the Chernobyl accident clearly demonstrated that in nuclear matters, states shared similar concerns in spite of the differences that might exist in their socio-economic and political systems. Furthermore, it was recognised that while each state operating a nuclear power plant bears full and unequivocal responsibility for safety, for each state the maintenance of safety was an international responsibility.

Although a new set of safety standards for nuclear power plants was approved in June 1988,[20] it took a further five years after the Chernobyl accident for the earlier call for "the creation of an international regime for the safe development of [nuclear energy]" to be echoed in detail by a request for the establishment of an "International Nuclear Safety Regime", based on safety principles, methods of verification, exchange of information and peer review.[21] As a consequence, policymakers decided that it was time "to consider an integrated international approach to all aspects of nuclear safety, including safety objectives for radioactive wastes, which could be adopted by all governments, and in this connection, [they recognised] the potential value of a step by step approach to a framework convention".[22]

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19. See, in particular the Safety Requirements publication on Preparedness and Response for a Nuclear or Radiological Emergency [see IAEA document, Safety Standards Series No. GS-R-2, IAEA, Vienna (2002)], which constitutes the basis for international cooperation and is intended to minimise the consequences for people, property and the environment of any nuclear or radiological emergency.

20. In 1974, the IAEA launched a new Nuclear Safety Standards Programme (NUSS). This programme was comprised of a comprehensive series of Codes of Practice, supplemented by Safety Guides detailing their implementation that were intended to ensure the safe design, siting and operation of the current generation of nuclear power reactors and enhance the reliability of the Codes for nuclear power plants. At the time of the Chernobyl accident some five Codes and 55 Safety Guides for nuclear power plants had been prepared. In light of the Chernobyl accident, the Codes were updated in 1988 to, *inter alia*, include a set of basic Safety Principles to cover nuclear power plants.

21. In particular, see the opening address of Mr. K. Töpfer, President of the International Conference on the Safety of Nuclear Power; Strategy for the Future (organised by the IAEA and held at IAEA Headquarters in Vienna, from 2 to 6 September 1991), in the Safety of Nuclear Power: Strategy for the Future, Proceedings of a Conference [p. 9, IAEA document STI/PUB/880, (1992)]. See also the Co-Chairman's Summary of Issue I.

22. See the Major Findings of the International Conference, p. 95-96 (footnote 21). See also General Conference resolution GC(XXXV)/RES/533, 20 September 1991, paras. 3-4, inviting the IAEA Director General to prepare "an outline on the possible elements of a nuclear safety convention" for the Board of Governors' consideration. Also see the report by the IAEA Director General on an Outline of the Possible Elements of a Nuclear Safety Convention, to the March 1992 meeting of the Board of Governors (IAEA document GOV/2567, 21 January 1992).

At the outset, there was support for the CNS to be more comprehensive, covering the whole nuclear fuel cycle, including the safe management of all types of nuclear installations and the safe management of radioactive waste. It was agreed, however, after protracted deliberations that its scope of application should apply exclusively to land based civil nuclear power plants, as defined therein.[23] The affirmation, though, of the need to begin promptly the development of an international convention on the safety of radioactive waste management illustrated the importance states gave to further making good the international cooperation that had started in earnest a decade earlier.[24] In the end, after two years of preparatory work, the Convention on Nuclear Safety (CNS) was adopted on 17 June 1994.[25]

The CNS requires states to fulfil a number of obligations relating to the regulation, management and operation of nuclear power plants. There is the fundamental obligation to establish and maintain a legislative and regulatory framework with respect to the safe management and operation of land-based civil nuclear power plants, and to implement a number of measures based on general internationally accepted safety considerations regarding, for example, the availability of financial and human resources, the assessment and verification of safety, quality assurance and emergency preparedness. The CNS also addresses technical aspects of the safety of such nuclear installations, including their siting, design and construction, as well as their operation.

The CNS is referred to as an "incentive convention" and therefore, unlike mechanisms in other legally binding international law instruments, its effectiveness does not derive from specific obligations for non-compliance or reliance on dispute settlement provisions but rather it seeks to rely on a common interest amongst the Parties to achieve high levels of safety. The mechanism for realising this commonality is achieved through the holding of periodic triennial meetings of the Parties, which they are not only obligated to attend but where they are also duty bound to submit "national reports" on the implementation of their obligations for a "peer review" by the other Parties.[26]

These national reports are the tools that enable Parties to focus on the steps and measures already taken and the progress made in implementing the respective conventions' obligations. Not only do they demonstrate compliance with a state's international obligations but they also serve two other important purposes. First, although being a major task, they allow national authorities to review all national activities and to draw conclusions on future measures that may have to be taken. Secondly,

23. For further analysis of the negotiations of the CNS and its substantive provisions see "The Convention on Nuclear Safety", Odette Jankowitsch, *Nuclear Law Bulletin* No. 54 (1996) and "International Convention on Nuclear Safety: National Reporting as the Key to Effective Implementation", Carlton Stoiber, in Nathalie Horbach, *Contemporary Developments in Nuclear Energy Law: Harmonising Legislation in CEES/NIS* (1999).

24. See preambular paragraph (viii) of the CNS which explicitly provides to "begin promptly the development of an international convention on the safety of radioactive waste management as soon as the ongoing process to develop waste management safety fundamentals has resulted in broad international agreement." See also General Conference resolution GC(XXXVII)/RES/615 which, *inter alia*, requested the IAEA Director General to initiate preparations for a convention on the safety of waste management.

25. See IAEA document INFCIRC/449. The Convention was opened for signature on 20 September 1994 and entered into force on 24 October 1996. Less than ten years later, following India's ratification of the Convention in March 2005, every state with an operating nuclear power plant is now a party to the Convention. The Convention will also enter into force for Estonia on 4 May 2006 which will bring the number of Parties up to 57.

26. It should be noted that the term "incentive convention" is strictly speaking a term without precise meaning or international law precedent. Rather, it was created during the early drafting process of the CNS. See also preambular paragraphs (vii) and (ix) of the CNS and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, respectively.

they enable an open exchange of information between Parties at a Review Meeting, so that they may assess whether further improvement in their own performance is needed.

Prior to the implementation of the CNS review process, it had been commented that the details which had been agreed upon did not bode well for the effectiveness of the review process. Yet, while the focus tends to be on the triennial national reports and Review Meetings, the CNS is actually an ongoing, gradual and sustained process that seeks to continually promote and improve safety worldwide and, after three review meetings, this pessimism has clearly been proven ill-founded. In fact, developments that have occurred during the application of the review process demonstrate not only significant progress towards safety-related improvements but also a willingness of the Parties to fully contribute to the process.

The first Review Meeting held in 1999 provided a first "snapshot" of the measures that Parties had taken, and were taking, to achieve and maintain a high level of nuclear safety. The second meeting held in 2002, however, provided a more focused review, both by highlighting progress in individual states since the first meeting and by concentrating on some specific issues identified at the first meeting. The level of participation in this meeting – around three times as many delegates as at the first meeting – also demonstrated the growing importance attached to the CNS. In recognising the progress made in nuclear safety and in concluding that all Parties in attendance at the last Review Meeting held in April 2005 were in compliance with the requirements of the CNS, Parties have also identified the challenge of avoiding any complacency in nuclear safety.

In addition, it is noted that associated issues, such as the appropriate balance between confidentiality and transparency in the CNS's review process have been addressed by a move away from confidentiality among states, towards openness, transparency and cooperativeness. For example, while the Review Meeting discussions still remain confidential, many states are now placing their own national reports (as well as the questions received and answers given) fully in the public domain.

Finally, a welcome addition to the process is the decision of the second Review Meeting that the IAEA Secretariat should submit a report presenting generic information, although not identifying any specific country, about the significant issues, developments and trends in enhancing nuclear safety, based on the results of its advisory safety related services and missions and to henceforth use the IAEA's comprehensive suite of safety standards as a tool to assist in the review process. The relation between the Parties to the CNS and the IAEA's Secretariat has therefore developed in a mutually beneficial manner with, on the one hand, Parties to the CNS recognising the important role and value that the IAEA's advisory safety peer review services and missions have in maintaining and improving operational safety, and on the other hand, that the many important findings and conclusions during the Review Meetings may serve as valuable guidance for the IAEA Secretariat in implementing its future safety programmes.

3. Radioactive Waste Management

In the early years of nuclear law, the safe management of radioactive waste and spent fuel – the "back end of the nuclear fuel cycle" – had received little attention in the form of a binding international instrument. Even in the years before Chernobyl, however, it was an issue of strong public concern and by the early 1990s it had become a wider concern for the international nuclear

community. In particular, there were a growing number of waste repositories and urgency to ensure the safe management of such repositories and of radioactive waste in general.[27]

The adoption of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the Joint Convention) was, therefore, another important step towards a comprehensive international safety regime.[28] As its "sister" convention the CNS, which formed the basis for its structure, the Joint Convention is a binding commitment by states to achieve and maintain a high level of safety worldwide and can also be described as an "incentive convention". It covers spent fuel from nuclear power plants and research reactors, radioactive waste from the nuclear industry, from medicine, research and industrial applications of radioactive materials, including disused sealed sources and radioactive discharges into the environment. The Convention also contains requirements with respect to the transboundary movement of spent fuel and radioactive waste.[29]

Under the Joint Convention, Parties are, *inter alia*, obliged to take the appropriate legislative, regulatory and administrative measures to govern the safety of spent fuel and radioactive waste management and to ensure that individuals, society and the environment are adequately protected against radiological and other hazards. This is carried out, *inter alia*, by the appropriate siting, design and construction of facilities and by making provisions for ensuring the safety of facilities both during their operation and after their closure. In addition, Parties are also obliged to participate in a "peer review" process – similar to that under the CNS. The first Review Meeting concluded, *inter alia*, that the process had already contributed significantly to achieving the Joint Convention's objectives: firstly, as a result of being prompted by the Review Meeting, several states had made improvements to the management of spent fuel or radioactive waste in the period leading up to the meeting; secondly, states had acknowledged that the process of preparing their respective national report had been beneficial since it had identified needs and deficiencies in the national arrangements for the safe management of radioactive waste; and thirdly, states had identified improvements for the future and volunteered to report on progress in their implementation at the second Review Meeting which is scheduled for 15 to 24 May 2006.

In addition, in an effort to maintain continuity in the Joint Convention process since the first Review Meeting held in 2003, two newsletters have been published in April and September 2004 to keep Parties up-to-date. Also, the General Committee of the Review Meeting has continued to function, its purpose being to review draft documents prepared by the Secretariat and "to clarify the guidelines to better reflect the duties of officers, prior to and during a Review Meeting and their necessary qualifications."

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27. For example, the General Conference in September 1990 endorsed the Code of Practice on the International Transboundary Movement of Radioactive Waste (see IAEA document INFCIRC/386).

28. See IAEA document INFCIRC/546. The Joint Convention was adopted on 5 September 1997, opened for signature on 29 September 1997 and entered into force on 18 June 2001. For further analysis see "The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management", Professor Peter D. Cameron, in Horbach (footnote 23); "The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management", Wolfram Tonhauser and Odette Jankowitsch, *Nuclear Law Bulletin* No. 60 (1998); and "An Expanding International Legal Regime: Environmental Protection and Radioactive Waste Management", Gordon Linsley and Wolfram Tonhauser, IAEA Bulletin 42, No. 3 (2000).

29. See Article 27 of the Joint Convention.

Finally, a number of activities are also carried out pursuant to the Action Plan on the Safety of Radioactive Waste Management. The Action Plan which was initially endorsed by the General Conference in September 2001 and was formulated from the conclusions of the International Conference on the Safety of Radioactive Waste Management, held in 2000, in Cordoba, Spain,[30] was more recently updated in light of the deliberations of the International Conference on Issues and Trends in Radioactive Waste Management, held in 2002, in Vienna, Austria.[31] In total there are nine action areas under the Action Plan, which include the development of a structured and systematic programme to ensure adequate application of the IAEA's waste safety standards and to facilitate their application in implementation of the Joint Convention. IAEA activities relating to the safety of radioactive waste management, including safety standards development and their use and application, are currently being reviewed.[32]

4. Safety and Security of Radioactive Sources

In addition to the treaty making process, the international community has taken a second, and new, approach to the normative control of nuclear risks through the adoption of legally non-binding norms governing the safe and peaceful uses of nuclear energy. Two Codes have recently been developed, one concerning the safety and security of radioactive sources and the other on the safety of research reactors. Although they have not been developed as a direct response to the Chernobyl accident, these instruments and the practical steps for their application are an important part of the international legal framework.

In light of the need to prevent both accidents involving radioactive sources[33] and the theft or unauthorised use of radioactive materials – including measures to respond adequately to illicit trafficking of these materials – the Major Findings of the 1998 International Conference on the Safety of Radiation Sources and the Security of Radioactive Material considered it interesting to "[…] investigate further whether international undertakings […] attracting broad adherence could be formulated." The initial proposal to satisfy this need was for an international undertaking – possibly in the form of a convention – "which should provide for a clear commitment by and attract the broad adherence of States". [34]

30. See the Findings of the Conference in IAEA document GOV/INF/2000/8-GC(44)/INF/5, 31 May 2000.

31. See the Proceedings of the Conference in IAEA document STI/PUB/1175**,** 2003.

32. This review is being undertaken in light of the International Conference on the Safety of Radioactive Waste Disposal, 3-7 October, 2005, Tokyo, Japan (see the Proceedings of the Conference to be published in 2006) and the International Symposium on Disposal of Low Activity Radioactive Waste, 13-17 December 2004, Cordoba, Spain (see the Proceedings of the Symposium in IAEA document STI/PUB/1224, 2005).

33. See the following IAEA publications concerning radiological accidents: The Radiological Accident in Cochabamba (Bolivia), IAEA, Vienna, 2004; The Radiological Accident in Gilan (Iran), IAEA, Vienna, 2002; The Radiological Accident in Samut Prakan (Thailand), IAEA, Vienna, 2002; The Radiological Accident in Istanbul (Turkey), IAEA, Vienna, 2000; The Radiological Accident in Yanango (Peru), IAEA, Vienna, 2000; The Radiological Accident in Tammiku (Estonia), IAEA, Vienna, 1998; The Radiological Accident in Soreq (Israel), IAEA, Vienna, 1993.; The Radiological Accident in San Salvador (El Salvador), IAEA, Vienna, 1990; The Radiological Accident in Goiania (Brazil), IAEA, Vienna, 1988.

34. The Conference which was held in Dijon, France, from 14 to 18 September 1998 was the first IAEA Conference devoted to both the safety of radiation sources and the security of radioactive materials. See

However, it soon became clear that states did not wish to enter into such a binding commitment at the present time and accordingly a non-binding Code of Conduct on the Safety and Security of Radioactive Sources was adopted in September 2000.[35] Some three years later, however, the Code of Conduct was revised, to reflect the change in the international community's perception of threats in light of the events of 11 September 2001 by, *inter alia*, including strengthened provisions relating to security of radioactive sources and additional components concerning national registries of such sources.[36] One of the general objectives of this revised Code is to achieve a high level of safety and security of civilian radioactive sources that may pose a significant risk to individuals, society and the environment. It includes guidance on general basic principles, legislation and the regulatory body. In addition, since the Code of Conduct only includes basic provisions on the import and export of "high level" radioactive sources[37] and in response to the need to explore further guidance on the import and export of radioactive sources, the Supplementary Guidance on the Import and Export of Radioactive Sources, was adopted by the Board of Governors and endorsed by the General Conference in 2004.[38]

As a counterbalance to the legally non-binding nature of the Code of Conduct, the IAEA General Conference urged states "to write to the Director General that [they] fully support and endorse the IAEA's efforts to enhance the safety and security of radioactive sources, [that they are] working toward following the guidance contained in the [Code of Conduct], and encourage[d] other countries to do the same".[39] Similarly, the 2004 General Conference encouraged states with respect to the Supplementary Guidance, "to act in accordance with the Guidance on a harmonised basis and to notify the Director General of their intention to do so as supplementary information to the Code of Conduct.[40] In response, both the Code and its Guidance have received considerable support in a relatively short period. To date, 82 states have expressed their political commitment to the Code and 24 states with respect to the Supplementary Guidance.[41]

In further support of the application of the Code of Conduct and its Supplementary Guidance, a number of related developments should be mentioned. First, at an international conference held last year, states discussed, *inter alia*, 24 national reports voluntarily submitted, covering national

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the Proceedings of the Conference in IAEA Document STI/PUB/1042, 1999 and also IAEA document GOV/1999/16 para 6(d), 25 February 1999.

35. See General Conference resolution GC(44)/RES/11 of 11 September 2000. The Code was published in March 2001 as IAEA/CODEOC/2001.

36. See IAEA document INFCIRC/663. A closely related issue is the categorisation of sources. It was recognised that the need to revise the Code also implied a need to revisit the source categorisation scheme developed to accompany the Code. The wider range of scenarios considered since 11 September 2001 has resulted in a categorisation system that is slightly more complex, but potentially more useful for general use.

37. Defined as Categories 1 and 2 in the Code of Conduct and see also the Categorization of Radioactive Sources, Revision of IAEA-TECDOC-1191, (IAEA TECD-1344, 2003).

38 . See General Conference resolution GC(48)/RES/10.D, 24 September 2004.

39. See operative paragraph 6 of General Conference resolution GC(47)/RES/7.B.

40. See operative paragraph 8 of General Conference resolution GC(48)/RES/10.

41. The Supplementary Guidance also encourages states to nominate a point of contact for the purpose of facilitating the export and/or import of radioactive sources and to provide the IAEA with the details of these points of contact (see Section V). To date 54 states have done this. Also, in order to facilitate the timely review of export requests, states are requested to make available to the IAEA their responses to a (confidential) Self Assessment Questionnaire (see Annex 1). To date 17 states have completed this questionnaire.

implementation of the Code.[42] The call at the conference for consultations on a possible formal review mechanism was echoed some months later in the resolution of the IAEA General Conference which, *inter alia*, requested the IAEA Secretariat to undertake consultations with Member States with a view to establishing a more formalised process for a periodic exchange of information and lessons learned and for the evaluation of progress made by states towards implementing the provisions of the Code of Conduct.[43]

Also, with regard to the Supplementary Guidance, states have already met to share national experiences in its application with a view to applying it in a co-operative and harmonised manner.[44] At this meeting, the multilateral nature of the Supplementary Guidance was noted, as was the importance of states making a political commitment to apply the Guidance in a harmonised manner. States were also encouraged to share information with other states. Also, it was recognised that the need for flexibility is required as states work towards implementing the Supplementary Guidance. Finally, communication between exporting and importing states was considered to be an important issue.

In support of the Code and its practical application, the IAEA continues to implement the revised International Action Plan on the Safety and Security of Radioactive Sources.[45] The Action Plan, in particular, concerns the promotion of greater international co-operation in addressing the security concerns raised by insufficiently controlled radioactive sources, the identification of those sources which pose the greatest risks, and the promotion of strong national action by all states to minimise those risks over the whole life-cycle of radioactive sources.

The Action Plan also includes a list of activities to be taken by the Secretariat to assist states in enhancing the safety and security of radioactive sources. In the context of establishing effective national regulatory infrastructures and national plans, the plan promotes mechanisms to encourage states to commit to the application of the Code of Conduct by an assessment by IAEA advisory missions of the degree of application of the Code; a continuation of dialogue with manufacturers and suppliers of radioactive sources, regulatory bodies and users on the appropriate means of controlling the export, use and return of radioactive sources consistent with the relevant provisions of the Code; and also the provision of assistance to manufacturers and suppliers of radioactive sources in the development of an appropriate Code of Practice that defines their roles and responsibilities during the life cycle of high-risk sources.

Extensive work has also been performed under the umbrella of an initiative between the Department of Energy of the United States of America and the Federal Atomic Energy Agency of the Russian Federation Partnership.[46] The IAEA has since the beginning of 2003 been managing the projects for the dismantling of the highest-risk disused sources and facilities (e.g. teletherapy

42. See the Findings of the President of the International Conference on the Safety and Security of Radioactive Sources: Towards a Global System for the Continuous Control of Sources Throughout their Life Cycle (the Bordeaux Conference), Bordeaux, France, 27 June – 1 July 2005.

43. See General Conference resolution GC(49)RES/9.

44. A technical meeting entitled "The Code of Conduct on the Safety and Security of Radioactive Sources – sharing experiences on implementing the Supplementary Guidance on the Import and Export of Radioactive Sources" was held at IAEA Headquarters from 12 to 14 December 2005.

45. See IAEA document GOV/2003/47-GC(47)/7.

46. The initiative was formerly known as the IAEA/Russian Federation/USA ("Tripartite") Initiative but as a result of a decision of the Initiative's Steering Committee meeting on 18 May 2005, the structure of the Initiative was changed to a regional partnership between the Department of Energy and the Federal Atomic Energy Agency, with the IAEA as a facilitator.

machines, irradiators etc.) and the transport of these type of sources to secure storage. In addition, a number of regional projects have been developed, for example, with the United States of America and Australia for increasing awareness on the security of sources and training regulators and radioactive source users in Southeast Asia. Also, a regional partnership between India, the United States of America and the IAEA will provide a mechanism for the provision of training, instrumentation, technical support and awareness building within India and in other states in the region. A third regional partnership was initiated with South Africa, the United States of America and the IAEA, specifically for recovering and securing disused, high-activity sources and training government institutions.

Finally, in an effort to achieve the safety and security of radioactive sources, the IAEA, established in 2004, the Radiation Safety and Security of Radioactive Sources Infrastructure Appraisal (RaSSIA) which is designed to provide the IAEA and its Member States with a means for assessing national progress in establishing a national regulatory infrastructure for radiation safety and security of radioactive sources, to provide recommendations relating to improvements in areas where shortcomings and deficiencies (against international standards and the Code of Conduct) have been identified, and to submit to the state a national action plan for improving the national regulatory infrastructure in this regard.

5. Safety of Research Reactors

For over 50 years, research reactors have been one of the cornerstones of nuclear science and technology. Throughout this time, most of the facilities have generally maintained a good record of safe operation. At the same time, however, a number of concerns still remained about the safety of some facilities which resulted in a number of initiatives in the late 1980s. More recently in April 2000, the Chairman of the International Nuclear Safety Advisory Group (INSAG)[47] wrote to the IAEA Director General drawing attention to the fact that there were a significant number of research reactors in a state of extended shutdown without definite plans for the future; that there were major issues related to the ageing of research reactors; that many research reactors had large stocks of spent fuel; and that research reactors were not covered by the CNS. In this respect, INSAG suggested the development of a Protocol to the CNS or some similar legal instrument as a way of establishing a better international safety framework for these reactors.[48] In recognising that such an instrument would take time to develop, it was recommended that urgent action be taken in two areas: a proper decommissioning of research reactors that are shut down and not decommissioned, and a thorough review of the safety of older research reactors not under the control of an independent national regulatory authority.

As a result of this initiative, the Code of Conduct on the Safety of Research Reactors was adopted in September 2004.[49] The Code is an important step towards an international nuclear safety regime for research reactors comparable to that already in existence for nuclear power plants under the

47. INSAG, established in 1985, is composed of leading experts from IAEA Member States. It is convened with the objective to provide authoritative advice and guidance to the IAEA Director General on nuclear safety approaches, policies and principles. In particular, INSAG provides recommendations and opinions on current and emerging nuclear safety issues to the IAEA, the nuclear community and the public.

48. See also the subsequent IAEA General Conference resolution GC(44)/RES/14, 22 September 2000.

49. For the text of the Code of Conduct see General Conference document GC(48)7. The General Conference in resolution GC(48)/RES/10/A.8 welcomed the adoption of the Code by the Board of Governors in March 2004

CNS. In substance, the Code provides a clear distinction between the different obligations of states, regulatory bodies and reactor operators. Its objective is to achieve and maintain a high level of safety in civilian research reactors worldwide through the enhancement of national measures and international cooperation including, where appropriate, safety related technical cooperation. This objective is to be achieved by proper operating conditions, the prevention of accidents and, should accidents occur, the mitigation of the radiological consequences, in order to protect workers, members of the public and the environment against radiation hazards.

However, unlike the Code of Conduct on the Safety and Security of Radioactive Sources and its Supplementary Guidance, there is currently no process foreseen by which states can make "political commitments" to apply the guidance in the Code.[50]

There are, however, a number of IAEA activities that are related to the Code's application. For example, the IAEA Research Reactor Safety Enhancement Plan of 2001[51] is focused on three main areas: first, establishing IAEA safety documents as the foundation upon which a global safety framework for research reactors is based; secondly, encouraging and assisting Member States in effective application of these safety documents; and finally, fostering global and regional cooperation in research reactor safety. This plan is in the process of being updated and it is expected that the new plan will be finalised during 2006.

In addition, the IAEA has established a number of safety standards that are fundamental to the enhancement of research reactor safety and has also provided for their application through advisory services, such as the Integrated Safety Assessment of Research Reactors (INSARR) missions to Member States. These missions are the principal mechanism for monitoring and enhancing the safety of research reactors by addressing, in an integrated manner, all aspects of safety, including maintenance and regulatory oversight, with follow-up missions carried out for the purpose of assessing progress in the implementation of INSARR team recommendations. In fact, the results of these missions are fed into an integrated information system that will also receive inputs from the IAEA's Incident Reporting System for Research Reactors (IRSRR) and the IAEA's database relating to research reactors. Efforts are also focused on the development of self-assessment capabilities in Member States, through information exchange and the participation of persons from those Member States as observers in INSARR missions. Also, in addition to organising regular training courses and workshops, the Secretariat has been assisting Member States that have research reactors with the establishment of sustainable programmes of education and training in nuclear safety.

Finally, pursuant to the request of the third Review Meeting of the CNS,[52] an open-ended meeting on effective application of the Code was held from 14 to 16 December 2005. At this meeting which was attended by 31 Member States it was agreed that, while national commitments (similar to those made with respect to the Code of Conduct on the Safety and Security of Radioactive Sources and its Supplementary Guidance) would be valuable, commitment is best displayed through participation in meetings for exchanging information and experience on application of the Code. In this respect, the meeting reached consensus on proposals for periodic meetings to discuss topics related to the application of the Code, to exchange experience and lessons learned, to identify good practices, to discuss future plans, and to discuss difficulties encountered and assistance required to

50. See the September 2004 General Conference resolution GC(48)/RES/10/A.8 which merely encourages states to apply the guidance in the Code to the management of research reactors.

51. See IAEA document GOV/2001/28-GC(45)/11, 2 August 2001.

52. See the Summary Report of the Third Review Meeting of Contracting Parties to the Convention on Nuclear Safety (CNS-RM-2005/08 FINAL).

reach full compliance. The meeting also called for an Internet site on which documents related to the periodic meetings can be posted to facilitate exchange of information. Finally, in recognising the benefits of the Code towards enhancing research reactor safety worldwide, there was also a call for the Code to be integrated into all IAEA safety assistance and review activities and for consideration to be given to updating the IAEA Project and Supply Agreements to reflect the provisions of the Code.[53]

6. Nuclear Security

As for nuclear safety, but probably even more so because of the sensitive matters which it impinges on, nuclear security has for a long time been considered as a national domain and thus almost exclusively a matter governed by national law.[54]

In recent years, however, terrorist attacks have taken on heightened significance: the events of September 2001 propelling a rapid and dramatic re-evaluation of the risks of terrorism in all its forms, including the threat of nuclear and radiological terrorism. In fact, while the Chernobyl accident did not contribute significantly to developments in nuclear security – notwithstanding the "coincidental" entry into force of the CPPNM less than a year after the accident – the "lesson of Chernobyl" in the safety sphere has been applied to nuclear security, in the sense that nuclear security should be urgently strengthened, without waiting for a "watershed" event to provide the impetus for security upgrades and expanded international co-operation. In this respect, it recognised that just as the transboundary consequences of the Chernobyl accident which demonstrated that "an accident anywhere is an accident everywhere", the illicit trafficking of nuclear and radioactive materials and the activities of terrorists are not limited by national boundaries.

A fundamental component of nuclear security is the establishment and application of adequate "physical protection measures". The overall objective of the international regime adopted under the auspices of the IAEA governing the physical protection of nuclear material is to have a strong physical protection regime – one in which security is everywhere and at an acceptable level.

The physical protection regime included the development and establishment, under the auspices of the IAEA, of binding and non-binding international norms. In particular, in 1972, guidelines for the establishment of national physical protection systems were developed as recommendations concerning specifics about physical protection measures for nuclear material and nuclear facilities and what states need to do in this regard.[55]

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53. See the Report of the Chairman, Open-ended meeting on Effective Application of the Code of Conduct on the Safety of Research Reactors.

54. Nuclear Security means "the prevention and detection of and response to, theft, sabotage, unauthorised access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities." (IAEA Advisory Group on Nuclear Security, January 2002).

55. See The Physical Protection of Nuclear Material and Nuclear Facilities, IAEA document INFCIRC/225/Rev. 4(Corrected). The recommendations originated as "Recommendations for the Physical Protection of Nuclear Material" prepared by a panel of experts convened by the IAEA Director General These recommendations were revised by a Group of Experts in cooperation with the IAEA Secretariat, and the revised version was published in 1975 in the IAEA document INFCIRC series. The document was subsequently revised four times in 1977, 1989, 1993 and lastly by a meeting of national experts that met from 2-5 June 1998 and from 27-29 October 1998. Its recommendations, concepts and terminology form the basis for the Physical Protection Objectives and Fundamental Principles (see footnote 56).

Also included in this regime are a number of physical protection objectives and fundamental principles that were endorsed in 2001 as another "step towards strengthening the physical protection regime".[56] These objectives and fundamental principles are intended for nuclear material in use and storage, and during transport, and for nuclear facilities using or storing such materials. They provide the basic elements that states need to take into account when developing their national regimes for preventing the theft, misuse or sabotage of nuclear material and facilities.

Even though the main responsibility in the area of nuclear security rested with the states concerned and despite the adoption of the aforementioned guidelines and fundamental principles, there was a growing widespread recognition in the early 1970s of the need for cooperation between states to ensure adequate physical protection of potentially hazardous nuclear material and of the necessity for an appropriate international legal instrument regulating such cooperation.

The idea of an international legally binding undertaking for protecting nuclear material was first discussed within the Secretariat in 1974[57] and five years later, on 26 October 1979, the international community adopted the Convention on Physical Protection of Nuclear Material (the CPPNM).[58] The adoption of the CPPNM broke significant new ground, not only demonstrating the value of the IAEA as a forum for negotiations on security matters but also by requiring action by states under their internal criminal legal system, which is a sensitive domestic matter.

The first area covered by the CPPNM refers to states' commitments to protect nuclear material during international transport (and during storage incidental to such transport). States commit themselves not to undertake or authorise the undertaking of such international transport unless assurances are provided that nuclear material will be protected at the levels required by the CPPNM. Nuclear material in transit from one part of a States Parties' territory to another, when passing through international waters or airspace, should also be protected at the prescribed levels. The second area covered by the Convention refers to states' undertakings to make the intentional commission of certain acts (e.g. theft or robbery of nuclear material, threat to use nuclear material to cause death and other ancillary offences such as attempt and participation in such acts) punishable offences under their national law, to establish jurisdiction over such offences and to detain alleged offenders for the purpose of prosecution or extradition. As a third subject area, the CPPNM also promotes international cooperation.

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56. The Board endorsed the "Physical Protection Objectives and Fundamental Principles" for publication as a "Security Fundamentals" document, "it being understood that their adoption would not lead to diminished interest on the part of Member States in becoming Parties to the Convention on the Physical Protection of Nuclear Material and that they were not a substitute for the Convention or for the recommendations in document INFCIRC/225/Rev.4 (Corrected)" [see IAEA document GOV/2001/41 or GC(45)/INF/14, GOV/OR.1033, paras 157-162)]. Also, see General Conference resolution GC(45)/RES/14.B of 21 September 2001 which welcomed the Board's endorsement.

57. For further information, see for example the Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons in May 1975; Resolution GC/XIX/RES/328 of the September 1975 General Conference; IAEA document "The Physical Protection of Nuclear Material" (INFCIRC/225); and the report of the Advisory Group on Physical Protection of Nuclear Material (which met in February 1977).

58. See IAEA document INFCIRC/274/Rev.1.The convention was opened for signature on 3 March 1980 and entered into force nearly seven years later on 8 February 1987. At present the convention has 116 Parties.

Despite the aforementioned arrangements, efforts to strengthen the CPPNM were initiated early on.[59] For a number of years it was recognised that the present convention was not adequate, since it did not cover major aspects of physical protection. Notably, there was no commitment by states to protect nuclear material in domestic use, storage and transport. In addition, there was no commitment regarding the protection of nuclear material and nuclear facilities against sabotage.

Recognising these deficiencies, an Amendment to the CPPNM was adopted on 8 July 2005 which now provides for an expanded regime and strengthens the CPPNM in three main areas. [60] The first area relates to the effective physical protection of nuclear material and of nuclear facilities and contains a new "core" undertaking by states to establish, implement and maintain a physical protection regime applicable to nuclear material and facilities under their jurisdiction, including an appropriate legislative and regulatory framework for physical protection, a competent authority responsible for its implementation, and other administrative measures necessary for the physical protection of such material and facilities. The second area concerns the prevention and combating of offences relating to nuclear material and nuclear facilities worldwide and, *inter alia,* requires states to bring under their jurisdiction and make punishable under their national laws certain offences including theft, robbery, smuggling of nuclear material or sabotage of nuclear facilities, as well as acts related to directing and contributing to the commission of such offences. The third area relates to facilitating co-operation among states and foresees, in particular, new arrangements for co-operation, assistance and coordination amongst states in case of a credible threat of sabotage or sabotage.[61]

In parallel to the aforementioned developments in the legal domain and similar to the review of the IAEA's nuclear safety programme shortly after the Chernobyl accident at the Special and Regular Sessions of the General Conference, held in September and October 1986, a sweeping review of the IAEA´s nuclear security programme was undertaken in 2001.[62] As a consequence, since that time the

59. The IAEA Director General convened in November 1999, an "Informal Open-Ended Expert Meeting to Discuss Whether there is a Need to Revise the Convention […]". The Expert Meeting concluded in May 2001 that there was "a clear need to strengthen the international physical protection regime". In recommending that a "well-defined amendment" be prepared by a group of legal and technical experts, the Expert Meeting indicated a number of subjects that should be covered. In response, the IAEA Director General on 6 September 2001 convened a Group of Experts to prepare a draft amendment aimed at strengthening the CPPNM. At its sixth and final meeting, held on 14 March 2003, the Group adopted by consensus its Final Report, which set out possible amendments to be made to the CPPNM.

60. The Amendment will enter into force in accordance with paragraph 2 of Article 20 of the CPPNM, on the thirtieth day after the date on which two-thirds of the States Parties deposit their instruments of ratification, acceptance or approval. On 19 and 29 September 2005, the IAEA Board of Governors and General Conference, in welcoming the Amendment to the CPPNM encouraged "all States party to the Convention to ratify the amendment as soon as possible and to deposit instruments of ratification, acceptance or approval with the depositary to enable the early entry into force of the amendment." In addition, "all States party to the Convention [were encouraged] to act in accordance with the object and purpose of the amendment until such time as the amendment enters into force".

61. For further information on the Amendment and the physical protection regime see "The International Regime on the Physical Protection of Nuclear Material and the Amendment to the Convention on the Physical Protection of Nuclear Material", Maria de Lourdes Vez Carmona, in *Nuclear Law Bulletin* (NLB), No. 76, Volume 2005/2, p. 29-46.

62. See IAEA document GOV/2001/50. By better exploiting the synergies between safety and security and promoting further cross-fertilisation of approaches, it was considered that the IAEA could help to build up mutually reinforcing global regimes. Accordingly, the IAEA decided to transfer the work on nuclear security that was previously linked with the safeguards programme to the Department of Nuclear Safety, now the Department of Nuclear Safety and Security.

IAEA has taken a holistic and comprehensive approach to helping to strengthen the nuclear security of its Member States. These activities were initially integrated into a three-year Plan of Activities to Protect against Nuclear Terrorism[63] which was since revised into a Nuclear Security Plan for 2006-2009 that provides a more simplified structure, emphasising efficiency and flexibility.[64]

In summary, these IAEA activities have three main points of focus: first, needs assessment, analysis and coordination; secondly, they relate to prevention; and thirdly, to detection and response. The overall goal of this approach is to assist Member States, upon request, in improving their nuclear security, thereby reducing the risk of a successful act of nuclear terrorism. The IAEA's role in achieving this goal is similar to that for nuclear safety. In particular, it consists of the following broad areas: facilitating the development of, and adherence to, legally binding and non-binding international instruments; developing international guidelines and recommendations acceptable to the international community; providing related assessment services, training, equipment and technical advice; and providing or facilitating the exchange of information and related services.

While these activities, unlike those in nuclear safety, are funded voluntarily by IAEA Member States through the Nuclear Security Fund (NSF), contributions have been significant. As of 31 July 2005, a total of 42.4 million US dollars (USD) had been pledged by 26 Member States and one nongovernmental organisation, and in total USD 36.7 million has been received.[65] As a consequence of this increased funding and pursuant to the aforementioned Nuclear Security Plan, there has been an acceleration of the existing IAEA activities, including the development of an extensive range of new voluntary "upon request" measures to assist states in the prevention, detection and response to malicious acts involving nuclear and other radioactive materials and their associated facilities and transports. For example, relevant advisory services include the International Nuclear Security Advisory Service (INSServ); the International Physical Protection Advisory Service (IPPAS); the International Regulatory Review Team (IRRT); and the International Team of Experts to promote adherence to and implementation of relevant international instruments in the area of nuclear terrorism (ITE). As shall be mentioned later, there are important synergies between nuclear safety and security. Consequently, in implementing the aforementioned activities, the IAEA has used a comprehensive approach – where IAEA activities contribute to both nuclear security and other IAEA objectives such as verification or safety.

7. Liability for Nuclear Damage

The Chernobyl accident with its transboundary consequences not only brought into sharp focus the inadequacies of existing international and national safety measures and standards but necessarily alerted the international community to finally arrive at an understanding of the need to strengthen the international rules mitigating the consequences of a nuclear accident through timely and adequate compensation.

63. See IAEA document GOV/2002/10. The 2002-2005 Plan was adopted by the IAEA Board of Governors in March 2002.

64. The Plan was adopted by the IAEA Board of Governors and endorsed by the IAEA General Conference in September 2005 in resolution GC(49)/RES/10. The Plan not only concerns nuclear material but also other radioactive material such as radioactive sources, their transport, as well as nuclear installations.

65. See IAEA document Nuclear Security – Measures to Protect Against Nuclear Terrorism, Progress Report and Nuclear Security Plan for 2006-2009, p. 9-12, GC(49)17, 23 September 2005.

The liability regime prior to the Chernobyl accident consisted of two conventions based on a number of identical basic principles: the Vienna Convention on Civil Liability for Nuclear Damage (the Vienna Convention), an instrument intended to regulate nuclear liability issues on a world-wide scale adopted in 1963 under the auspices of the IAEA; and the Paris Convention on Third Party Liability in the Field of Nuclear Energy (the Paris Convention), a regional instrument adopted in 1960 under the auspices of the OECD.

The Chernobyl accident also raised two issues, both crucially important for the effectiveness of an international legal regime of nuclear liability: the first was, of course, the wide international acceptance of the regime; but the second was, inevitably, the adequacy of the regime to cope with the transboundary consequences of a major nuclear accident.

With a view to ensuring a wider international acceptance and application of the civil liability regimes established by the Vienna and Paris Conventions, the focus, first of all, was on the need to avoid the duplication created by the existence of two different conventional regimes based on very similar principles: the regional Paris regime, on the one hand, and the Vienna regime, on the other. For many years, the Vienna and Paris Conventions, while based on the same principles, existed in isolation from each other. Their parallel operation raised a potential problem of the conflict of law. Although various possibilities were envisaged to address this problem, it was eventually concluded that the best solution would be the adoption of a new international instrument aiming at linking the two conventions into one system. Work that had been initiated some years before the Chernobyl accident received renewed impetus and resulted in the adoption on 21 September 1988 of a Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention.[66]

This Joint Protocol provides for a mutual extension of the operator's liability under the Paris and Vienna systems: thus, if a nuclear incident occurs for which an operator is liable under both the Vienna Convention and the Joint Protocol, he shall be liable in accordance with the Vienna Convention for nuclear damage suffered not only in the territory of Parties thereto, but also in the territory of Parties to both the Paris Convention and the Joint Protocol; conversely, if an incident occurs for which an operator is liable under both the Paris Convention and the Joint Protocol, there shall be reciprocity. Moreover, the Joint Protocol is meant to eliminate conflicts which might otherwise arise, especially in transport cases, from the simultaneous application of the two Conventions. In order to avoid conflict of jurisdiction, the Joint Protocol establishes a choice of law rule to determine which of the Conventions should apply (to the exclusion of the other) in respect of the same accident.

As for the adequacy of the Vienna civil liability regime, it was recognised that the Vienna Convention did not provide adequate protection, especially in the event of a large scale nuclear accident. Even if the former Union of Soviet Socialist Republics had been Party to the convention, making it possible for affected persons to receive compensation, the amount of compensation available would probably only have been available to a small number of affected persons. In this respect, the revision of the existing Convention was proposed, as was the need to consider the broader question of international liability in inter-state relations, in particular, whether a new multilateral instrument, complementary to the existing civil liability instruments, should be developed to elaborate international claims for nuclear damage against states. It was considered, however, during the following years that the need for an international regime of state liability for nuclear damage could, for example, be obviated by the establishment of a system of global supplementary funding.

66. See IAEA document INFCIRC/402. The Joint Protocol was adopted and opened for signature on 21 September 1988 and entered into force on 27 April 1992.

Following eight years of negotiations, states adopted, in September 1997, the Protocol to Amend the Vienna Convention on Liability For Nuclear Damage (the 1997 Protocol) and the Convention on Supplementary Compensation for Nuclear Damage (the CSC).[67]

Quite simply, the 1997 Protocol extends the coverage of the Vienna Convention to include nuclear damage suffered in non-Contracting States (except for states which have a nuclear installation on their territory or in their maritime zones and do not afford reciprocal benefits). The Protocol also expands the types of damage for which coverage is provided, including costs associated with the reinstatement of significantly impaired environment, loss of income deriving from an economic interest in use or enjoyment of a significantly impaired environment; and costs of preventive measure. In addition, the amount of coverage is raised: the minimum liability limit set in the 1963 Vienna Convention is increased to not less than 300 million SDRs (currently, approximately USD 400 million). States that have difficulty in immediately implementing the increased liability amount may phase in this amount during a fixed period of time. The Protocol also extends to 30 years the period for claiming damages due to loss of life and personal injury, and removes the exoneration for natural disasters. It also enhances the jurisdiction provisions of the Vienna Convention by providing that, in the event of transport incidents within the exclusive economic zone or a similar maritime area, jurisdiction over actions concerning nuclear damage lies with the courts of the coastal state. The Protocol may be signed and adhered to by all states, not just Parties to the Vienna Convention.

The need for enhanced compensation of nuclear damage after the Chernobyl accident was not only addressed by the adoption of the 1997 Protocol but also by the CSC. Different to the 1997 Protocol, however, the CSC is aimed at establishing a worldwide liability regime in which all states, irrespective of whether they are party to the Vienna Convention or Paris Convention, may participate. States party to the CSC are required to bring their national legislation on compensation for nuclear damage into line with the liability rules under the Vienna and Paris Conventions – thus it provides a means for states not in a position to adhere to the Vienna or Paris Conventions with an alternative means for joining the international nuclear liability regimes. The CSC also establishes a mechanism for providing additional funds to supplement the compensation of nuclear damage available under the Vienna or Paris Conventions, or under the national legislation of states not party to the two basic conventions, with supplementary compensation being provided by States Parties in addition to the national compensation amount. A state with a nuclear installation on its territory must be also a Contracting State to the Convention on Nuclear Safety.

Despite the adoption of these new instruments, concerns still remain with regard to a comprehensive liability regime. These concerns were expressed, in particular, in the Summary and Findings of the President of the 2003 International Conference on the Safety of Transport of Radioactive Material which noted, *inter alia*, that "there remains considerable uncertainty and debate related to the implementation of a comprehensive regime to deal with the legal liability resulting from an accident during the transport of radioactive material. There are a number of liability-related conventions, to which many States are Parties but many others are not." Further, "the provisions of the liability conventions, and the relationships between them, are not simple to understand" and concluded that "the preparation of an explanatory text for these instruments would assist in developing a common understanding of what are complex legal issues, and thereby promote adherence to these instruments.

67. Both instruments were opened for signature by all states on 29 September 1997. The Protocol entered into force on 4 October 2003, the CSC is not yet in force. See IAEA documents INFCIRC/566 and INFCIRC/567, respectively.

The IAEA Secretariat should prepare such an explanatory text, with the assistance of an independent group of legal experts appointed by the IAEA Director General."[68]

In light of the aforementioned findings and with a view to fostering a global and effective nuclear liability regime, the IAEA Director General established the same year an advisory Group – the International Expert Group on Nuclear Liability (INLEX).[69] Since its inception INLEX has held a total of five meetings.[70]

Among the tasks INLEX has accomplished so far, and pursuant to the Conference's call, is the finalisation of explanatory texts (including an overview of the revised IAEA nuclear liability regime) on the nuclear liability instruments adopted under IAEA auspices. These texts constitute a comprehensive study of the IAEA's nuclear liability regime in order to aid the understanding and authoritative interpretation of that regime.[71] In addition, INLEX has also discussed and reached conclusions on possible gaps and ambiguities in the scope and coverage of the existing nuclear liability regime, and the disadvantages of not adhering to a global nuclear liability regime, in particular, with regard to the possible difficulties of obtaining compensation outside the regime.

In order to provide a platform for both fostering adherence to the international nuclear liability regime and to provide a forum for open discussions on possible difficulties, concerns or issues states may have with the regime, INLEX has also dealt with a number of outreach activities, including the development of standard training material in the area of nuclear liability and the organisation of regional workshops.[72]

8. The IAEA's Legislative Assistance Programme

The aforementioned international legal framework and its steps for its practical application would not be complete, however, without a program that assists states in the establishment and

68. See Section A.3 of the Summary of Explanatory Topical Session on Liability in the Summary and Findings of the President of the International Conference on the Safety of Transport of Radioactive Material, held from 7 to 11 July 2003, in Vienna (IAEA document STI/PUB/1200, 2004).

69. See the IAEA Director General's Statement to the September 2003 General Conference and also the resolution of the Conference GC(47)/RES/7.C, 19 September 2003 which, *inter alia*, welcomed "the decision of the IAEA Director General to appoint a group of experts to explore and advise on issues related to nuclear liability".

70. The first meeting was held on 16 and 17 October 2003, the second from 22 to 26 March 2004, the third from 13 to 16 July 2004, the fourth from 7 to 11 February 2005 and the fifth from 11 to 14 July 2005. The sixth meeting is scheduled for May 2006.

71. See The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage – Explanatory Texts – A comprehensive study of the IAEA's nuclear liability regime by the IAEA International Expert Group on Nuclear Liability (INLEX) to aid the understanding and authoritative interpretation of that regime: www.iaea.org/About/Policy/GC/GC48/Documents/gc48inf-5expltext.pdf.

72. The first Regional Workshop on Liability for Nuclear Damage, in the context of INLEX's outreach activities, was held in Sydney, Australia, from 28 to 30 November 2005. The workshop was attended by 49 participants from 14 IAEA Member States in the Asia region and 12 non-IAEA Member States who are Member States of the Pacific Islands Forum. Two representatives of the Pacific Islands Forum Secretariat also attended the workshop. The second regional workshop under INLEX's outreach activities is scheduled to be held in Lima, Peru in 2006. The workshop is open to representatives from Member States in Latin America.

development of a comprehensive corresponding national legal framework governing the safe and peaceful uses of nuclear energy that, *inter alia*, implements the international legal instruments which they have ratified.

In this regard, the IAEA – independently of the various safety and security, technical missions and advisory services carried out in Member States – has been providing advice on Member States' legislative and regulatory frameworks since its inception but in a more systematic manner since 1997, within the framework of a legislative assistance programme.[73]

This programme has evolved to include three primary elements, first, an interaction with individual states entailing a long-term relationship and an ongoing process; secondly, an interface between legal and technical issues, requiring lawyers and technical experts to interact with each other and to work jointly; and finally, a multi-means approach to transfer knowledge and know-how through the combination of regional and national workshops and seminars, training, bilateral assistance in drafting legislation, and the development of reference material for the assessment and drafting of national nuclear legislation. In this regard, the IAEA published a Handbook on Nuclear Law in 2003 which, *inter alia*, provides a basic understanding of key elements, principles and concepts of nuclear legislation.[74]

To date, assistance to states to improve their nuclear legislative frameworks in the areas of nuclear safety, security, safeguards and liability for nuclear damage, has been provided to more than 100 Member States. The programme, therefore, has been highly successful in strengthening the nuclear legal infrastructure of many countries and its appreciation by Member States is reflected, *inter alia*, in yearly resolutions of the General Conference.[75]

In recent years, however, there has been an increasing number and complexity of international instruments adopted in the areas of safety and security and there has been an increased interest in the field of liability for nuclear damage, as indicated by the work of INLEX. In fact, today more than ever, there is an increasing need for the IAEA to provide advice to states about the contents of existing and new international legal instruments in the nuclear field in a structured and coordinated manner; to clarify the interrelation among these different instruments; and to develop and convey a uniform message to states on how they should develop their national nuclear legislation.

In addition, the interrelationship between safety and security and the effect that a well-developed regulatory safety system in a given state has on ensuring the security of radioactive material can be now found more and more in IAEA documentation.[76] Similarly, a number of IAEA documents

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73. For an overview of the IAEA's legislative assistance activities see **"**Building a Stronger Framework of Nuclear Law: The IAEA's Legislative Assistance Services", Carlton Stoiber, IAEA Bulletin, Volume 45, Number 1 (2003).

74. See the *Handbook on Nuclear Law*, IAEA, STI/PUB/1160, July 2003: www-pub.iaea.org/MTCD/publications/PDF/Pub1160_web.pdf.

75. See for example, omnibus safety resolutions of the General Conference in 2001-2005 e.g. GC(45)/RES/10 of 2001 and GC(46)/RES/9 of 2002.

76. A number of General Conference resolutions (for example GC(49)/RES/10, GC(48)/RES/11 and GC(47)RES/8), and the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources [(BSS) IAEA Safety Series No.115, 1996] recognise the interrelation between safety and security and the effect that a well-developed regulatory safety system in a given country has on ensuring the security of radioactive material. In addition, the Findings of the President of the "International Conference on the Safety and Security of Radioactive Sources", held from 27 June to 1 July, 2005, in Bordeaux, France, "recognised that safety and security are an integral part of effective

recognise the central contribution of IAEA safeguards agreements and additional protocols thereto and also of state systems of accounting for and control of nuclear material (SSACs) to preventing illicit trafficking and to deterring and detecting diversion of nuclear material, thus recognising the dual purpose of SSACs for safeguards and security.[77]

But more needs to be done than simple recognition. These concepts have overlapping jurisdictions and implications, in particular, further consideration has to be given to the impact of safety or security measures on each other. Bringing balance and harmony to these two principles not only requires the development of international guidance but also the application of effectively coordinated mechanisms for national application. This is a big challenge as the interrelationship as well as the areas of overlap and of diversity must be identified, rationalised and given effect in the national legislation.

To explore this further, there has accordingly been a re-orientation and re-structuring of the IAEA's legislative assistance programme. In fact, the IAEA will in the future be pursuing a comprehensive approach to nuclear safety, security and safeguards – the so called "3S" approach – as well as encompassing nuclear liability. This approach not only recognises the complex technical and legal interrelationships, as well as the areas of coexistence and diversity of these branches of nuclear law but also provides for their practical implementation – so that they may be given effect in a national legislative framework. In particular, in addition to the aforementioned primary elements of the programme, the development of further guidance material for Member States on how to draft national legislation in the various fields of nuclear law is foreseen. In this context, for example, a second volume of the aforementioned Handbook on Nuclear Law will be published later in 2006 that, in light of the different legal systems in states, comprises elements and sample modular legislation text plus extracts from the national legislation of various states, with corresponding explanations and annotations. Also, an International Nuclear Law Web site (and underlying database of nuclear information and knowledge), will be created from where information to be used for legislative drafting can be found in one place and from where states can exchange experiences in drafting national legislation. Finally, a pool of nuclear law legal experts is being trained from which the IAEA can draw on, so as to provide the required assistance and training to states.

Part II. Challenges

Despite the numerous legal and practical achievements in the international framework for the safe and peaceful uses of nuclear energy in the two decades since the Chernobyl accident, a number of challenges still remain.

1. Emergency Preparedness and Response

For example, while the Early Notification and Assistance Conventions were drafted with the aim of closing a significant "gap" in the legal framework for mitigating the consequences of nuclear accidents and while they represent important progress in international law and in the field of nuclear safety, they were always considered as being only a first step. While admittedly much has been done since their entry into force and there are now a large number of practical arrangements for notifying

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and comprehensive regulatory infrastructures for ensuring the continuous control of radioactive sources throughout their life cycle."

77. See for example the aforementioned Nuclear Security Plan for 2006-2009.

and responding to nuclear accidents and emergencies, international cooperation in this area cannot stand still.

Also, since the Chernobyl accident, major political and technological developments such as improvements in international cooperation and advances in information technology require the continuous improvement of the international emergency preparedness and response system. In addition, there is a heightened awareness of the need to strengthen arrangements to respond to emergencies that could arise from activities involving the possible malicious use of nuclear or radioactive material and about possible attacks on nuclear installations. It is also recognised that there is a large number of radioactive sources for which the international emergency preparedness and response system is less developed than for nuclear installations.

The development of the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies, which recognises these issues, is therefore a welcome step. Also, the proposal to initiate the development of a "Code of Conduct for the International Emergency Management System" which is intended to expand and formalise arrangements outlined in the aforementioned EPR-ENATOM 2004 and which applies to emergency situations that can arise from both accidents as well as malicious acts, involving radioactive and other nuclear material, should greatly contribute towards a more uniform and state-of-the-art emergency assistance and response system worldwide.

Ultimately, however, the Early Notification and Assistance Conventions would need to be revised and updated so as to represent legally binding state of the art practice in this field.

2. Safety of Nuclear Power Plants

In the area of nuclear power plant safety, a major challenge facing the international nuclear community was recognised for the 1990s as ensuring that all nuclear installations worldwide are safe.[78] It is without doubt that the adoption of the CNS later in that decade contributed to overcoming this challenge.

Yet despite past efforts, challenges still remain, not only for those countries with extensive operating experience and strong regulatory oversight but also for those without. Quite simply, the safe operation of nuclear power plants can never be considered as being completed, even in those states with a high level of safety. At the same time, the past few years have witnessed a significant change in attitudes towards nuclear power. There is increasing attention to its benefits as an environmentally clean source of electricity and to meet the energy needs in the 21st century. In fact, there are 443 power reactors now operating in 30 countries (with a further 26 under construction), generating electricity for nearly 1 billion people. Nuclear energy presently accounts for about 16% of the world's electricity production, keeping pace with the steady expansion in the global electricity market. It is clear that not only is there a need for the establishment of adequate and comprehensive national legal and regulatory frameworks for the safe and peaceful uses of nuclear energy worldwide, but also a need for their constant maintenance and development.

78. See the 1990 Report by the IAEA Director General to the Board of Governors, in IAEA document GOV/INF/583, 21 May 1990.

3. Radioactive Waste Management

The safe management of radioactive waste is still a point of scepticism in public acceptance of nuclear energy. In this respect, the significance of the Joint Convention as the only binding instrument in the field and thus as an important mechanism to improve worldwide confidence cannot be underestimated.

Although there is recognition of the growing support for the universal application of the safety standards for protecting people and the environment against nuclear accidents, there is still a need to have broader participation in the nuclear safety conventions, in particular, the Joint Convention. Despite a modest increase this past year in the membership of the Convention, it is highlighted that it is relevant to all states in which there is radioactive waste, even to those where the only waste generated comes from the use of radioactive materials in medicine and research. The Joint Convention, however, has at the time of writing, only 36 Parties[79] and in fact, just less than one third of the states that operate nuclear power plants (8 out of 30 worldwide) have yet joined the regime. Promoting adherence to the convention and achieving a worldwide common understanding of the issues underlying the safe management of radioactive waste and spent fuel is certainly one of the more important near term tasks.

4. Safety and Security of Radioactive Sources and Safety of Research Reactors

As concerns the Codes of Conduct that have been mentioned, it would appear at first glance that these Codes are an exception to the call shortly after the Chernobyl accident for "the creation of an international regime for the safe development of [nuclear energy]". At that time, there appeared a need for binding norms: to move away from the recommendatory nature of the safety standards.

In this regard, the codes could be considered, as a step backwards. They are not obligatory and again like the safety standards are non-mandatory, leaving states free to pick and choose whether to apply at will the norms contained therein. However, it should be borne in mind that whatever the legal form of an instrument (i.e. whether it is binding such as a treaty, or not), what is important is its effectiveness. In fact, a binding instrument may itself contain vague or non-obligatory language and even if it does not, it may also do very little to alter the behaviour of its addressees. Also, in cases where a binding instrument is in force, it still may be deficient from a lack of adherence by states. In contrast, a legally non-binding instrument such as a Code of Conduct can be supported by many more states committing themselves to apply the guidance contained therein, than might become party to a legally binding convention.

That said, as with any international legal instrument, but even more so with a Code of Conduct, proper national implementation or application is the key to its success and effectiveness. Application can be encouraged through the incorporation of "peer review" mechanisms such as in the CNS and the Joint Convention, as opposed to specific obligations for non-compliance or reliance on dispute settlement provisions. While at the outset, states did not wish the inclusion of such "peer review" mechanisms during the preparatory work on the two Codes adopted under IAEA auspices, the international community is now considering the effectiveness of their application.

79. With the entry into force of the Joint Convention for Brazil on 18 May 2006; Estonia on 4 May 2006; Iceland on 27 April 2006; Italy on 9 May 2006; and the Russian Federation on 19 April 2006, there will be 41 Parties to the convention.

In this regard, it will be interesting to see whether states wish to take steps leading to the adoption of a formalised process for discussing the application of the Code of Conduct on the Safety and Security of Radioactive Sources. Should states choose to do so, it will illustrate a new and interesting development of nuclear normative rule making at the IAEA: a mechanism for "hardening" or "strengthening" what can in fact be considered as "soft law".

5. Nuclear Security

The challenge of increasing the nuclear security of states has taken on heightened significance in recent years. Accordingly, the practical response has been swift and also on multiple fronts.[80] Indeed, few areas of activity in the nuclear field have undergone such fundamental changes in so short a period. These efforts have been focused, by necessity, on helping states identify and address vulnerabilities, upgrading the physical protection of nuclear facilities, improving national detection and response capabilities, securing high priority radioactive sources and developing standards and guidance. The overall objective is to achieve the improved worldwide security of such material in use, storage and transport, and of associated facilities, by supporting Member States in their efforts to establish, maintain and sustain effective national nuclear security regimes, *inter alia*, through the implementation of relevant international legal instruments.

As in the other branches of nuclear law, there is an increasing number and complexity of binding and non-binding international instruments in this area which require application and implementation by Member States.[81] In particular, following the UN General Assembly's adoption in April 2005, after seven years of negotiation, of the International Convention for the Suppression of Acts of Nuclear Terrorism (the Nuclear Terrorism Convention) there are now 13 universal conventions

80. For example, there are a number of international and regional initiatives that are directly relevant to the IAEA's Nuclear Security Programme. Mention will be given two of them. First, the 2004 Global Threat Reduction Initiative (GTRI), announced by the USA Secretary of Energy Spencer Abraham on 26 May 2004. The mission of the GTRI is to remove and-or secure high-risk nuclear and radiological materials and equipment around the world that pose a threat to the United States and to the international community. The GTRI has been working in collaboration with the IAEA to systematically address threats, posed by high-risk nuclear and other radioactive material. Second, there is the 2003 EU Strategy against the Proliferation of Weapons of Mass Destruction. In May 2004, the European Council adopted in the implementation of this Strategy, a Joint Action on support for IAEA activities under the IAEA's Nuclear Security Programme. In July 2005, the Council also adopted, in this framework, a new Joint Action on support for IAEA activities not only in the area of nuclear security, but also in the area of verification. The purpose of one of the projects in the latter Joint Action is to strengthen national legislative frameworks for the implementation of states' obligations under IAEA safeguards agreements and additional protocols. This is to be achieved by the provision of IAEA legislative assistance to target countries in the drafting and/or revision of national legislation. Further mention of this type of assistance and the synergies between security and safeguards is provided later in this paper.

81. The importance of some of these instruments is recognised in UN Security Council Resolution 1540, adopted in April 2004. Many governments have already responded to this resolution which, *inter alia*, calls on all states to develop and maintain effective border controls and law enforcement efforts to detect and combat illicit trafficking, and to refrain from providing any form of support to non-state actors that attempt to develop, acquire, use or transfer nuclear, chemical or biological weapons or their delivery systems.

and protocols against terrorism, including the CPPNM, which have been developed under the auspices of the UN and its specialised agencies.[82]

One of the main challenges in building a global nuclear security regime, therefore, is clearly to analyse all the relevant international instruments that have been adopted in various fora and to explore their interrelation and synergies but also any conflicting or overlapping obligations and to assist states in updating their national legislation.

6. Liability for Nuclear Damage

Turning to liability for nuclear damage, it is highlighted that despite the adoption of the aforementioned new norms, providing for a broader geographical scope of application of the liability regime, an increased amount of liability of the operator of a nuclear installation, enhanced means for securing adequate and equitable compensation, and a means for supplementary compensation, there still remain concerns. For example, the lack of adherence to the various nuclear liability instruments by the main states engaged in these activities is clearly a disincentive for other states to join these instruments.

In addition, although INLEX has identified some gaps and ambiguities, it is clear that further steps still need to be taken towards actually filling these gaps and ambiguities, with the aim of eventually leading towards the universal application of a global regime of nuclear liability. In this respect, the entry into force of the CSC which could serve as an "umbrella" over the present somewhat fragmented situation would certainly be a step in the right direction. To facilitate this ongoing process, the IAEA Director General decided in 2005 that INLEX should carry on its work and extended its term for an indefinite period. It is expected that INLEX will continue to play its role not only as a forum of expertise for providing authoritative advice on the nuclear liability instruments adopted under IAEA auspices but also for developing further a global nuclear liability regime.

Part III. Outlook

Having considered the international legal framework on the safe and peaceful uses of nuclear energy and the most relevant practical aspects underpinning these instruments, it is fair to say that in the two decades since Chernobyl, significant achievements and important steps have been taken by the international community to establish a harmonised, efficient, effective and transparent infrastructure and that as forums for international cooperation among states, international organisations such as the IAEA have been indispensable for fulfilling this purpose.

At the same time, however, it appears that concerns are now driven by new realities. On the one hand the "renaissance" of nuclear energy production and technology. On the other hand the rise in terrorism and the declared ambition of terrorists to acquire and use weapons of mass destruction; the discovery of clandestine nuclear programmes and supply networks; and the emergence of an extensive black market in nuclear material and equipment. To name but a few.

82. For the text of the Nuclear Terrorism Convention see the Annex to UN General Assembly resolution A/RES/59/290 of 13 April 2005. It should also be noted that the Ad Hoc Committee established by UN General Assembly resolution 51/210 is currently negotiating a draft "comprehensive convention on international terrorism".

In this respect, for nuclear energy to play a fundamental role in the future and to be a viable option for more countries – in particular developing countries – and so as to address these concerns, the international community will need innovation in terms of policy, infrastructure development and the present level of international cooperation.

Although much has been achieved and the IAEA's work is making a difference – recognised by the award of the 2005 Nobel Peace Prize[83] – it is still acknowledged that much still remains to be done. In this context, the international legal framework and the practical activities that are carried out thereunder should always be viewed as a "work in progress". In fact, one of the lessons of Chernobyl should certainly be that progress in nuclear law should not be a reaction to crisis. Instead there should be a "gradual evolution or progressive development" of both international and national rules of law which not only addresses potential or perceived problems and events but also follows developments and initiatives. Examples which require such a gradual evolution can at this stage be found in initiatives that are at present being developed.

These initiatives, in short, concern regional approaches to energy needs;[84] the use of an advanced generation of nuclear power plants;[85] and consistent with regional approaches – multinational arrangements for enrichment, fuel production, waste disposal and reprocessing which could feasibly facilitate safety, security and proliferation resistance in the future utilisation of nuclear energy.[86] Such multilateral approaches are not new but they would require, for example, a legal framework for multilateral management and control of both the "front end" (enrichment and fuel production) and "back end" (i.e. spent fuel and radioactive waste) of the fuel cycle. Also, there would have to be assurances of supply of reactor technology and fuel, either through the IAEA, under Article IX of its Statute, where it is authorised to serve as guarantor of the supply of fissile material for fuel and the reprocessing of spent fuel, or under a separate multilateral/regional or bilateral arrangement.

In any event, while greater internationalisation of the existing nuclear safety and security regimes would be in line with the envisaged world-wide nature of such multilateral approaches, there would obviously be a need to consider thoroughly whether the existing instruments are effective or even any longer adequate in their present form. Furthermore, most of the practical arrangements that support the legal framework, such as the international safety standards and associated peer reviews and

83. The Nobel Peace Prize for 2005 was awarded by the Norwegian Nobel Committee to the IAEA and its IAEA Director General, Dr. Mohamed ElBaradei for "their efforts to prevent nuclear energy from being used for military purposes and to ensure that nuclear energy for peaceful purposes is used in the safest possible way." See the Press Release concerning the award of the 2005 Nobel Peace Price, http://nobelprize.org/peace/laureates/2005/press.html.

84. An example of such an approach is the joint communiqué signed on 27 February 2006 by the Prime Ministers of the three Baltic states, Estonia, Latvia and Lithuania in which they agreed to prepare, during 2006, a common Baltic Energy Strategy which includes cooperation in building a new nuclear plant.

85. See the Generation IV International Forum for the development of a technology "road map" to help guide future nuclear power plant development and evaluations and the IAEA's International Project on Nuclear Reactors and Fuel Cycles (INPRO) are helping to promote evaluation of and cooperative research on innovative nuclear energy designs.

86. See the IAEA Director General's Expert Group on Multilateral Approaches to Nuclear Fuel Cycle. The Group was to explore options and develop proposals for improved controls, including possible multilateral oversight arrangements, for the front- and back-ends of the nuclear fuel cycle. The Group's report, finalised in February 2005, identifies a number of approaches with the objective of increasing non-proliferation assurances associated with the civilian nuclear fuel cycle while preserving assurances of supply and services. (see IAEA document INFCIRC/640, 22 February 2005 or IAEA document MNA/2005, April 2005).

advisory services, would no doubt need to be updated to ensure that advanced reactor types and fuel cycle facilities are adequately addressed. Transport of nuclear and radioactive material safety and security, as well as the liability of the operator or supplier of nuclear fuel will also be important issues that will need to be addressed and could be major considerations in the development of the future international legal framework governing the safe and peaceful uses of nuclear energy.

All of these multilateral initiatives will impose significant tasks on international normative regulation not at least because internationalisation of what was for many years considered a strictly national domain will be required. In as much as it has been time, 20 years after Chernobyl, to look back and to take stock, challenges still remain.

