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NUCLEAR ENERGY FUTURES PAPERS

The Nuclear Energy Futures Project

The Global Nuclear Safety and Security Regimes

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Addressing International Governance Challenges

Abstract

In this report Aaron Shull explores the international legal regimes, both binding and non-binding that relates to the safety and security of civilian nuclear applications. The areas he considers are the safety of nuclear power plants, radioactive waste management, research reactors, radioactive sources, emergency preparedness and response, and nuclear security. From here the author examines how four different states – Australia, Brazil, Canada and Jordan – have dealt domestically with their international legal obligations relating to such matters. The author concludes by recommending ways to strengthen and integrate the regimes to better cope with the expected global revival in peaceful applications of nuclear energy.

Canadian Centre for Treaty Compliance

CIGI's Nuclear Energy Futures Project is being conducted in partnership with the Centre for Treaty Compliance at the Norman Paterson School of International Affairs, Carleton University, Ottawa.

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Letter from the Executive Director

On behalf of The Centre for International Governance Innovation (CIGI), it is my pleasure to introduce the Nuclear Energy Futures Papers Series. CIGI is a Canadian-based non-partisan think tank that addresses international governance challenges and provides informed advice to decision makers on multilateral governance issues. CIGI supports research initiatives by recognized experts and promising academics; forms networks that link world-class minds across disciplines; informs and shapes dialogue among scholars, opinion leaders, key policy makers and the concerned public; and builds capacity by supporting excellence in policy-related scholarship.

CIGI's Nuclear Energy Futures Project is chaired by CIGI Distinguished Fellow Louise Fréchette and directed by CIGI Senior Fellow Trevor Findlay, Director of the Canadian Centre for Treaty Compliance at the Norman Paterson School of International Affairs, Carleton University, Ottawa. The project is researching the scope of the purported nuclear energy revival around the globe over the coming two decades and its implications for nuclear safety, security and nonproliferation. A major report to be published in 2009 will advance recommendations for strengthening global governance in the nuclear field for consideration by Canada and the international community. This series of papers presents research commissioned by the project from experts in nuclear energy or nuclear global governance. The resulting research will be used as intellectual ballast for the project report.

We encourage your analysis and commentary and welcome your thoughts. Please visit us online at www.cigionline.org to learn more about the Nuclear Energy Futures Project and CIGI's other research programs.

John English
Executive Director

Acronyms and Abbreviations

AEC Atomic Energy Commission

AECL Atomic Energy of Canada Limited

AFCONE African Commission on Nuclear Energy

ANSTO Australian Nuclear Science and Technology Organisation

ANWFZ African Nuclear Weapon-Free Zone Treaty

ARPANS Australian Radiation Protection and Nuclear Safety

ARPANSA Australian Radiation Protection and Nuclear Safety Agency

ASNO Australian Safeguards and Non-Proliferation Office

AU African Union

CACNARE Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency

CANDU Canada Deuterium Uranium (reactor)

CCPBNP Commission for the Coordination of Protection of the Brazilian Nuclear Program

CCSRR Code of Conduct on the Safety of Research Reactors

CCSSRS Code of Conduct on the Safety and Security of Radioactive Sources

CENNA Convention on Early Notification of a Nuclear Accident

CNEN Brazilian National Commission for Nuclear Energy

CNS Convention on Nuclear Safety

CNSC Canadian Nuclear Safety Commission

CPPNM Convention on the Physical Protection of Nuclear Material

DISPLAN Disaster Plan

EC European Commission

ENATOM Emergency Notification and Assistance Technical Operations Manual

EPREV Emergency Preparedness Review

ERNM Emergency Response Network Manual

EUROPOL European Police

FAO Food and Agriculture Organization of the United Nations

FNEP Federal Nuclear Emergency Plan

GIF Generation IV International Forum

IACRNA Inter-Agency Committee on the Response to Nuclear Accidents

IAEA International Atomic Energy Agency

ICAO International Civil Aviation Organization

ICSANT International Convention for the Suppression of Acts of Nuclear Terrorism

IEC Incident and Emergency Centre

IMO International Maritime Organization

INSAG International Nuclear Safety Advisory Group

INSARR Integrated Safety Assessment of Research Reactors

INSServ International Nuclear Security Advisory Service

INSSP Integrated Nuclear Security Support Plan

INTERPOL International Criminal Police Organization

IPPAS International Physical Protection Advisory Service

IRRS Integrated Regulatory Review Service

IRSRR Incident Reporting System for Research Reactors

ISSAS SSAC Advisory Service

JAEC	Jordan Atomic Energy Commission
JREMPIO	Joint Radiation Emergency Management Plan of the International Organizations
MAPLE	Applied Physics Lattice Experiment (reactor)
MOU	Memorandum of Understanding
NCACG	National Competent Authorities' Co-ordinating Group
NEA	Nuclear Energy Agency
NFWA	Nuclear Fuel Waste Act
NNSA	National Nuclear Security Administration
NSCA	Nuclear Safety and Control Act
NSF	Nuclear Security Fund
NSR	Nuclear Security Regulations
NSSR	National Sealed Source Registry
NUSS	Nuclear Safety Standards
NWMO	Nuclear Waste Management Organization
OECD	Organisation for Economic Co-operation and Development
OPAL	Open Pool Australian Lightwater (reactor)
OSART	Operational Safety Review Team
PAHO	Pan American Health Organization
PFRW	Policy Framework for Radioactive Waste
PROSPER	Peer Review of the Effectiveness of the Operational Safety Performance Experience Review
RANET	Response Assistance Network
RAP	Regulatory Assessment Principles
RaSIA	Radiation Safety Infrastructure Appraisal
RDD	Radioactive Dispersal Device
REPLIE	Response Plan for Incidents and Emergencies
RG	Regulatory Guidelines
RIAPSSRS	Revised International Action Plan on the Safety and Security of Radioactive Sources
RNRC	Radiation and Nuclear Regulatory Commission
RPNSSL	Radiation Protection, and Nuclear Safety and Security Law
RSRS	Regional Security of Radioactive Sources
SACTSP	Special Advisor for the Coordination of Technical and Scientific Programs
SAE	Secretariat for Strategic Affairs
SIPRON	System for Protection of the Brazilian Nuclear Program
SSAC	State Systems for Accountancy and Control
SSTS	Sealed Source Tracking System
UNEP	United Nations Environment Programme
UN/OCHA	United Nations Office for the Co-ordination of Humanitarian Affairs
UN/OOSA	United Nations Office for Outer Space Affairs
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
US	United States
WHO	World Health Organization
WMD	Weapons of Mass Destruction
WMO	World Meteorological Organization

Introduction

Known as the most devastating accident in the history of nuclear power, the April 26, 1986 disaster at Chernobyl in the Ukraine made the deficiencies of the international legal regime and regulations governing the safety of the peaceful uses of nuclear energy all too apparent. Prior to the Chernobyl accident there were few international legally-binding commitments governing nuclear safety. It was thought that because the nuclear industry was contained within the territorial boundaries of individual states, international regulation was unnecessary. However, the trans-boundary effects of the Chernobyl accident, in addition to the 1979 incident at Three Mile Island, in Pennsylvania, United States, caused a rethinking of nuclear law and regulation and an unprecedented era of commitments and cooperation on the part of states. Numerous international treaties as agreed and non-binding commitments were agreed, along with a great deal of activity within international organizations.

In the related but distinct area of nuclear security, a similar realization about the inadequacies of the international nuclear regime occurred following the terrorist attacks of September 11, 2001, against the US and the revelation that terrorist groups are actively seeking nuclear material for nuclear or radiological weapons. A slew of initiatives to strengthen international governance of nuclear security were taken after 2001.

Despite all these developments, new concerns have been raised in recent years because of the expected global resurgence of nuclear power. As increasing numbers of states turn to nuclear energy in order to meet their ever-growing energy demands and reduce greenhouse gas emissions (while at the same time the threat of terrorism and nuclear weapons proliferation continues) it is unclear whether the current international regime governing the safety and security of civilian nuclear applications is sufficiently robust. Growing numbers of nuclear power reactors and associated facilities, increased production and transport of nuclear materials, higher levels of nuclear waste and spent nuclear fuel, and the possible re-emergence of spent fuel reprocessing geared towards sustaining a so-called "plutonium economy" make it vital that the global governance regime for nuclear safety and security be as effective as possible.

This paper seeks to determine exactly what international legal obligations, both binding and non-binding, govern the safety and security of civilian nuclear applications. Aspects considered are the safety and security of nuclear power plants, research reactors and related facilities, nuclear transport, radioactive waste management, and emergency preparedness and response. Although radioactive sources are not directly related to the production of nuclear power, they will also be covered for the sake of completeness and because such sources are now viewed as of interest to terrorists. Similarly, research reactors, though not of immediate concern for nuclear power generation, have also been included, since inadequate control of research reactors could undermine public confidence in the safety and security of nuclear power. Moreover, the close proximity of many research reactors to cities and universities raises obvious security concerns.

The study draws a distinction between nuclear safety and nuclear security. *Safety* refers to the challenges involved in preventing and mitigating nuclear accidents and the effects of radiation that may result. *Security,* as defined by the IAEA Advisory Group on Nuclear Security is "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, 2003-2004). Although it is useful for analytical purposes to consider safety and security separately, it is apparent that global governance

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instruments and bodies sometimes deal with both safety and security, presumably on the sensible grounds that they are related and mutually reinforcing.

The paper does not consider nuclear safeguards agreements or International Atomic Energy Agency (IAEA) monitoring and verification to ensure the non-diversion of nuclear material to weapons purposes, even though this contributes to nuclear safety and security by ensuring that special nuclear material is located at known and declared locations and subject to safeguards, including auditing and inspections. In addition to its safeguards role, the IAEA is the primary international body responsible for promoting the safe and secure use of nuclear technologies and materials for peaceful purposes. Its activities in these realms therefore feature prominently in this study.

This paper is intended only to survey the existing international regimes, without commenting on their effectiveness in practice. It thus does not make judgements about compliance with the regimes by states party to the various international agreements, or the compliance of other stakeholders, such as industry. Additionally, the paper does not comment on the effectiveness of the IAEA's role in supporting the nuclear safety and security regimes. All of these are worthy subjects for other studies.

The paper examines four case studies to illustrate the extent and nature of the current international legal regimes as they apply to individual states, the principal stakeholders aside from industry. The four countries, Canada, Australia, Brazil and Jordan, were selected due not only to their geographical and developmental diversity, but also because of the wide variance in their civilian nuclear industries. Each case study confines itself to broadly surveying what each state has done domestically that is relevant to the international regimes. There is no intention to systematically determine whether the steps taken are derived from international agreements or whether they are actually in compliance with their international legal obligations. This again, must be left for further study.

This paper will conclude with thoughts about how the international regimes governing nuclear safety and security should be strengthened.[1]

[1] For a comprehensive explanation of the regime, see *A Guide to Global Nuclear Governance: Safety and Security* by Justin Alger.

The International Nuclear Safety Regime

Nuclear Power Plants

This first section considers the international regime governing the safety of nuclear power plants. The focus is not solely on binding international law, but on both binding and non-binding legal instruments, nuclear safety standards, IAEA advisory and review services and the establishment of domestic legal and regulatory mechanisms.

1994 Convention on Nuclear Safety

Status and Background

The Convention on Nuclear Safety (CNS) was adopted on June 17, 1994, opened for signature on September 20, 1994 and entered into force on October 24, 1996. There are currently 61 state parties (IAEA, 2008a).

There were numerous proposals in the 1960s to establish a legally-binding international convention to govern the safety of civilian nuclear power plants. However, the broader international community was disinclined to establish a binding regime, opting instead for recommendatory safety standards (OECD, 2006: 13). This changed after the Chernobyl accident, which clearly demonstrated the costly trans-boundary effects of unsafe nuclear practices (Savchenko, 1995). This gave rise to a new set of safety standards agreed by the IAEA in June 1998, with an internationally legally-binding regime following in the form of the CNS.

Substantive Obligations

As a starting point, the CNS acknowledges in its preamble that "the responsibility for nuclear safety rests with the State." However, it also acknowledges the international importance of ensuring the safety of nuclear energy and sets out a legally-binding commitment to the application of fundamental safety principles. While the CNS does not provide a detailed set of safety standards, it does establish a basic set of obligations covering the safety requirements of civilian nuclear power plants.

In terms of substantive obligations, Article 4 requires each state party to take the legislative, regulatory and administrative steps necessary to implement the obligations set out in the convention. Any state that desires to meet such obligations should have, at a minimum, domestic legal provisions that mirror those found in the CNS. Each party is also required, under Article 5, to provide a detailed report on the measures taken domestically in order to fulfill its obligations under the convention.

Article 7 requires each state party to establish and maintain a legislative and regulatory framework governing the safety of nuclear installations. This framework must establish both national safety regulations and a system for licensing nuclear installations. Additionally, each state party must establish a system of regulatory inspection and assessment of nuclear installations in order to ensure that licensees are complying with the terms of their license. The state must also provide for sanctions in the event of a breach of the licensing requirements.

In order to enforce these provisions in its domestic law, Article 8 requires each state party to establish a regulatory body that has the authority, competence, and resources – both financial and human – to implement the legislative and regulatory framework. In similar fashion, Article 11 obliges each party to ensure the existence of adequate financial resources to support the safety of its nuclear installations and a sufficient number of qualified and adequately trained staff.

The legal obligations under the CNS cover both nuclear installations that existed prior to the convention's entry into force as well as any installations built later. Prior to building a new installation, Article 14 requires a state party to conduct a comprehensive and systematic safety assessment. These must also be repeated throughout the life of the installation. In addition, a party must undertake verification activities to ensure the safe operation of any installation. These activities may be conducted through analysis, surveillance, testing or inspection.

In addition to such verification activities, under Article 16 parties must put in place emergency plans, both on-site and off-site, to mitigate the consequences of any radiation release. This obligation also extends to states that do not have a nuclear installation on their territory, insofar as they are likely to be "affected in the event of a radiological emergency at a nuclear installation in the vicinity."

The CNS also obliges parties to ensure that when selecting a site for a potential installation they evaluate all relevant site-related factors likely to affect the safety of a nuclear power plant for its projected lifetime. In addition, a party must ensure that the design and construction provide for "defence in depth" against the release of radioactive materials, meaning that each state party must employ a design that provides for several reliable levels and methods of protection, mitigates the consequences of a radiation leak and utilizes only proven technologies.

During operation of a nuclear facility each state party is obliged to ensure that the operational limits of a nuclear installation on its territory are not exceeded. Moreover, a party must ensure that relevant levels of maintenance, inspections and testing are conducted and that procedures exist to respond to operational incidents and accidents. They must also ensure that safety related engineering and technical support is available and that all significant safety incidents are reported.

Under Article 20, state parties must hold review meetings in order to review the national reports submitted under Article 5. Attendance is mandatory, as required by Article 24.

IAEA Advisory Services and Missions

In addition to its broad legal obligations under the CNS, a state will likely wish to take advantage of the IAEA's safety-related services and missions. The IAEA has two functions, set down in Article III of its Statute, that are applicable to nuclear safety generally, not only to civilian nuclear power plants. The first is to establish safety standards. These represent the international consensus on methods to minimize the potential dangers presented by the peaceful use of nuclear materials. The second function is to assist states in the application of such standards domestically. However, the IAEA will only undertake this activity when requested to do so by an IAEA member state (states are able to join the IAEA independently of becoming states parties to any of the nuclear conventions or agreements, making the global regime applicable in some respects to a much wider group of countries).

IAEA Safety Standards

The IAEA has created comprehensive, detailed sets of safety standards covering a wide array of subjects, including establishment of an adequate legislative and regulatory infrastructure to govern civilian nuclear applications, radiation protection, site evaluation, and the design, safe operation and decommissioning of nuclear power plants. The Nuclear Safety Standards (NUSS) apply to nuclear power plants.

These standards are not, however, legally-binding on IAEA member states or on states parties to the CNS or any other treaty. They may be adopted in whole or in part by member states in their national regulations or can be used as a template for situating their national regulatory variations.

IAEA Safety Publications

As part of a detailed suite of safety-related publications, the IAEA produces a Technical Reports Series, a Radiological Assessment Reports Series and the International Nuclear Safety Advisory Group (INSAG) Series, all of which can be used by member states to inform the safety of their nuclear facilities. In addition to these, the IAEA also issues the Provisional Safety Standards Series, the Training Course Series, the IAEA Services Series, a Computer Manual Series, Practical Radiation Safety Manuals and Practical Radiation Technical Manuals. In short, the IAEA produces a comprehensive set of non-binding safety-related guidelines that serve to buttress the legally-binding regime established by the CNS.

IAEA Advisory Missions

Operational Safety Review Teams (OSART)

The OSART program, established in 1982, is designed to aid IAEA member states in improving the operational safety of nuclear power plants under their control. Under the program, teams of international experts conduct three-week intensive reviews of individual nuclear power plants, at the request of the host country. The scope of these reviews is wide and covers management goals and practices, organization and administration, training and qualifications of personnel, operations, maintenance, technical support, operational experience feedback, radiation protection, chemistry and emergency planning and preparedness.

The OSART program allows nuclear experts and power plant operators from one country to assist power plant operators in other countries through the sharing of information and international best practices. Not all of an OSART's work is remedial: an important component is to identify strengths that can be shared with other states.

The first OSART mission was to the Republic of Korea in August 1983 at the Ko-Ri nuclear power plant. Since then there have been more than 132 missions, carried out at eighty-seven nuclear power plants in thirty-one countries (IAEA, 2005).

OSART missions arrive at a plant site already familiar with its main features, operating characteristics, history, regulatory provisions, technical specifications, procedures, organization and key personnel, as a consequence of their study of an Advance Information Package (AIS) prepared by the IAEA Secretariat in consultation with the receiving state's authorities (IAEA, 1995: 16). The team will then conduct its review of the plant, with a follow-up review one year to 18 months after the initial mission. The results of each OSART mission are put into a database, which indexes the results of all missions and follow-up missions, noting recommendations, suggestions and strengths and weaknesses.

Examples of such missions in the four case studies adopted in this work are set out below.

Table 1. OSART Missions Accepted by Case Study Countries

State	Type of mission	Missions	Follow-up	Year of mission
Canada	O, T	3	NA	1987,1990, 2004
Australia	NA	NA	NA	NA
Brazil	O, T	5	3	1985, 1989, 1992 2002, 2003, 2005
Jordan	NA	NA	NA	NA

O: Operational safety review missions
P: Pre-operational safety review missions
S: Safety review missions (design and operations)
T: Technical exchange missions
E: Expert missions to former Soviet-type reactors
NA: Not applicable

Source: IAEA, 2008.

Peer Review of the Effectiveness of the Operational Safety Performance Experience Review (PROSPER)

This service is designed to enhance the safety of nuclear power plants, from construction to decommissioning. This is achieved through the provision of advice and assistance to member states regarding their development and management of an operational experience feedback process. This involves, in essence, learning important safety principles from both internal and external experience.

PROSPER began in 2000 and the service is available to all countries with nuclear power plants. When determining a state's operational experience feedback process, these missions will consider the existence of effective management practices, sound policies and procedures, the comprehensiveness of available instructions, the existence of adequate resources, and the overall capability and reliability of plant personnel (IAEA, 2003).

The purpose of these peer reviews is to determine whether an installation's operating experience meets with internationally accepted best practices. If not, areas in which a facility can improve are suggested. These findings and the corresponding corrective actions are reported to the national body responsible for utility management. Additionally, a follow-up mission will be conducted within 18 months at the request of the state, to assess how the recommendations have been put in place to improve the operational safety performance process.

Role of Other Organizations

In addition to the IAEA, several other organizations are involved in nuclear safety.

Nuclear Energy Agency

The Nuclear Energy Agency (NEA), founded on February 1, 1958 is a semi-independent institution of the Organisation for Economic Co-operation and Development (OECD), a Paris-based body comprising the most developed states.[2] Its mission is to "assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for the safe, environmentally friendly and economical use of nuclear energy for peaceful purposes" (Nuclear Energy Agency, 2008). To achieve this, the NEA focuses on selected areas and produces authoritative assessments that reflect, or seek to develop, common understandings among member states. The NEA has seven main international standing technical committees dealing with the nuclear sciences, safety, regulation, waste management, technical and economic studies, nuclear law and radiation protection.

In contrast to the IAEA, the NEA does not conduct advisory missions and focuses only on providing reports on issues of relevance to member states (Nuclear Energy Agency, 2008). The NEA currently has a staff of 69 and an annual budget for the Main Secretariat of about 10.3 million euros and 2.9 million euros for the Data Bank (Nuclear Energy Agency, 2008).

EURATOM

The 1957 EURATOM Treaty does not specifically mandate EURATOM to regulate nuclear installation safety. As a result, regulatory activities governing nuclear installation safety in European countries have developed at the national level. Nevertheless, EURATOM does promote the highest level of safety in the operation of nuclear facilities and the best accident prevention and mitigation strategies through the cultivation of common views on nuclear safety issues and by identifying best practice.

In July 2007, the EURATOM Commission established a European High-Level Group on Nuclear Safety and Waste Management to establish common understandings and reinforce common approaches in the fields of nuclear safety and waste management, with a view to creating common European rules (Community Report, 2007). The establishment of this High-Level Group has led to some political controversy. There is concern that states that oppose nuclear power will attempt to have nuclear safety and waste management standards set so high that they act as de facto barriers to the use of nuclear power.

Generation IV International Forum

The Generation IV International Forum (GIF) is a framework for cooperation in research and development for the next generation of nuclear power reactors. Generation IV reactors will reputedly be designed using the most advanced technological practices, increasing both safety and efficiency above those of the Generation II and III reactors. The GIF Charter was signed in July 2001 by Argentina, Brazil, Canada, France, Japan, the Republic of Korea, South Africa, the United Kingdom and the United States. Most designs under the Generation IV framework are not expected to be commercially available before 2030.

Radioactive Waste Management

This section outlines the regime governing both spent fuel and radioactive waste. Spent fuel is nuclear fuel that has been irradiated in a reactor core to the extent that it can no longer sustain a nuclear reaction. Spent fuel may be reprocessed to produce uranium and plutonium which may be recycled as reactor fuel. Radioactive waste is defined as radioactive material in gaseous, liquid or solid form for which there is no foreseen further use.

1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

Status and Background

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) was adopted on September 5, 1997, opened for signature on September 29, 1997, and entered into force on June 18, 2001. There are currently 46 state parties (IAEA, 2008b).

Substantive Obligations

As with the CNS, under the Joint Convention the ultimate responsibility for ensuring the safety of spent fuel and radioactive waste management rests with the state. The

[2] The OECD has 30 members: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States. The only 2 OECD members not part of the NEA are New Zealand and Poland.

obligations found in this convention govern spent fuel from nuclear power plants and research reactors, as well as radioactive waste from the nuclear industry, medical applications, research and industrial applications. However, this convention applies only to civilian nuclear waste and spent fuel, not to military or defence-related waste or spent fuel.

Spent Fuel Management

Article 4 lays out the general safety requirements that state parties are legally obliged to meet. A party must adequately address residual heat generated during spent fuel management, and ensure that the amount of spent fuel waste generated is kept to a practical minimum. Parties must also apply national protective methods approved by a national regulatory body and take into account all hazards associated with spent fuel management.

The convention applies not only to spent fuel management facilities built after the convention's entry into force, but also to existing facilities which predated entry-into-force. In this way, under Article 5, a party is obligated to review the safety of any such facility and make any necessary upgrades to render it safe.

When determining where to build a new spent fuel management facility, Article 6 requires a party "to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime." In addition, the state party must make information on the safety of such a facility available to the public. A party must also consult other state parties in the vicinity of such a facility, insofar as they are likely to be affected by that spent fuel management facility.

During the design and construction of a spent fuel management facility, each party must ensure that its design and construction limits possible radiological impacts from discharges or uncontrolled releases. Article 7 also requires that these facilities incorporate only proven technologies in their design and construction. Moreover, under Article 8, each party must ensure that a systematic safety assessment and an environmental assessment are completed prior to the construction of a spent fuel management facility and that before the facility becomes operational a second updated assessment is prepared.

During the operational life of a spent fuel management facility, a state party must ensure that any licence granted meets the safety and environmental assessment criteria created under Article 8. Additionally, Article 9 obliges a state party to ensure that the operational limits of the facility are revised as necessary and that the "operation, maintenance, monitoring, inspection and testing" of the facility are carried out using recognized procedures.

Similarly, Article 9 requires a state party to put in place safety-related engineering and technical support and ensure that significant incidents are reported promptly to the regulatory body. Finally, a state party must also make plans for decommissioning spent fuel management facilities based on information obtained throughout the operating lifetime of the facility and have those plans reviewed by the national regulatory body.

Radioactive Waste Management

Provisions in Article 11 regarding the safety of radioactive waste management mirror many of those for the safety of spent fuel management. Waste management obligations include those governing upgrades to existing facilities, siting of proposed facilities, design and construction, safety and environmental assessment and the operation of facilities.

However, the obligations governing radioactive waste management differ from their spent fuel counterparts significantly. Under Article 17, obligations are imposed on a state party after the closure of a waste disposal facility. A party must ensure that records regarding the location, design and inventory of the closed facility are preserved and that either active or passive institutional controls remain in place, if required.

Obligations Covering Both
Radioactive Waste and Spent Fuel Management

Article 18 requires states parties to incorporate the obligations set out in the convention into their domestic law. States should thus have, at a minimum, domestic legal provisions that mirror those found in the Joint Convention.

To advance this objective, each party is also required under Article 19 to put in place a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management. This framework must establish national safety regulations, create a system of licensing for spent fuel and radioactive waste and prohibit operating without a licence.

The legislative framework must also provide for a system of institutional control, regulatory inspection, documentation and reporting. There must also be provisions for the enforcement of the national regulations and terms of licence. Additionally, a regulatory body must be created that has the authority, competence, and financial and human resources to oversee the safety of waste management and spent fuel management facilities. Likewise, a state party must also ensure the presence of adequately qualified staff and adequate financial resources to ensure the safety of these facilities.

The Joint Convention also contains, at Article 27, a set of international obligations governing international movement of radioactive waste and spent fuel. These include a requirement to ship only with the notification and consent of the state of destination and in accordance with relevant international legal obligations governing radioactive transboundary movement, notably the 1980 Convention on the Physical Protection of Nuclear Material (CCPNM) (see below). Moreover, the receiving state may only take delivery of radioactive waste or spent fuel if its administrative, regulatory and technical infrastructure meet the broader requirements of the Joint Convention.

Procedural Obligations

Article 33 requires state parties to attend review meetings that discuss mandatory national reports submitted by the each state party detailing the measures that it has taken to implement its obligations under the convention. These reports detail what each state party has done in terms of spent fuel management and waste management policy, practices and classification system. Each report must also provide a list of the spent fuel management facilities and radioactive waste facilities, their location and essential features, and an inventory of spent fuel and radioactive waste.

IAEA Advisory Services and Missions

The IAEA publishes a detailed set of safety standards that address radioactive waste and has also published a draft set addressing spent fuel management. The Agency's Disposable Waste Unit develops the standards that deal with radioactive waste. At the request of a member state, this unit will assist in their application by undertaking a Peer Review by a team of international experts, who will visit to assess and make recommendations regarding the applicable safety standards of the requesting state. In addition, the IAEA offers technical assistance to facilitate the safe management of radioactive waste.

Safety of Research Reactors

This section considers the regime that applies to research reactors. The safety and security of research reactors is especially important because in many instances they are located at universities in or near population centres and may use highly-enriched uranium (HEU) which is a nuclear weapons material.

2004 Code of Conduct on the Safety of Research Reactors (CCSRR)

Status and Background

The CCSRR is a non-binding international legal agreement to which states are free to determine their own level of commitment. The CCSRR was adopted in September 2004 by the IAEA Board of Governors. However, in contrast to the Code of Conduct on the Safety and Security of Radioactive Sources (CCSSRS) (see below), there is no process by which states can make a written political commitment to apply it.

Substantive Obligations

The stated objective of the CCSRR is "to achieve and maintain a high level of safety in research reactors worldwide through the enhancement of national measures and international cooperation." To achieve this, Section III(5) encourages states to apply the IAEA's research reactor safety standards and those relating to legal and governance infrastructure, in order to improve national safety regulation pertaining to all stages in the life of research reactors. If there is any difficulty in applying the substantive provisions found in the CCSRR the state in question should communicate that to the IAEA.

Under Section V(9), the state party should establish a legislative and regulatory framework to govern the safety of research reactors. This framework should establish national safety regulations, a regulatory authority, a system for authorizing the operation of research reactors, a system for inspection to determine compliance with the national regulations and a mechanism for enforcing the regulations.

In addition, under Section V(10), this legislative framework should establish a regulatory body to "conduct authorization, regulatory review and assessment, inspection and enforcement, and should establish safety principles, criteria, regulations and guides." Under the code this regulatory body should be provided with adequate resources to effectively discharge its duties.

The state should establish an emergency response capability, legal and infrastructure arrangements for decommissioning, and require the organization operating the research reactor to prepare and maintain a safety analysis report. Authorization must be obtained for the siting, construction, commissioning, operation, safety modifications, extended shutdown and decommissioning of a research reactor. The organization operating the research reactor should undertake periodic safety reviews and make necessary upgrades to ensure its safety.

IAEA Advisory Services and Missions

As in the case of nuclear power reactors, the IAEA also promulgates non-binding safety standards for research reactors and offers review services. This section considers some of the services available.

Integrated Safety Assessment of Research Reactors (INSARR)

INSARR missions are a safety review service offered by the IAEA and conducted at the request of a member state. INSARR missions cover the siting, design, safety analysis, construction, commissioning, operation, operational limits and conditions, radiation protection, safety of experiments, maintenance, periodic testing and the safety culture of research reactor operators.

Incident Reporting System for Research Reactors (IRSRR)

The IRSRR collects and analyzes information from member states regarding the occurrence of "unusual" events at research reactors. Reports are generated by the IAEA based on the information received. These reports, which provide technical information, identify the causes of the problematic events and remedial actions taken.

Nuclear Emergency Preparedness and Response

This section considers the regime that applies to emergency preparedness and response to a nuclear accident. Although hopefully never needed, mitigation strategies are an essential aspect of the international regime.

1986 Convention on Early Notification of a Nuclear Accident (CENNA)

Status and Background

CENNA was adopted by the IAEA General Conference at a special session and was opened for signature in Vienna on September 26, 1986 and in New York on October 6, 1986. The CENNA entered into force on October 27, 1986. There are currently 102 state parties (IAEA, 2008c).

Substantive Obligations

This convention applies when an accident has the potential to, or results in, the release of radioactive material that has transboundary effects with consequences for the safety of another state. It covers nuclear reactors, nuclear fuel cycle facilities, radioactive waste management facilities, nuclear fuels or radioactive waste in transport or storage and radioisotopes.

Under Article 2, in the event of a nuclear accident on its territory, a state party must notify the IAEA and any state which is, or may be physically affected. This notification must detail the nature of the accident, the time of its occurrence, location, and all information relevant to mitigating the accident's consequences.

Under the CENNA the IAEA, as mandated by Article 4, must inform state parties, IAEA member states, relevant international intergovernmental organizations, or any other states which are or may be physically affected. The Agency will provide information about the nature of the accident, the time of its occurrence and its location, and which facility or activity was involved. Additionally, the IAEA will provide information relevant to any state which might eventually be affected by the accident, including details of the assumed cause of the accident, its general characteristics, meteorological conditions which may affect the release of radiation, results from environmental monitoring and protective measures taken.

In order to facilitate this process, Article 7 obliges each state party to ensure that the IAEA and other state parties are aware of the competent national authorities and a point of contact responsible for issuing and receiving a notification and information in the event of an accident. Under the same article the IAEA is obliged to maintain an up-to-date list of such national authorities as well as points of contact for relevant international organizations.

1968 Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (CACNARE)

Status and Background

CACNARE was opened for signature in Vienna on September 26, 1986 and entered into force on October 26, 1986. There are currently 100 state parties (IAEA, 2008d).

Substantive Obligations

Under Article 2 of this convention, a state party, in the event of a nuclear accident, may call on any other state party or where appropriate, international intergovernmental organizations, for assistance. Any state party may request assistance, but each is also obliged to provide information related to the scope and type of assistance required.

Once a request is made, each party is obliged to promptly notify the requesting party whether or not it is in a position to render assistance. If so, the assisting party must notify the IAEA of what capabilities they have to assist, including experts, equipment, and materials; they must also lay out the terms under which these assets will be made available. States may also request medical assistance for individuals involved in the accident, and this may include their temporary relocation to the territory of another state party.

For its part, if a request for assistance is made, the IAEA will respond by making appropriate resources available, acting as liaison with other states which may possess the necessary resources, and – if requested – coordinating the assistance at the international level. This does not mean that the requesting state loses control of the coordination or supervision of assistance activities domestically. In fact, Article 3 stipulates that while an assisting state will maintain immediate operational supervision of its contributed personnel, the overall direction, control, and supervision of the assistance effort remains with the requesting state. However, to facilitate this assistance process, Article 4 requires states parties to identify to the IAEA and other states parties a point of contact and competent authority that will handle requests for assistance or accept offers.

Under Article 5 the IAEA is given a central role in the prevention and mitigation of nuclear accidents. To this end, the IAEA will collect information regarding experts, equipment and materials that are available to assist, in addition to communicating appropriate methodologies, techniques and the latest research relating to response techniques. The agency will also, when requested, assist states to prepare emergency plans, develop training programs, transmit requests for assistance, put in place radiation monitoring programs, and conduct feasibility studies regarding radiation monitoring systems. In addition to this, the IAEA acts as an international hub, by establishing and maintaining liaison with the relevant international organizations that deal in some way with nuclear emergencies.

In terms of the costs of assistance operations, a state party, under Article 7, may offer assistance without cost to the receiving state. However, there are provisions in the convention that govern the reimbursement of expenses. If assistance is offered on a reimbursement basis, a receiving state is obliged to reimburse promptly the expenses of an assisting state.

Another way in which this convention fosters the provision of assistance is by granting privileges and immunities under Article 8. Under this article a requesting state is obliged to provide necessary privileges and immunities to foreign personnel providing assistance. These include immunity from arrest, detention and legal process, involving criminal, civil and administrative jurisdictions. In addition, under Article 9, state parties are obliged to facilitate the transit of foreign personnel, equipment and property through their territory when they are involved in an assistance mission.

IAEA Advisory Services and Missions

The IAEA has safety standards dealing with emergency preparedness and response. It also dispatches Emergency Preparedness Review Teams (EPREV) at state request, to evaluate emergency preparedness and make recommendation to improve it.

IAEA Incident and Emergency Centre

The Incident and Emergency Centre (IEC), established on February 1, 2005 is the IAEA's central administrative mechanism for responding to nuclear incidents. It is the central point for coordinating the provision of assistance and allows for the effective sharing of information between states, their competent authorities, international organizations and technical experts.

To facilitate the provision of assistance, the Emergency Notification and Assistance Technical Operations Manual (ENATOM) clarifies the expectations of the Secretariat and the roles of the IAEA, member states, and international organizations in the event of a nuclear emergency. The Emergency Response Network Manual (ERNM) and the Response Assistance Network (RANET) are further attempts to strengthen international response by improving coordination of the provision of assistance and by promoting emergency preparedness in member states. The IAEA Response Plan for Incidents and Emergencies (REPLIE) details how the agency staff will organize in response to an emergency.

Inter-Agency Committee on Response to Nuclear Accidents (IACRNA)

The Inter-Agency Committee is designed to coordinate the response of international organizations in the event of a nuclear accident. The members of IACRNA, in addition to the IAEA, include:

- The European Commission (EC)
- The European Police Office (EUROPOL)
- The Food and Agriculture Organization of the United Nations (FAO)

- The International Civil Aviation Organization (ICAO)
- The International Maritime Organization (IMO)
- The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)
- The International Criminal Police Organization (INTERPOL)
- The Organisation for Economic Co-operation Development (OCED)/ Nuclear Energy Agency (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).

To facilitate the response in the event of a nuclear emergency, the IACRNA has developed the Joint Radiation Emergency Management Plan of the International Organizations (JREMPIO). The JREMPIO describes the roles and responsibilities of the different international organizations, lays out the interfaces between them and with states, and establishes a framework for emergency preparedness.

IACRNA and IAEA Emergency Response Exercises

The IACRNA, in partnership with the IAEA Secretariat, coordinates international emergency response exercises to increase preparedness for a nuclear accident. A recent example is the ConvEx-3 (2005) exercise at the Cernavoda nuclear power plant in Romania. Sixty-two countries and eight international organizations participated. Such exercises allow the international community to identify weaknesses in its response capacities and mitigation strategies.

<u>Biennial Meetings of "Competent" Authorities</u>

According to Article 7 of the CENNA and Article 4 of the CACNARE, state parties are obliged to designate competent authorities to deal with the various obligations under the two conventions. In order to facilitate international cooperation and communication, the Secretariat of the IAEA has convened biennial meetings of competent authorities identified under the two conventions. These meetings generate reports on new ways of increasing nuclear safety and improving emergency preparedness and international assistance in the event of a crisis, among other topics.

In addition to the biennial meetings, at the second meeting of competent authorities in June 2003 a National Competent Authorities' Co-ordinating Group (NCACG) was established. The NCACG, consisting of a Chairperson and six members representing Africa, Asia and Australasia, Eastern Europe, South and Central America and Caribbean, North America and Western Europe, manages the tasks assigned to the competent authorities and coordinates their contributions.

Safety and Security of Radioactive Sources

Unlike other parts of this study, this section, dealing with radioactive sources, considers both safety and security, since the two aspects are essentially dealt with in the same international regime. Radioactive sources have widespread and varied uses. Although not part of the nuclear power generation process, radioactive source material could be sought by terrorist groups for radiological weapons, otherwise known as Radioactive Dispersal Devices (RDDs), and thus have safety and security risks that could have an impact on the peaceful uses of nuclear energy as a whole.

Non-binding Code of Conduct on the Safety and Security of Radioactive Sources

Status and Background

Radioactive sources have numerous medicinal applications in both diagnosis and treatment. An example is teletherapy, a procedure in which an intense beam of radiation is aimed at a specific tissue area. Radioactive sources also are used in research and education, industry and the military and are found throughout the world. Due to the widespread use of these sources, the 1998 International Conference on the Safety of Radiation Sources and Security of Radioactive Material noted the need to prevent both theft and accidents. Proposals were thus floated to create an international undertaking, possibly even a legally binding convention, "which should provide for a clear commitment by and attract the broad adherence of States" (Joint Report, 2006: 17).

However, it became clear that the international community was not yet ready to agree to a legally-binding document. As a result, the Non-binding Code of Conduct on the Safety and Security of Radioactive Sources (CCSSRS) was inaugurated in September 2000 and revised after the September 11, 2001 terrorist attacks on the US to reflect the new global threat environment. This new interest in protecting radioactive sources reflects the fear that they might be used in radiological weapons or RDDs.

Recognizing that the non-binding code does not carry the same force of law as an international convention, the IAEA General Conference urged states to inform the Agency's Director-General in writing 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 that they encourage other countries to do the same (OECD, 2006: 18). A similar mechanism of support was requested with respect to the supplementary guidance, which was approved by the IAEA Board of Governors in September 2004. As of July 24, 2008, 92 states have expressed their support for the code of conduct, while 48 have expressed their support for the supplementary guidance (IAEA, 2008).

Substantive Obligations

The CCSSRS does not apply to radioactive sources in military or defence programs or to nuclear material as defined in the 1980 Convention on the Physical Protection of Nuclear Material (CPPNM) (see below), except for sources incorporating plutonium-239. The main goal of the CCSSRS is to maintain high levels of safety and security for radioactive sources by preventing unauthorized access to them and by mitigating any consequences of an accident or malicious act. The main vehicle envisioned for achieving this is adequate national regulatory control.

The CCSSRS notes that every state should take the appropriate measures necessary to ensure that radioactive sources under their control are safely managed and securely protected during their useful lives and should have in place an adequate legislative and regulatory control system to manage these sources. This should be buttressed by strategies to minimize the likelihood of lost control or sabotage. If such events occur, states should have in place national strategies, with rapid response capability, for regaining control or mitigating the consequences of sabotage. In furtherance of this objective, the code stipulates that every state should ensure the staff of its national regulatory body are adequately trained, as are its law enforcement agencies and emergency services.

Additionally, under the CCSSRS every state should establish a national register of radioactive sources. In terms of national implementation measures, every state should have in place legislation and regulations that assign governmental responsibilities for the safety and security of radioactive sources, provide effective control, and specify the necessary protection and safety requirements. This legislation should also provide for the establishment of an independent regulatory body that has responsibility for the safety and security of radioactive sources.

Article 20 of the CCSSRS stipulates that legislation should ensure that the regulatory body has adequate authority to create binding regulations governing the safety and security of radioactive sources, issue authorizations for the use of these sources, create safety assessments and security plans, and revoke or suspend authorizations if necessary. In addition, the regulatory body should issue minimum performance and maintenance requirements for the use of radioactive sources and emergency procedures, including the safe and secure management of disused sources.

In order to facilitate their duties, the regulatory body should be endowed with broad powers, including the right to enter and inspect premises in order to ensure that regulatory requirements are being met, monitor "orphaned" sources, and ensure that remedial actions are taken where necessary. In addition to these broad powers, every state should ensure that its regulatory body is staffed by qualified personnel, has adequate financial resources and the necessary equipment to undertake its responsibilities.

The CCSSRS also makes provisions for regulating the import and export of radioactive sources. Under Article 23, if the state intends to export a radioactive source it should notify the importing state requesting its consent. The importing state should consent to the import only if legislative and technical infrastructure is in place to meet its obligations under the CCSSRS. Moreover, the exporting state should only export radioactive sources if it is satisfied that the importing state has authorized the receipt of these materials and has an adequate technical and regulatory infrastructure to manage them safely. The CCSSRS is further strengthened by the Supplementary Guidance on the Import and Export of Radioactive Sources. As an illustration the following table shows the situation in respect of the four case study countries.

Table 2. Commitment by Four Case Study Countries to Code of Conduct on the Safety and Security of Radioactive Sources and Supplementary Guidance on the Import and Export of Radioactive Sources

State	**Code of Conduct**	**Supplementary Guidance on the Import and Export of Radioactive Sources**		
	Notification pursuant to GC(47)/RES/7.B	Notification pursuant to GC(48)/RES/10.D	Contact Point Designated	Response to SAQ
Canada	YES	YES	YES	YES
Australia	YES	YES	YES	YES
Brazil	YES	YES	YES	YES
Jordan	YES	NO	YES	NO

Source: IAEA, 2008g.

IAEA Advisory Services and Missions

The IAEA publishes a set of safety standards for protection against ionizing radiation and for the safety of radiation sources within its Safety Series, Safety Reports and TEC-DOC series.

Radiation Safety Infrastructure Appraisal (RaSIA)

The Radiation Safety Infrastructure Appraisal (RaSIA) system, an integrated safety appraisal system developed by the IAEA's Division of Radiation, Transport and Waste Safety is designed to assess, at a member state's request, the effectiveness of the domestic regulatory infrastructure for radiation safety, including the safety and security of radioactive sources. The adequacy of the national infrastructure governing radiation is assessed against recognized international standards. The appraisal also covers both the legislative and statutory framework and the activities of the regulatory body. In this way, the RaSIA is designed to cover both the legal framework and the actual application of the law, including notification and the keeping of an inventory of radiation sources, authorization, inspection, enforcement and information dissemination.

Revised International Action Plan on the Safety and Security of Radioactive Sources

To facilitate the practical application of the CCSSRS, the IAEA has put in place the Revised International Action Plan on the Safety and Security of Radioactive Sources (RIAPSSRS). The RIAPSSRS has several purposes. It is designed to assist states in establishing an effective regulatory infrastructure and national plan for managing radioactive sources. It also seeks to promote the application of the CCSSRS, provide for an assessment by IAEA advisory missions, and increase the level of awareness among users of radioactive sources.

Bilateral and Regional Initiatives

Bilateral and regional arrangements may also be helpful in increasing the security of radioactive sources. In March 2006, for example, the US National Nuclear Security Administration (NNSA) and Australia's Radiation Protection and Nuclear Safety Agency (ARPANSA) signed a memorandum of understanding (MOU) to increase, through bilateral efforts, the security of radioactive source materials in Southeast Asia. The MOU is an attempt to foster the relationship between the two states, increase awareness of security concerns related to radioactive sources, and to train regulators and radioactive source users in Southeast Asia (OECD, 2006: 20). One result is the Australian-led Regional Security of Radioactive Sources (RSRS) Project to improve the regulatory infrastructure, training, and physical protection programs of radioactive sources in Southeast Asia.

The International Nuclear Security Regime

This section considers the nuclear security regime, outlining the mechanisms in place to prevent, detect and respond to theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material. This aspect of nuclear governance has been thrust to the forefront of international concern by both the terrorist attacks of September 11, 2001 and by concern that terrorist groups are actively seeking nuclear material to use in future attacks.

1980 Convention on the Physical Protection of Nuclear Material (CPPNM)

Status and Background

The CPPNM was opened for signature on March 3, 1980 and entered into force on February 8, 1987. There are currently 135 states parties (IAEA, 2008e).

Substantive Obligations

The purpose of the CPPNM is threefold. The first is to establish legally prescribed protective levels for nuclear material during international transport. The second is the criminalization of the intentional commission of certain acts related to nuclear material, essentially theft. The third is to promote international cooperation relating to prosecution of these offences and to the response efforts in the event of a protective breach. To this end, under Article 3 each state party is obligated to ensure that nuclear material under its jurisdiction is protected during international nuclear transport. Recognizing that different types and quantities of nuclear material have different proliferation risks associated with them, the CPPNM, in Annex I, sets out the different levels of protection required for the various classifications of nuclear substances. There are three classifications of nuclear material covered under the convention, ranging from those with the highest levels of associated risk in category I to those with a lowest risk in category III.

In terms of the levels of protection mandated by the convention, the treaty contemplates two scenarios. The first is material being stored incidental to international transport. The second is during the actual act of international transport. When being stored, category III materials must be stored in an area with controlled access. Category II materials must be under constant surveillance by guards or electronic devices, surrounded by a physical barrier, and there must be limited and controlled points of entry. Category I material must be stored in the same way as category II, but with added levels of protection provided by the most severely restricted access and close communication between surveillance personnel and appropriate response forces.

During international transport of category II and III materials, special precautions must be made, including prior arrangements among sender, receiver and carrier which outline the time, place and procedures for transferring responsibility for the shipment. The same considerations apply to category I materials, but these must also be under constant surveillance by escorts who are in close communication with appropriate response forces.

Under Article 4, state parties are obliged not to export nuclear material unless they have been assured that the material will be protected, during transport, at the levels described in Annex I. Moreover, a state party is obligated not to import nuclear material from a state not party to the Convention unless they are assured that the material will be protected during transport at Annex I levels. Additionally, parties are required not to allow the transit of nuclear material through their territory unless it is protected.

Article 5 stipulates that each party must also identify to other parties a point of contact for their central authority that has responsibility for physical protection of nuclear material and for coordinating recovery and response operations in the event of any protective breach. In such a case, parties are required to cooperate to the maximum feasible extent in the recovery and protection of nuclear material.

The parties are also required to criminalize a host of activities that relate to the unlawful, use, possession, or other unauthorized means of obtaining nuclear material. As an example, Article 7 requires the criminalization of the theft of nuclear material, or obtaining nuclear material through fraudulent means or through the use of force. The penalties that attach to these offences must take into account the serious nature of the offences. To facilitate the conviction of an offender, Article 13 requires state parties to provide assistance, including the supply of evidence, to any other party during a criminal proceeding for an offence laid out in Article 7.

2005 Convention on the Physical Protection of Nuclear Material (CPPNM) Amendment

Status and Background

The Amendment to the CPPNM was adopted on July 8, 2005. There are currently fifteen contracting parties (IAEA, 2008f). The amendment is not yet in force, as this is contingent on ratification by two thirds of the original 112 state parties to the CPPNM.

Substantive Obligations

Not long after the negotiation of the CPPNM, efforts were begun to strengthen its role in preventing nuclear weapons proliferation and nuclear terrorism. While the treaty was viewed as an important step in increasing the physical security of nuclear material worldwide, it does not require states to protect such material while in domestic use, storage or transport, unless domestic transport crosses international water or airspace. Large and important aspects of the civilian nuclear industry were thus not covered by the convention.

To remedy this, the CPPNM amendment creates a legally-binding regime to establish and maintain physical protection measures applicable to nuclear material in use, storage and transport anywhere and also to nuclear facilities. Article 2A requires state parties to implement an "appropriate physical protection regime" for both nuclear material and nuclear facilities under its jurisdiction. Under the amendment, this regime should be designed to prevent theft, establish a rapid response capacity to locate and recover missing or stolen nuclear material, protect against sabotage of nuclear material or nuclear facilities, and mitigate the consequences of any successful sabotage. To do this, each party must establish a legislative and regulatory framework to govern physical protection and designate a competent authority responsible for the domestic implementation of the framework.

African Nuclear Weapon-Free Zone Treaty (Treaty of Pelindaba)

Status and Background

The African Nuclear Weapon-Free Zone Treaty (ANWFZ) is the only nuclear weapon-free zone treaty that contains provisions for ensuring the physical security of nuclear materials. (The 1985 Treaty of Rarotonga, which created a nuclear weapon-free zone in the South Pacific, bans nuclear dumping, as does the ANWFZ, but does not concern itself with nuclear safety or security). The Treaty of

Pelindaba was opened for signature on April 11, 1996. It will enter into force on the date of deposit of the twenty-eighth instrument of ratification. Currently 26 states have ratified, while 27 have signed (UNODA, 2003).

Substantive Obligations

Under Article 10, state parties are legally obliged to maintain the "highest standards of security and effective physical protection of nuclear materials." This requirement, designed to prevent theft or unauthorized use of nuclear material, also applies to facilities and equipment. Each party undertakes to apply measures of physical protection equivalent to those provided for in the CPPNM and IAEA guidelines. It is unclear how the requirements of the CPPNM would be applied to domestic transport, facilities and equipment, given that without its amendment, the treaty currently applies only to international transport. Under Article 11 the treaty bans attacks on nuclear facilities, again the only NWFZ to contain this provision. The inclusion of physical protection requirements in the ANWFZ is a novel attempt to increase nuclear security regionally.

To facilitate compliance with the treaty, state parties agreed to establish the African Commission on Nuclear Energy (AFCONE). This commission will be instituted once the treaty enters into force, will facilitate the exchange of information, arrange consultations between parties and review the application of IAEA safeguards. If a party believes another party is in breach of its obligations, the complainant is obliged to bring the issue to the attention of the other state. The alleged non-compliant party has 30 days to provide an explanation and resolve the matter. This may include technical visits if agreed by the parties. If this does not resolve the issue, then the complaint will be forwarded to AFCONE. On receiving a detailed inspection report from the IAEA, and in the event of a breach, AFCONE will meet in extraordinary sessions and make recommendations to the party in breach and to the African Union (AU). If necessary, the AU may refer the matter to the United Nations Security Council.

2005 International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT)

Status and Background

ICSANT was opened for signature on September 14, 2005, and entered into force on July 7, 2007. There are currently 29 state parties (United Nations, 2007).

Substantive Obligations

Article 2 of the ICSANT establishes a wide variety of offences in relation to nuclear terrorism. Under the convention it is an offence for anyone to possess radioactive material with the intent to cause death, injury or damage to property, or the environment, or use radioactive material in such a way that runs the risk of these consequences. Threatening to undertake these acts also constitutes an offence, as does participating as an accomplice or directing another to undertake these acts.

Regarding national implementation, each state party is obliged under Article 5 to establish the offences under the convention within their domestic criminal law. Moreover, a state party is obliged to ensure that the "penalties fit the crime" in the sense that they must take into account the grave nature of nuclear terrorism.

The ICSANT also places an obligation on state parties to cooperate in preventing acts of nuclear terrorism by providing accurate information to each other in order to detect, suppress and investigate the offences denoted in the convention. Each party is also obliged to establish jurisdiction over the offences if they are committed in its territory, on board a vessel or aircraft registered in that state, or when the offender is a national. ICSANT legally requires parties to either prosecute or extradite an offender and allows for a wide measure of mutual legal assistance in connection with criminal proceedings.

Security Council Resolution 1540 (2004)

Adopted in April 2004 by the United Nations Security Council under Chapter VII of the UN Charter (which makes it legally-binding) resolution 1540 obliges all states to refrain from providing support or assistance to non-state actors seeking to acquire so-called weapons of mass destruction (WMD). WMD are normally taken to mean nuclear and radiological, as well as chemical and biological weapons. The resolution also requires states to adopt and enforce appropriate and effective laws that prevent this prohibited conduct.

With respect to nuclear material, the resolution requires all states to develop and maintain measures to account for and secure these items, appropriate physical protection measures, appropriate and effective border controls and law enforcement agencies, and national export and trans-shipment controls. The resolution also establishes a 1540 Committee comprised of representatives of Security Council member states, to oversee the implementation of the resolution, in particular by examining compliance reports that states are obliged to submit periodically. The Security Council has twice extended the resolution and the mandate of the committee, in 2006 (in resolution 1673) for two years and in 2008 (resolution 1810) for another three.

IAEA Illicit Trafficking Database (ITDB)

Established in 1995, the IAEA's Illicit Trafficking Database (ITDB) collects information from states regarding incidents of illicit trafficking. States are not obliged to contribute to it, since the database does not derive from a treaty obligation or other international agreement. The information collected pertains to all types of nuclear material as well as radioactive sources. The principle objective is to facilitate the exchange of authoritative information on reported incidents among states. The information collected from states is reportedly subjected to continuous analysis by the Agency's ITDB staff to identify trends and patterns, assess threats and evaluate weaknesses in material security and detection capabilities and practices (IAEA, 2006: 1). In 2006, a total of 252 incidents were reported (IAEA, 2006: 2). While somewhat dated – the most recent fact sheet available from the IAEA is for 2006 – it provides a reasonable idea of current incident levels.

IAEA Advisory Services and Missions

Publications

The IAEA has series of publications to assist states in establishing a coherent nuclear security infrastructure. The IAEA Nuclear Security Series provides recommendations and guidance for states and lays out IAEA activities in the area of nuclear security.

International Nuclear Security Advisory Service (INSServ)

INSServ conducts missions at a state's request, to assist in identifying its nuclear security requirements and the ways in which it can meet those requirements. It generates reports which can serve as the basis for cooperation between the state and IAEA and also for bilateral nuclear security assistance.

International Physical Protection Advisory Service (IPPAS)

IPPAS is the IAEA's primary mechanism for evaluating the physical protection arrangements in member states. Its missions conduct detailed reviews of the legal and regulatory infrastructure of a requesting state and determine the level of compliance with the CPPNM. They also seek to compare national practice with IAEA standards and international best practice. A confidential mission report by each mission is intended to form the basis for any remedial action. Additionally, the IAEA provides follow-up assistance such as training, technical support and more targeted assessments.

SSAC Advisory Service (ISSAS) and the International Team of Experts (ITE)

ISSAS provides requesting states with recommendations regarding improvements to their State System of Accounting and Control (SSAC), which is the basis of nuclear safeguards under the IAEA's strengthened safeguards system adopted after 1993, but which also contributes to safety and security by ensuring that states adequately account for their nuclear material. ITE advisory missions have two objectives. The first is to inform national policy makers about the need for the state to adhere to the international legal framework governing nuclear material and to implement it domestically. The second is to provide information on how to do so.

Integrated Regulatory Review Service (IRRS)

The IIRRS was inaugurated in 2006 to help states improve the effectiveness of national regulatory bodies and to assist in the implementation of national safety legislation and regulations. These reviews could benefit the nuclear security infrastructure by allowing for more effective national regulators and better legislative frameworks.

Integrated Nuclear Security Support Plan

The Integrated Nuclear Security Support Plan (INSSP), based on findings from numerous nuclear security support missions, attempts a "holistic" approach to nuclear security capacity-building. This plan is individualized to meet the specific needs of each state. The INSSP represents a more organized approach to what were previously ad hoc interventions.

Three Year Plan of Activities to Protect against Nuclear Terrorism

The Nuclear Security Plan of 2006-2009 is designed to improve the security of nuclear and radioactive material worldwide by assisting states in implementing effective national security measures. The priorities of the plan are to provide advice concerning the implementation of international agreements and guidelines, review and assess the needs of member states, provide support for states in implementing nuclear security recommendations, and outreach information exchange. The plan is dependent on extra-budgetary contributions to a Nuclear Security Fund (NSF) for financing.

Case Studies

Australia

Background

Australia does not have a nuclear power generation program. It is, however, one of the world's major uranium producers, with production and exports averaging about 10,000 tonnes of uranium oxide per year (Australian Uranium Association, 2008). It has the world's largest known recoverable amount of uranium, at 24 percent of the global total, with Kazakhstan as second with 17 percent, and Canada third with 9 percent (World Nuclear Association, 1997).

Australia has one operating research reactor, the Open Pool Australian Lightwater (OPAL) reactor, at Lucas Heights near Sydney, in the state of New South Wales. In addition, it is currently decommissioning an old reactor at the site, the High Flux Australian Reactor (HIFAR). This was shut down in January 2007 and the fuel and heavy water have been removed.

In April 2007, the federal government changed its policy regarding uranium and proposed repealing existing legislation that prohibited nuclear activities – notably the 1999 Environmental Protection and Biodiversity Conservation Act. At the time of the 2008 general election the previous government had not acted on this proposal. Meanwhile, the then opposition Australian Labor Party had reversed its long-standing opposition to new uranium mines in favour of states having the right to approve new mines if they wished. Now that the Labor Party is in power Australia will likely be increasing its uranium exports in the coming years.

At the state level, uranium mining is currently permitted only in South Australia and the Northern Territory (Nuclear Energy Agency, OECD, 2001: 5). New South Wales and Victoria have legislated prohibitions on uranium exploration and mining. Western Australia and Queensland have policies, rather than legislation, prohibiting uranium mining. Tasmania has no legislative restriction, but hosts no operating mines (Australian Uranium Association, 2006).

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) regulates the safety aspects of nuclear materials and facilities in Australia. ARPANSA is governed by a Board, is headed by a Chief Executive, and has several different branches and advisory bodies (Australian Government, 2007). The Australian Nuclear Science and Technology Organisation (ANSTO) is Australia's national nuclear research and development organization and nuclear operator (Australian National Report, 2007: 6). The Australian Safeguards and Non-Proliferation Office (ASNO) is responsible for the application of nuclear safeguards, the physical protection and security of nuclear materials and facilities and bilateral safeguards agreements with states to which Australian uranium is exported.

Table 3. Australia's International Legal Obligations: Nuclear Safety and Security

Obligation	Signature	Ratification	In Force
Convention on Nuclear Safety	September 20, 1994	December 24, 1996	March 24, 1997
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	November 13, 1998	August 5, 2003	November 3, 2003
Convention on Early Notification of a Nuclear Accident	September 26, 1986	September 22, 1986	October 23, 1987
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	September 26, 1986	September 22, 1986	October 23, 1987
Convention on the Physical Protection of Nuclear Material	February 22, 1984	September 22, 1986	October 22, 1987
Convention on the Physical Protection of Nuclear Material Amendment	No	NA	NA
International Convention for the Suppression of Acts of Nuclear Terrorism	September 14, 2005	No	NA

Source: IAEA, 2008h

Nuclear Power Plants

For the purposes of the CNS, Australia does not have any nuclear installations. In fact, Australian legislation currently prohibits the construction or operation of a nuclear power reactor. Section 10 of the 1998 Australian Radiation Protection and Nuclear Safety Act (ARPANS) prohibits the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) from issuing a license for the construction or operation of a nuclear power plant (Commonwealth of Australia, 2007: 6).

Radioactive Waste Management

Both research reactors and radioactive sources used in industry and medical applications generate radioactive waste. This waste is currently stored at numerous locations across the country. Currently Australia has no integrated long-term waste management strategy. (Nuclear Energy Agency, 2007: 59). However, the federal government is working to establish one. For waste produced by federal agencies, the Australian Government is establishing a near-surface repository (Commonwealth of Australia, 2005: 85). Responsibility for all other radioactive waste rests with the states and territories.

The federal government is presently developing a national code covering the treatment, conditioning, packaging, storage and transport of radioactive waste. The new code will establish requirements for the storage of radioactive waste, including long-lived intermediate-level waste.

Research Reactors

The Australian Radiation Protection and Nuclear Safety Regulations (ARPANS Regulations) provide the legal basis on which ARPANSA regulates the safety of Australia's active and decommissioned nuclear reactors. Under Part 5 of the ARPANS Act, any activity involving a nuclear reactor or prescribed radiation facility must be undertaken with a licence issued by ARPANSA. Under the ARPANS Act it is unlawful for a person or company to engage in the siting, construction, operation, possession or control, or decommissioning of a nuclear reactor or prescribed radiation facilities without a licence.

In terms of the issuance of a licence, ARPANSA may impose licensing conditions. For example, the now decommissioned HIFAR reactor operated under a set of 55 Licence Conditions. Set out in a handbook provided by ARPANSA, these governed all relevant aspects of the operation and control of the reactor (Commonwealth of Australia, 2007: 14).

Radioactive Sources

In Australia, the regulation of most radioactive sources and equipment used in industrial and medicinal applications takes place at the state level. Each individual state, as well as the Northern Territory and the Australian Capital Territory, have separate legislation that covers the issuance of licenses or permits for the use, possession and disposal of radioactive sources.

However, if the radioactive source contains uranium, plutonium, thorium, heavy water or nuclear grade graphite, it is possible that the 1978 Nuclear Non-Proliferation (Safeguards) Act may trigger a separate set of controls.

Emergency Preparedness and Response

ARPANS Regulation 46 requires the licence holder to take "all reasonably practicable steps to prevent an accident involving controlled materials, controlled apparatus or controlled facilities." If an accident occurs, the licence holder is obliged to take all reasonable steps to mitigate the consequences, including both damage to human health and the environment. Moreover, the licence holder is obliged to inform ARPANSA of the accident within 24 hours and provide a written report not later than 14 days after the accident.

Additionally, the ARPANS Regulations require an emergency plan to be in place as a requisite element of the issuance of the licence. The ARPANSA Regulatory Assessment Principles (RAP) set out the different aspects of emergency plans that must be addressed and the various arrangements that must be in place. These regulations govern both existing installations and the issuance of licences for the construction of new installations.

The Regulatory Guidelines (RG) require detailed and comprehensive emergency plans – based on an assessment of the likely consequences of an accident – that aim to minimize the consequences of an emergency and ensure the protection of on-site personnel, the public and the environment. In terms of overall governmental preparedness, the ANSTO Local Liaison Working Party (LLWP) routinely examines the adequacy of government, local authority and off-site agency response mechanisms for dealing with a radiological emergency (Commonwealth of Australia, 2007: 43). This involves discussions on exercises, public information and changes to emergency plans or arrangements.

In addition, ANSTO's broader emergency plans are part of the Disaster Plan (DISPLAN) of the State of New South Wales. The DISPLAN has been developed and accepted by relevant agencies, including the New South Wales Police and State Emergency Services. Review of the plans is continuing, and regular meetings of the relevant agencies are held to plan exercises and discuss changes. Additionally, for the OPAL reactor, assessments of the radiological consequences of acts of sabotage and terrorism have been undertaken by ANSTO and reviewed by ARPANSA (Commonwealth of Australia, 2007: 44).[3]

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[3] The threat posed by terrorism in this context is real. Several individuals are currently being tried for conspiring to commit terrorist acts on Australian soil, one act named in the conspiracy being the destruction of the Lucas Heights reactor.

Nuclear Security

The 1987 Safeguards Act creates a series of offences that serve to buttress the physical security regime for nuclear material and are thus relevant to Australia's compliance with the CPPNM. Under the Safeguards Act, it is an offence to steal nuclear material, use false pretences to obtain nuclear material, acquire nuclear material through threats, or to use or threaten use it to cause serious personal injury and substantial property damage. These offences are punishable by a term of imprisonment no longer than 10 years, a maximum fine of $20,000 AUD (US$17,200), or both.

In addition to these specifically designated offences for crimes involving nuclear material, a detailed security plan has always been one of ARPANSA's licensing requirements. Moreover, ASNO requires and inspects arrangements to ensure the physical protection of nuclear material (including fissionable material such as that contained in reactor fuel) and nuclear facilities (including reactors) against theft or sabotage. Thus, there is a requirement to demonstrate adequate physical protection and security arrangements.

ARPANSA and ASNO recognize that safety and physical protection aspects of the OPAL reactor are closely related. In 2007 ASNO and ARPANSA concluded a memorandum of understanding (MOU) about the respective roles of the two agencies in relation to the reactor.

Brazil

Background

The Brazilian Federal Constitution of 1988 gives the federal government exclusive competence for managing all nuclear energy activities, including the operation of nuclear power plants. The federal government also has exclusive jurisdiction over the surveying, mining, milling, exploitation, industrialization and commercial application of nuclear minerals and materials.

The *Comissão Nacional de Energia Nuclear* (Brazilian National Commission for Nuclear Energy, CNEN) was created in 1956 and is responsible for all nuclear activities in Brazil. The CNEN is the regulatory body in charge of regulating, licensing and controlling nuclear energy. As such, it is considered the national regulatory body in accordance with the National Nuclear Energy Policy Act (CNEN, 2007: 12).

Brazil has two nuclear power plants in operation and one under construction. They are located at a common site, near the city of Angra in the state of Rio de Janeiro. Brazil also has one uranium enrichment and fuel fabrication facility, located in Resende, also in the state of Rio de Janeiro, four research reactors in various locations, and two uranium mines (CNEN, 2007: 2).

Table 4. Brazil's International Legal Obligations: Nuclear Safety and Security

Obligation	Signature	Ratification	In Force
Convention on Nuclear Safety	September 20, 1994	March 4, 1997	June 2, 1997
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	October 31, 1997	February 17, 2006	May 18, 2006
Convention on Early Notification of a Nuclear Accident	September 26, 1986	December 4, 1990	January 4, 1991
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	September 26, 1986	December 4, 1990	January 4, 1991
Convention on the Physical Protection of Nuclear Material	May 15, 1981	October 17, 1985	February 8, 1987
Convention on the Physical Protection of Nuclear Material Amendment	No	NA	NA
International Convention for the Suppression of Acts of Nuclear Terrorism	September 16, 2005	No	NA

Source: IAEA, 2008i.

Nuclear Power Plants

The CNEN issues radiation protection regulations and those for licensing nuclear power plants. These regulations address safety concerns during operation, quality assurance, licensing of personnel and their medical certification, reporting requirements for operational nuclear power plants and plant maintenance.

In Brazil it is unlawful under licensing regulation CNEN NE 1.04[8] to construct or operate a nuclear installation without a licence. There are detailed reporting and safety requirements established at each stage of the licensing process, including site approval, construction, authorization for nuclear material utilization, initial operation, permanent operation and decommissioning (CNEN, 2007: 14).

Moreover, the radiation protection regulations establish a system of regulatory inspections and parallel enforcement mechanisms to ensure that the licensing conditions are being fulfilled and that any breach is dealt with. In the event of a breach of a licensing requirement the CNEN may modify, suspend or revoke the licence.

A separate environmental licensing process is required to ensure that the nuclear installation will meet environmental requirements.

Radioactive Waste Management

The policy adopted by Brazil with regard to spent fuel from nuclear power plants is to keep the fuel in safe storage at the reactor site. What this means in practice is that spent fuel is kept in cooling pools. Brazil is awaiting an international consensus about reprocessing, recycling, and/or final disposal of spent fuel (CNEN, 2006).

Similarly, there is currently no long-term, comprehensive Brazilian policy or legal framework on radioactive waste. Present policy is to keep radioactive waste safely isolated from the environment, in expectation of a national policy framework. Under Law 6.189 enacted December 16, 1989, the CNEN has responsibility for the final disposal of radioactive waste. Moreover, under the more recent Law n. 10.308 of November 20, 2001, rules were established for the siting, licensing, operation and regulation of radioactive waste facilities in Brazil. As a general rule, nuclear waste is put into either special containers or special drums, then kept in a separate facility or buried. All waste is subject to CNEN inspections. After an IAEA mission in 2000, one waste storage facility is being expanded, taking into account the recommendations made by the team of experts.

Spent fuel from Brazilian research reactors had previously been shipped to the United States for disposal. However, this option is no longer available. As a result, Brazil has joined an IAEA regional project to develop a regional strategy to deal with research reactor spent fuel. At present, this spent fuel is kept on site in racks located in the reactor pool.

Research Reactors

The CNEN Directorate of Research and Development is responsible for all issues relating to the fuel cycle, reactor technology and radioisotopes produced by research reactors. In a similar fashion to power reactors, there are detailed licensing requirements that must be met, and sanctions in the event of breach.

Radioactive Sources

There can be little doubt that Brazil understands the dangers posed by mishandled radioactive sources. In 1985 an accident in Goiania involving a caesium-137 source left at a disused private radiotherapy institute was found by two individuals who took the unit home and tried to remove the source assembly. They ultimately ruptured the source capsule, contaminating themselves and hundreds of other people. Four people died, many were seriously injured and the emergency response and clean-up lasted six months.

In an effort to avoid future calamities, the CNEN now performs a biannual inspection on every authorized radiotherapy installation. These inspections, buttressed by a federal registry, verify source inventory and storage safety. Moreover, the CNEN has instated a policy of collecting disused sources. This involves CNEN experts literally picking up disused sources in a special truck and taking them away for safe disposal.

Emergency Preparedness and Response

To improve their emergency preparedness and response capacity, on October 7, 1980 under Law 1809, Brazil established the System for Protection of the Brazilian Nuclear Program (SIPRON). Decree 2210 of April 22, 1997 further strengthened this capacity by establishing the *Secretaria de Assuntos Estratégicos* (Secretariat for Strategic Affairs, SAE). The SAE, established as the central organization of SIPRON, was replaced during a reorganization in 2000 by the Ministry of Science and Technology, through the Special Advisor for the Coordination of Technical and Scientific Programs (SACTSP). Thus it is the SACTSP that is responsible for overall supervision preparedness and response during a nuclear emergency (CNEN, 2007: 18).

In addition to SIPRON, Decree 2210 also established a Commission for the Coordination of Protection of the Brazilian Nuclear Program (CCPBNP), composed of representatives of Eletronuclear, the nuclear operator, CNEN, and other agencies, the Municipal Civil Defence, the State Civil Defence, the Angra Municipality – home to Brazil's nuclear power plants – the National Transport Infrastructure Department, the National Army, Navy and Air Force, Ministry of Health, Ministry of Foreign Relations, Ministry of Justice, Ministry of Finance, Ministry of Planning and Budget, and the Ministry of Transportation and Communications. Also, under the SIPRON guidelines Eletronuclear, as the nuclear operator, and the Municipal and State Civil Defence Department prepare emergency plans for a nuclear accident. Additionally, the City of Resende, home to Brazil's enrichment facility, has a *Comitê de Planejamento de Resposta a Situações de Emergência Nuclear no Município de Resende* (Committee for Nuclear Emergency Response Planning in the City of Resende) (CNEN, 2007: 94).

Nuclear Security

The CNEN is the primary regulatory body for ensuring the security of nuclear installations. Security personnel are trained according to CNEN regulations. SIPRON also seeks to ensure a high level of coordination in security matters.

Canada

Background

Canada has a large nuclear power, nuclear export and nuclear research sector. There are currently 22 nuclear power reactors in the country, operated both by public utilities and private companies, in Ontario (20), Quebec (1) and New Brunswick (1). Of these, 18 are currently licensed to produce power (Government of Canada, 2007). Together, these power plants generate an estimated 15 percent of Canada's electricity. In the province of Ontario, Canada's most populous province, over 50 percent of electricity comes from nuclear power (Government of Canada, 2007: 5).

The Canadian Nuclear Safety Commission (CNSC) regulates the safety and security of nuclear materials and facilities in Canada and has a staff of approximately 650 (Canadian Nuclear Safety Commission, 2007). Atomic Energy of Canada Limited (AECL), a Crown corporation, has responsibility for nuclear research and development, reactor design, engineering and marketing.

Canada also produces most of world's radioisotopes for medical diagnostic and treatment purposes using the National Research Universal Reactor (NRU). Two new Multipurpose Applied Physics Lattice Experiment (MAPLE) reactors built to replace the NRU have never functioned properly and it was announced in 2008 that they will be discontinued.

Canada also exports uranium and nuclear technology. Canada has an active mining, milling, refining and uranium conversion industry and is the world's largest exporter of uranium (Government of Canada, 2007: 5). In terms of exported technology, Canada exports its own Canadian-designed reactor, the CANada Deuterium Uranium (CANDU) reactor. Nine such reactors are in operation or under construction outside Canada.[4] An advanced CANDU reactor (the ACR-1-000) is under development for domestic use and export.

[4] In addition, in Canada there are an estimated 125 hospitals and universities performing isotope studies in research and/or nuclear medicine.

Table 5. Canada's International Legal Obligations: Nuclear Safety & Security

Obligation	Signature	Ratification	In Force
Convention on Nuclear Safety	September 20, 1994	December 12, 1995	October 24, 1996
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	May 7, 1998	May 7, 1998	June 18, 2001
Convention on Early Notification of a Nuclear Accident	September 26, 1986	January 18, 1990	February 18, 1990
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	September 26, 1986	August 12, 2002	September 12, 2002
Convention on the Physical Protection of Nuclear Material	September 23, 1980	March 21, 1986	February 8, 1987
Convention on the Physical Protection of Nuclear Material Amendment	No	NA	NA
International Convention for the Suppression of Acts of Nuclear Terrorism	September 14, 2005	No	NA

Source: IAEA, 2008j.

Nuclear Power Plants

The main legislation in Canada governing the nuclear industry is the 1997 Nuclear Safety and Control Act (NSCA) and its regulations. The NSCA gives the CNSC the authority to regulate the nuclear industry and authorizes the use of technical and support staff to support that purpose. The CNSC reports to the Canadian Parliament through the Minister of Natural Resources.

The Canadian regulatory system has detailed licencing requirements and is premised on the fact that licensees are primarily responsible for safety. Therefore a company that wishes to operate a nuclear facility must apply for and obtain a licence from the CNSC. The CNSC ensures that a potential licensee meets all necessary safety and security requirements before issuing a licence. The applicant for a licence must justify the selection of a site, design, method of construction and mode of operation of a facility (Government of Canada, 2007: 6). If the requisite criteria are met and the CNSC is satisfied that adequate measures to protect health and safety are in place, the Commission will issue a licence.

The CNSC issues detailed regulations to govern the safety and security of nuclear reactors. These include the General Nuclear Safety and Control Regulations, Radiation Protection Regulations, Class I Nuclear Facilities Regulations, Class II Nuclear Facilities and Prescribed Equipment Regulations and the Nuclear Security Regulations.

To ensure compliance with the law and licensing requirements, CNSC inspectors inspect licensed activities. The inspectors have clearly defined powers and can penalize non-compliance with the licensing requirements, order remedial actions in hazardous situations and suspend or revoke a license when necessary (Government of Canada, 2007: 34).

Radioactive Waste Management

In July 1996 the government announced a Policy Framework for Radioactive Waste (PFRW) designed to lead to the future development of an institutional and financial structure for the permanent safe disposal of spent fuel waste. In April 2001 the government introduced the Nuclear Fuel Waste Act (NFWA), which entered into force on November 15, 2002 (Government of Canada, 2005). Article 6 of the NFWA required nuclear energy corporations to create a waste management organization to propose a long-term management plan for nuclear fuel waste. This organization would implement the approach selected by the government. In addition, the NFWA required the utilities that created this organization to establish trust funds to finance the management of nuclear fuel waste, under the "polluter pays" principle.

The Nuclear Waste Management Organization (NWMO) was created in 2002 and submitted its long-term waste management proposal, *Choosing a Way Forward,* in November 2005 (Nuclear Waste Management Organization, 2005). Based on the recommendations of the NWMO, the government ultimately selected Adaptive Phased Management (APM) as the approach to best deal with nuclear waste in Canada. The APM approach has three key phases. The first involves maintaining the used nuclear fuel at reactor sites, while undertaking necessary preparation for centralization. The second phase will be a determination regarding the desirability of shallow underground interim storage. The last phase involves the centralized containment and isolation of used nuclear fuel in a deep geologic repository. The government has not yet selected where this central waste repository will be. Until then, nuclear waste producers and owners are responsible for interim management. In most instances nuclear waste is stored at locations where it is generated.

Research Reactors

Non-power reactors are licensed by the CNSC in similar fashion to power generating reactors. Again, the overriding concern with licensing arrangements is the protection of the health and safety of Canadians and the environment. The CNSC's licensing process for research reactors follows the Class I Nuclear Facilities Regulations. Licensees must meet requirements at every stage of the process, including site preparation, construction, operation and decommissioning.

If the CNSC is satisfied that the potential licensee has put in place appropriate programs and safety and security requirements to ensure the safe operation of a research reactor, the CNSC may issue a licence. As with power reactors, the CNSC will regularly inspect licensed facilities to ensure compliance with the terms of the licensing agreement and to ensure that the facilities are being operated in a safe and secure manner. If there is a breach of licensing requirements, the license may be suspended, revoked or altered and the licensee may be subject to penalties.

Radioactive Sources

To ensure the safety and security of radioactive sources the CNSC has put in place the National Sealed Source Registry (NSSR) and the Sealed Source Tracking System (SSTS). The NSSR and the SSTS provide for "cradle to grave" regulatory oversight of radioactive sources that pose a significant risk to Canadians.

The NSSR and SSTS were designed by the CNSC to be implemented to meet the provisions of the CCSSRS. To implement the SSTS the CNSC had to amend the 278 licenses it had granted to make the reporting of radioactive source transactions mandatory. As a result, the tracking of radioactive sources became legally required on January 1, 2006.

Emergency Preparedness and Response

On-site emergency planning is the responsibility of the license holder. The licensee is obliged to create, and be prepared to implement, emergency response plans and procedures subject to regulation by the CNSC. Every aspect of these emergency plans is regularly tested. In the Canadian federal system, it is the provinces that have primary responsibility for off-site emergencies.

Nevertheless, at the federal level the Federal Nuclear Emergency Plan (FNEP) lays out how the federal government will respond to a nuclear emergency. The FNEP will become activated if federal support is required. Although Health Canada is the lead federal department under the FNEP, the plan involves 19 federal departments and agencies (Government of Canada, 2007: 85).

Nuclear Security

The Nuclear Security Regulations (NSR) are the central mechanism for establishing a high level of nuclear security in Canada. The NSR were recently amended, the new regulations coming into force on August 16, 2006. Mandatory requirements in the regulations include: threat and risk assessments; an on-site armed response force available 24 hours a day; security screening of employees; security checks; enhanced access control; design basis threat analysis; the provision of uninterrupted power supply for alarm monitoring and security systems; and the initiation of contingency planning, drills and exercises.

Jordan

Background

The Kingdom of Jordan presently has no nuclear power plants and no research reactors. However, the Jordan Atomic Energy Commission (JAEC) with IAEA assistance is currently completing a feasibility study for a nuclear energy generation program.

The study is paired with a separate evaluation, which is investigating the economic feasibility of restarting a uranium mining program abandoned in the 1990s. It is believed that proceeds from uranium exports could help offset the capital investment needed to establish a nuclear power industry.

In terms of international cooperation, Jordan and the US Department of Energy have signed a Memorandum of Understanding (MOU) in which they agreed to negotiate a bilateral nuclear cooperation agreement. Jordan has plans to negotiate similar cooperation agreements with Canada, France, Russia and Euratom.

To increase Jordan's domestic capacity, the Jordan University of Science & Technology will be establishing a nuclear engineering degree program. This is envisioned as the first step toward a national nuclear research centre. It is suggested that Jordan would like to establish a nuclear power generation plant by 2017.

Nuclear Power Plants

In 2007 the lower house of the Jordanian Parliament endorsed two bills, one on atomic energy, the second on nuclear safety and protection from nuclear radiation.

Table 6. Jordan's International Legal Obligations: Nuclear Safety & Security

Obligation	Signature	Ratification	In Force
Convention on Nuclear Safety	December 6, 1994	NA	NA
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	No	NA	NA
Convention on Early Notification of a Nuclear Accident	October 2, 1986	December 11, 1987	January 11, 1998
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	October 2, 1986	December 11, 1987	January 11, 1998
Convention on the Physical Protection of Nuclear Material	No	NA	NA
Convention on the Physical Protection of Nuclear Material Amendment	No	NA	NA
International Convention for the Suppression of Acts of Nuclear Terrorism	November 16, 2005	NA	NA

Source: IAEA, 2008k.

These nuclear energy "draft" laws will lay the legal foundation for Jordan's nuclear efforts. They are a starting point only and are not intended to establish a fully developed system of legal governance to manage a peaceful nuclear program. Law No. 43, the Radiation Protection, and Nuclear Safety and Security Law (RPNSSL) establishes the Radiation and Nuclear Regulatory Commission (RNRC).

Under Article 4 of this law, the RNRC is given the power to regulate and control the use of nuclear energy and ionizing radiation in Jordan. This body is also charged with ensuring the protection of the environment, human health and property from the hazards of radiation. Additionally, the RNRC is empowered to ensure public safety, radiation protection and nuclear safety and security. To achieve these ends, Article 5 gives the RNRC the power to grant licences and permits for radiation institutes, nuclear facilities and workers in the nuclear field. Moreover, the RNRC may conduct inspections to ensure compliance with the terms of the licence. In addition, the RNRC is empowered to implement comprehensive safeguards and to create a system to account for and control all nuclear materials.

Article 7 of this law stipulates that the Board of the RNRC is responsible for the formulation of the general policy, while the Director General, under Article 10, is responsible for implementation of the general policy, ensuring the commitment of the licensees to licence requirements, and conducting inspections of nuclear institutions, facilities and installations.

Appropriate penalties are established for a breach of licence requirements. These penalties include the suspension or revocation of a licence, or in the appropriate circumstances, a period of incarceration.

Radioactive Waste Management

Under Article 14 of the RPNSSL, it is prohibited to possess or manage radioactive waste without a valid licence. Importing radioactive waste into Jordan is also prohibited by law and it is not possible to obtain a licence for this activity. The disposal of radioactive waste resulting from the use of radiation sources is prohibited unless it is done with the consent of the Board, under the supervision of the RNRC, and in the sites licensed by the RNRC and allocated for this use by the Ministry of Environment. The Jordan Atomic Energy Commission (JAEC) is the body responsible for the disposal of radioactive waste.

Research Reactors

Article 3 of Law No. 42, the Nuclear Energy Law, establishes the JAEC. This body is mandated to conduct and support research related to nuclear energy and radiation technology. Also, it is to establish and develop facilities and laboratories to conduct research on nuclear energy and put them at the disposal of scientists, researchers and institutions. However, as with nuclear power plants, Article 5 of the RPNSSL gives the RNRC the authority to grant licenses and permits for radiation institutions, nuclear facilities, and workers in the nuclear field. Additionally, it is the RNRC that seems to have the authority to conduct inspections to ensure compliance with the terms of the license, even in a research facility.

Radioactive Sources

Under Article 14 of the RPNSSL, radioactive sources and substances emitting ionizing radiation are strictly controlled. As such, the import, export, use, dealing, possession, trafficking, operation, lease, transfer, storage, destruction, disposal, or production, including exploration, grinding, milling crushing, extracting, converting, mining or manufacturing of these substances requires a license. Undertaking these activities without a license is strictly prohibited and may be met with legal sanction.

Emergency Preparedness and Response

Under Article 15 of the RPNSSL every licensed facility must provide for the "necessary" precautions for radiation protection, nuclear safety and security. The levels of precaution are commensurate with the nature of the radiation source and the expected hazard. In addition, these facilities are expected to appoint a radiation protection and nuclear safety and security officer, and establish an emergency plan that is commensurate with the level of risk associated with the facility. This will be addressed further under a future regulatory regime.

Moreover, a licensee is expected to have in place physical monitoring programs to determine the measurement of radiation levels, radiation protection and contamination removal precautions. A licensee must also periodically conduct an evaluation of the effectiveness of these precautions. Under Article 15, in the event that a nuclear accident does occur, the licensee must immediately notify the RNRC and the civil defence directorate. The licensee must also clarify, in writing, the details of the accident and its cause.

Nuclear Security

As with emergency preparedness, under Article 15 of the RPNSSL every licensed facility must take the necessary precautions to ensure nuclear security. The required security levels are to be dictated by the nature of the radiation source. Also, at a nuclear facility there must be a nuclear safety and security officer. However, more detailed security requirements will likely be forthcoming under a more comprehensive regulatory regime.

Conclusions and Recommendations

The foregoing review of legally binding conventions, non-binding codes of conduct, optional support services and safety standards, regional arrangements and bilateral efforts, demonstrates the existence of a wide-ranging international legal, quasi-legal and voluntary framework governing the safety and security of peaceful nuclear activities. The four case studies have been employed to demonstrate different approaches applied by states as they pursue compliance with their international legal obligations. As is apparent from this review, the many similarities in the national arrangements used to ensure the safety and security of nuclear material and facilities are an obvious by-product of a successful international regime.

That is not to say that there is no room for improvement. For a start, obvious deficiencies created by the non-binding nature of the CCSRR could be remedied by negotiating an internationally binding legal convention that governs the safety of research reactors. The same could be said for radioactive sources. This is especially important not only because of the widespread use of research reactors and radioactive sources, but also because of the possibility of a terrorist plot which employs a "dirty" bomb. The importance of the safe handling and security of these types of radioactive materials cannot be underestimated.

Historically, there has been little political impetus for the negotiation of a convention in these areas. Since the subject of research reactors and radioactive sources is relatively apolitical, further international regulation could be possible. At a minimum, an apparatus for the expression of political commitment to the CCSRR would strengthen the regime.

Perhaps more important is the fact that there are presently no binding international legal obligations governing the decommissioning of nuclear reactors. As nuclear power becomes more important in the global power mix, states will undoubtedly seek to decommission older civilian reactors and replace them with newer, more efficient and safer models. Many states with long-standing nuclear power programs face block obsolescence of their existing reactor fleet as they approach their 30 to 50-year life spans. Thus, an international regime to govern reactor decommissioning should be considered urgent.

Perhaps the greatest challenge facing the international regime that governs the safety and security of nuclear material and technology is that most of it is non-binding. Certainly, international treaties form the bedrock for international governance in this area and are binding as a matter of law. The obligations they impose tend to be broad and vague. On top of this bedrock have been added layers of non-binding codes, recommendations and guidelines that have no direct legal link to the treaties they are purportedly designed to implement. The comprehensive suite of advisory services and recommendations produced by the IAEA and other international organizations play a significant role in fleshing out the details of the international regime. The most glaring difficulty here is that these services are not obligatory and their recommendations have no binding force. Thus, what has been created is an international regime that has binding legal requirements at a very general level, with the most specific, and arguably more important elements, left entirely to the discretion of individual states.

This situation can be contrasted to the non-proliferation side of the nuclear equation. Under the 1968 Nuclear Non-Proliferation Treaty (NPT) and associated safeguards agreements, the international community has established a legally-binding framework under which international inspectors verify compliance with commitments not to divert nuclear material to nuclear weapons. Non-compliance is treated with the utmost seriousness and a compliance system is available for dealing with alleged infractions, leading ultimately to the authority of the United Nations Security Council.

Notwithstanding the special importance of securing weapons-grade nuclear material and technology, ensuring the safe and secure operation of civilian nuclear power globally should be viewed as vital, especially given current concerns over possible terrorist acquisition of civilian nuclear material. The global use of nuclear power is an area in which all states have a collective interest. During the expected resurgence of nuclear power, a major accident in one state will have adverse consequences on the nuclear industry in all other states. Thus, there is a collective interest in ensuring the safe and secure operation of nuclear power plants globally. Consequently, there is room for a strengthened, more integrated and more compulsory regime. International inspections, similar to safeguards inspections under the NPT regime, could be envisioned as one way to monitor compliance.

In terms of ensuring nuclear safety and security more broadly, large gains have been made through the establishment of the Amendment to the CPPNM and the ICSANT. These two instruments recognize that there is a serious level of risk associated with nuclear materials and installations and obliges parties to act accordingly. The Amendment to the CPPNM fills another lacuna in the international legal governance structure, but needs to be brought into force as soon as possible in order to ensure that all nuclear material receives the level of physical protection commensurate with the risks it poses.

The actions taken by the international community after the Chernobyl accident, Three-Mile Island and the attacks of September 11, 2001 have created a broad legal regime that seeks to ensure the safety and security of peaceful nuclear applications. However, as nuclear technology advances and as more and more states turn to it to meet their energy demands, a robust and integrated regime that decreases the risks associated with the use of nuclear power becomes increasingly necessary.

Works Cited

Alger, Justin (2008). "A Guide to Global Nuclear Governance." *Nuclear Energy Futures Special Publication.* September. Available at: http://www.igloo.org/community.igloo?r0=community&r0_script=/scripts/folder/view.script&r0_pathinfo=%2F%7B7caf3d23-023d-494b-865b-84d143de9968%7D%2FPublications%2Fresearch%2Fnucleare%2Ftest%2Ftesta&r0_output=xml

Australian Uranium Association (2008). *Australia's Uranium and Nuclear Power Prospects.* Briefing Paper 1. (January). Available at: http://www.uic.com.au/nip01.htm.

World Nuclear Association (1997). *Uranium Mining.* (March). Available at: http://www.uic.com.au/ozuran.htm.

Australian Uranium Association (1996). *Regulation of Australian Uranium Mining.* Mines Paper 9. (September). Available at: http://www.uic.com.au/mineregulation.htm.

Australian Government (2007). *Australian Radiation Protection and Nuclear Safety Agency.* Corporate Structure. (December). Available at: http://www.arpansa.gov.au/AboutUs/structure.cfm.

Canadian Nuclear Safety Commission (2007). *Protecting Canadians,* 2006-2007 Annual Report.

Canadian Nuclear Safety Commission (2007). *Annual CNSC Staff Report for 2006 on the Safety Performance of the Canadian Nuclear Power Industry.* INFO-076. (June).

Government of Canada (2005). *Canadian National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.* Second Report. (October).

Commonwealth of Australia (2007). *Convention on Nuclear Safety.* Australian Radiation Protection and Nuclear Safety Agency. (September).

Commonwealth of Australia (2005). *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.* Australian National Report. (October).

CNEN-Comissão Nacional de Energia Nuclear (2006). *National Report of Brazil for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* (May).

CNEN-Comissão Nacional de Energia Nuclear (2007). *Fourth National Report of Brazil for the Nuclear Safety Convention.* (September).

Government of Canada (2007). *Fourth Canadian National Report for the Nuclear Safety Convention.* (September).

IAEA (1956). *Statute of the International Atomic Energy Agency*. 8 UST 1093, TIAS No. 3873, 276 UNTS 3. (October 26).

IAEA (1994). *Convention on Nuclear Safety.* 33 I.L.M. 1514. (September).

IAEA (1995). *OSART: Operational Safety Review Teams.* (August). Available at: http://www-ns.iaea.org/downloads/ni/s-reviews/osart/OSART_Brochure.pdf.

IAEA (2003). *PROSPER guidelines for peer review and for plant self-assessment of operational experience feedback process.* IAEA Services Series No. 10. (April).

IAEA (2003-2004). *Concepts and Terms.* IAEA Website. Available at: http://www-ns.iaea.org/standards/concepts-terms.htm.

IAEA (2006). *IAEA information system on incidents of illicit trafficking and other unauthorized activities involving nuclear and radioactive materials.* IAEA Illicit Trafficking Database (ITDB).

IAEA (2008a). *Convention on Nuclear Safety.* Registration No: 1676. (June). Available at: http://www.iaea.org/Publications/Documents/Conventions/nukesafety_status.pdf.

IAEA (2008b). *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management,* Registration No: 1729. (February) Available at: http://www.iaea.org/Publications/Documents/Conventions/jointconv_status.pdf.

IAEA (2008c). *Convention on Early Notification of a Nuclear Accident,* Registration No: 1532. (March). Available at: http://www.iaea.org/Publications/Documents/Conventions/cenna_status.pdf.

IAEA (2008d). *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency,* Registration No: 1534. (March). Available at: http://www.iaea.org/Publications/Documents/Conventions/cacnare_status.pdf.

IAEA(2008e). *Convention on the Physical Protection of Nuclear Material.* Registration No: 1533. (September). Available at: http://www.iaea.org/Publications/Documents/Conventions/cppnm_status.pdf.

IAEA (2008f). *Amendment to the Convention on the Physical Protection of Nuclear Material.* Available at: http://www.iaea.org/Publications/Documents/Conventions/cppnm_amend_status.pdf.

IAEA (2008g). "List of states that have made a political commitment with regard to the Code of Conduct on the Safety and Security of Radioactive Sources and the Supplementary Guidance on the Import and Export of Radioactive Sources." IAEA website. Available at: http://www.iaea.org/Publications/Documents/Treaties/codeconduct_status.pdf.

IAEA (2008h). "Country Factsheets: Australia." IAEA website. Available at: http://ola.iaea.org/factSheets/CountryDetails.asp?country=AU.

IAEA (2008i). "Country Factsheets: Brazil." IAEA website. Available at: http://ola.iaea.org/factSheets/CountryDetails.asp?country=BR.

IAEA (2008j). "Country Factsheets: Canada." IAEA website. Available at: http://ola.iaea.org/factSheets/CountryDetails.asp?country=CA.

IAEA (2008k). "Country Factsheets: Jordan." IAEA website. Available at: http://ola.iaea.org/factSheets/CountryDetails.asp?country=JO.

OECD (2006). *International Nuclear Law in the Post-Chernobyl Period.* Joint Report by the OECD Nuclear Energy Agency and the International Atomic Energy Agency. Available at: http://www.nea.fr/html/law/chernobyl/nea6146-iaea-chernobyl.pdf.

Nuclear Energy Agency (2008). Website (July). Available at: http://www.nea.fr/html/nea/flyeren.html.

Nuclear Energy Agency (2001). *Nuclear Legislation in OECD Countries, Regulatory and Institutional Framework for Nuclear Activities*, Australia.

Nuclear Energy Agency (2007). *Nuclear Law Bulletin No. 79.* (June).

Nuclear Waste Management Organization (2005). *Choosing a Way Forward: The Future Management of Canada's Used Nuclear Fuel,* Final Study.

Savchenko, V.K (1995). *The Ecology of the Chernobyl Catastrophe: Scientific Outlines of an International Programme of Collaborative Research.* New York: Parthenon Publishing.

United Nations (2007). *International Convention for the Suppression of Acts of Nuclear Terrorism.* Multilateral Treaties Deposited with the Secretary-General. Available at: http://untreaty.un.org/ENGLISH/bible/englishinternetbible/partI/chapterXVIII/treaty19.asp.

United Nations-Office for Disarmament Affairs (UNODA). (2003) Multilateral Arms Regulation and Disarmament Agreements. Available at: http://disarmament2.un.org/TreatyStatus.nsf.

The Centre for International Governance Innovation
Centre pour l'innovation dans la gouvernance internationale

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