Commonwealth of Australia

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

Australian National Report

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AUSTRALIAN RADIATION PROTECTION AND NUCLEAR SAFETY AGENCY

ARPANSA

CONTENTS

A INTRODUCTION

The responsibility for the governance of Australia is shared by Australia's federal government (also known as the Commonwealth government) and the governments of the six states and two self governing territories. Responsibility for radiation health and safety in each State and Territory rests with the respective State/Territory government, unless the activity is carried out by a Commonwealth agency or a contractor to a Commonwealth agency; in those cases the activity is regulated by the Federal government (Commonwealth government of Australia).

In terms of the Joint Convention there are therefore nine jurisdictions that have to be considered. The legislative and regulatory requirements of these jurisdictions with respect to management of spent fuel and radioactive waste are not identical, but are often similar. Accordingly, throughout the rest of this document, the similarities and differences are detailed.

Australia has no nuclear power reactors and only one operational research reactor. This simplifies the situation with respect to spent fuel management, as the federal jurisdiction is the only one with responsibility for the management of spent fuel.

Australia has several operational uranium mines, a large number of mineral sand mines, and large coal and aluminium mining industries. These operations produce very large quantities of waste containing radionuclides. There are also several uranium mines that are non-operational but are still under regulatory control because of the presence of potentially hazardous waste materials.

The Commonwealth of Australia, and all of its constituent states and territories, have in place, within the framework of appropriate law, the legislative, regulatory, and administrative measures, including monitoring, inspection and auditing, necessary for implementing all obligations under this Convention.

B POLICIES AND PRACTICES

Article 32 (Reporting)

(1) In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

(i) spent fuel management policy;

(ii) spent fuel management practices;

(iii) radioactive waste management policy;

(iv) radioactive waste management practices;

(v) criteria used to define and categorize radioactive waste.

(i) Spent fuel management policy

The Commonwealth is the only jurisdiction that has a requirement to manage spent fuel. The Commonwealth's spent fuel management policy requires that all spent fuel is to be transported overseas for indefinite storage (in the case of US-obligated fuel), or to another country for reprocessing, with an agreement that all resulting long-lived intermediate-level radioactive waste will be returned to Australia at a mutually agreeable time for storage.

In Victoria, the *Nuclear Activities (Prohibitions) Act 1983* prohibits the construction or operation of a facility for reprocessing[1] spent fuel. In NSW, the *Uranium Mining and Nuclear Facilities (Prohibitions) Act 1986* prohibits the construction or operation of nuclear reactors and other facilities in the nuclear fuel cycle. Other jurisdictions do not have specific policies for the management of spent fuel.

(ii) Spent fuel management practices

The Commonwealth is the only jurisdiction that has a requirement to manage spent fuel. The current spent fuel management practices for the spent fuel arising from the HIFAR and Moata research reactors are described below.

1. **Shut-down Reactor (Moata)**

Moata was an ARGONAUT type reactor operated by the Australian Nuclear Science and Technology Organization (ANSTO) during the period April 1961 until May 1995, after which time the reactor was permanently shut down and the fuel dry-stored on site. The fuel is US-origin, and it has been agreed that this fuel will be returned in the next shipment to the

[1] **"**Reprocessing**"** is defined as “the chemical separation of spent fuel”: s.2 of the *Nuclear Activities (Prohibitions) Act 1983* (Vic).

US under the Foreign Research Reactor Spent Nuclear Fuel (FRR-SNF) takeback program. There is no return of waste from shipments to the US under this program.

2. Operational Reactor (HIFAR)

The High Flux Australian Reactor (HIFAR) is the only operational research reactor in Australia. Operating the reactor produces approximately 37 spent fuel elements each year. Once discharged from the reactor, the spent fuel elements are stored for several years under water, to allow much of the short-lived activity to decay. The fuel elements are then transferred to a dry storage facility, consisting of holes drilled into the bedrock and lined with stainless steel.

Spent fuel from HIFAR has been shipped to the United States, to the BNFL facility at Dounreay, United Kingdom and to the COGEMA facility at La Hague, France.

Spent fuel elements for shipment overseas are loaded into licensed transport casks. These casks are drained, vacuum dried and hermetically sealed, tied down in specially strengthened steel ISO containers, and transported by road to the port. Sea transportation is carried out on a dedicated INF-2 classification ship. The waste arising from reprocessing of spent fuel elements shipped to the US under the FRR-SNF program will not be returned to Australia. It is a contractual requirement with BNFL and COGEMA that waste arising from reprocessing of spent fuel elements at their plants will be returned to Australia as long-lived intermediate-level waste.

3. The Replacement Research Reactor (RRR)

ANSTO's existing contract with COGEMA for the reprocessing of spent fuel from HIFAR includes provision for the reprocessing of spent fuel from the replacement reactor.

The RRR now under construction is a 20MW thermal, open pool reactor designed for LEU[2] aluminium clad fuel.

Spent fuel discharged from the reactor core will be moved a short distance under water into storage racks in the reactor service pool, adjacent to and connected with the main pool. These racks will have the capacity to store, under water, up to 10 years' arisings of spent fuel discharged from the reactor, while retaining sufficient spare space to unload the complete operating reactor core at any time should this be required. This arrangement has the advantages of minimising handling of the spent fuel, with no movement required outside the immediate vicinity of the reactor for storage purposes and convenient, continuous monitoring

[2] LEU – Low Enriched Uranium.

of the spent fuel storage conditions. The spent fuel will also be protected by the same structural features as the reactor itself. The spent fuel will be available at all times for visual inspection of its condition.

The reactor service pool will have a purpose-built stand to take a spent fuel transport cask. Using handling tools, spent fuel rods will be moved the short distance from the storage racks underwater and loaded into the transport cask for shipment.

The timing of spent fuel shipments overseas will be determined by a number of factors, including:

- the time required to accumulate a practicable sized shipment;
- the minimum cooling time required for the youngest elements in a shipment, to satisfy shipping cask regulatory criteria; and
- the benefit for radiological safety of minimising the number of such shipment operations.

On the basis of around 20 to 30 spent fuel elements arising per year, it is anticipated that there will be one overseas shipment of spent fuel every 5 or 6 years. The first such shipment would be approximately 8 years after commencement of reactor operation, given a minimum cooling period of 3 years and the above-mentioned 5 or 6 years to accumulate a sufficient quantity for shipping.

(iii) Radioactive waste management policy

In most jurisdictions, radioactive waste management policy is prescribed by an Act of Parliament and implemented by a government department (Commonwealth, NSW, Qld, SA, Tas, Vic, NT) or a Radiological Council (WA, ACT) through Regulations, with the aim of minimizing harm to people and the environment, in line with internationally accepted recommendations. In most jurisdictions, the policy is to apply the same legislative and regulatory requirements to both radioactive materials and radioactive wastes (including sealed and unsealed sources). In NSW, the policy is for licensees to store their radioactive wastes until these wastes decay to the point at which they are no longer radioactive, or until such time as a national repository and/or store are operational. Although not explicitly stated, most other jurisdictions also follow this approach. WA does not have an implied policy requiring registrants to store waste – except for material being prepared for planned disposal operations. Users are encouraged to return disused sources to the supplier or, where appropriate, arrange for their disposal at the State's low-level waste repository. The Commonwealth radioactive waste management policy requires that all radioactive waste originating within Australia be stored, or disposed of, in Australia at suitably-sited facilities after being categorised in accordance with agreed international practice.

(iv) Radioactive waste management practices

In all jurisdictions, waste management practices are implemented in such a way as to minimize the impact of any disposed or stored radioactive waste on people and the environment. In most cases the policies and regulations are based on the recommendations of the International Commission on Radiological Protection (ICRP) and the International Atomic Energy Agency (IAEA).

In all jurisdictions, radioactive waste must be managed in accordance with the relevant legislation and regulations promulgated within that jurisdiction. All stored and disposed radioactive wastes would be designated under the IAEA waste classification scheme[3] as low or intermediate level wastes. In most jurisdictions, disposal of small quantities of waste must be carried out in compliance with the *Code of Practice for the Disposal of Radioactive Wastes by the User* (NHMRC, 1985), and bulk wastes must be disposed in compliance with the *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (NHMRC, 1992). The disposal of radioactive material in Queensland must comply with the *Radiation Safety Act (1999)* and the *Radiation Safety Regulation (1999)*. For certain wastes, clients' radiation safety and protection plans require disposal arrangements which are consistent with the User Disposal Code (NHMRC, 1985).

Some jurisdictions (Qld & WA) have specifically-designated waste storage and/or disposal facilities that are licensed and audited regularly. Other jurisdictions have a range of management requirements and practices depending on the type of waste (liquid or solid, mine waste, medical waste, research waste) and on the half-lives of the radionuclides in the waste. These include registration of storage sites, permits for disposal, etc. The Queensland store will only accept certain, specifically approved radioactive substances from within Queensland.

Management of short-lived wastes in most jurisdictions is carried out by allowing the radionuclides to decay until the waste is no longer classified as radioactive, and then disposing of the waste under the appropriate regulations for disposal of non-radioactive waste.

In NSW long-lived wastes are currently stored at their place of generation until a national repository or storage facility become available.

In all jurisdictions re-entry or transit of sealed sources is permitted, for ultimate return to the manufacturer/supplier, and in certain instances for recycling or disposal to a licensed waste disposal facility. In SA the disposal of unwanted sealed sources by utilizing the services of a company that can facilitate the disposal is encouraged. The Mt Walton waste disposal facility in WA can only take sources that have been used in WA, due to a licence condition put on the

[3] International Atomic Energy Agency, *Classification of Radioactive Waste; A Safety Guide*, Safety Series No. 111-G-1.1, IAEA, Vienna, 1994.

operation by the Minister for the Environment. Currently, in most jurisdictions, any unwanted sealed radioactive source that has been used in industrial, scientific or medical applications remains the responsibility of the owner, who must store the unwanted source safely in accordance with legislative and regulatory requirements, pending its disposal.

Spent fuel management facilities

Spent fuel is subject to a period of interim storage at ANSTO's facilities near Sydney. Those facilities consist of:

- An inspection and loading pond for spent fuel;
- Ponds for cropping and wet storage of spent fuel (used for long term cooling of fresh spent fuel); and
- A dry storage facility, comprised of 50 storage holes with capacity for 1100 spent fuel elements.

Radioactive waste management facilities

ANSTO has a facility for the management of radioactive waste originating from its activities. The process components of that facility are:

- Low level solid waste store
- Decontamination centre
- Low level solid waste compaction facility
- Low level liquid waste treatment facility
- Intermediate level liquid waste storage and treatment facility
- Hot Cells facility
- Intermediate level solid waste store facility
- Waste treatment & packaging facility

Nuclear facilities under decommissioning

The 100 kW Moata research reactor was shut down in 1995, and fuel and cooling water were removed in 1996. It is presently awaiting decommissioning. Three stages of decommissioning are envisaged: post-operational care with fuel removed (current status), partial dismantling with continuing care, and complete dismantling. Decommissioning to "green field" is under planning.

(v) Criteria used to define and categorize radioactive waste

Most jurisdictions do not specifically define or categorize radioactive waste in legislation. In practice in most jurisdictions, any sealed or unsealed material containing radionuclides at levels above exemption and for which no further use is envisaged is regarded as radioactive waste. In most cases wastes are categorized, for management purposes, as long-lived or short-lived, liquid or solid, and sealed or unsealed. Further categorization is based on IAEA recommendations (NSW, NT), nuclide (Qld), or, for small quantities of solid waste, on the *Code of Practice for the Disposal of Radioactive Wastes by the User* (NHMRC, 1985). Categorization is also based on the *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (NHMRC, 1992).

SA requires uranium-mining operators to comply with the requirements and definitions of waste in the *Code of Practice on the Management of Radioactive Wastes from the Mining and Milling of Radioactive Ores* (Commonwealth of Australia, 1982). Similarly, under the present authorisation, uranium-mining operators in the NT are committed to comply with the above-mentioned Code.

C SCOPE OF APPLICATION

Article 3 (Scope of Application)

(1) This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.

(2) This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.

(3) This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.

(4) This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.

As no reprocessing facilities exist, or are proposed, in Australia, the discussion of management of spent fuel in this report does not include reprocessing activities. Also, the *Australian Radiation Protection and Nuclear Safety Act 1998* (Cwlth) prohibits ARPANSA from licensing the construction or operation of reprocessing facilities.

Waste containing only naturally-occurring radioactive materials that do not originate from the nuclear fuel cycle has not been declared as radioactive waste for the purposes of this Convention.

Australia has no spent fuel within military or defence programmes. Radioactive waste managed within military or defence programmes has not been declared as radioactive waste for the purposes of this Convention.

D INVENTORIES AND LISTS

Article 32 (Reporting)

(2) The report shall also include:

(i) a list of spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

(ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

(iv) an inventory of radioactive waste that is subject to the Convention that:

(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;

(b) has been disposed of; or

(c) has resulted from past practices.

(v) A list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

(i) A list of spent fuel management facilities subject to this Convention and their details is attached as Annex A of this report.

(ii) An inventory of spent fuel that is subject to this Convention is attached as Annex D of this report.

(iii) A list of radioactive waste management facilities subject to this Convention and their details is attached as Annex B of this report.

(iv) In the form of conditioned waste requiring disposal, Australia has approximately 3500 m^3 of low-level and short-lived intermediate-level radioactive waste within civilian programmes. This total is made up of the following volume approximations[4]

- 2010 m^3 of slightly contaminated soil from ore-processing research;

[4] Department of Education, Science and Training, *National Radioactive Waste Repository Draft EIS*, PPK Environment & Infrastructure, Adelaide, 2002.

- 1320 m^3 of operational waste stored at the ANSTO site;
- 160 m^3 of miscellaneous waste including spent sealed sources used in gauges, smoke detectors, medical equipment and luminous signs; and
- 20 m^3 of miscellaneous waste in interim storage at Woomera.

It should be noted that these figures are estimates of waste volumes for disposal whereas actual volumes will depend on the Waste Acceptance Criteria for the disposal of waste in the proposed national radioactive waste repository. Waste already disposed of at the Mt Walton East facility in Western Australia is not included in the above volume estimates.

The current estimated inventory of long-lived intermediate-level radioactive waste in the jurisdiction of the Commonwealth consists of an approximate waste volume of 500 m^3. Approximately 200 m^3 of this is in the form of reactor target cans, ion-exchange columns, used control arms, aluminium end pieces and some solidified liquid waste. Approximately 165 m^3 is historical waste in the form of thorium and uranium residues arising from mineral sands processing, and approximately 35 m^3 is disused sources from medical and research equipment[5].

Refer to Annex E for tables of the total activity of each radionuclide in waste stored in radioactive waste management facilities in Australia and waste disposed of in Western Australia's Mt Walton East facility. It should be noted that these tables have not incorporated sources of unknown activity, sources of unknown radionuclide and sources for which a range of activities was recorded. Where the activities of waste with mixed radionuclides could be attributed to each individual nuclide, this was undertaken. Inventories of radioactive waste in storage at ANSTO's radioactive waste management facility and of wastes from the mining and milling of radioactive ores are also supplied.

(v) A list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities is attached as Annex C of this report.

[5] Department of Industry, Science and Resources, *Safe Storage of Radioactive Waste, The National Store Project: Methods for choosing the right site*, A public discussion paper, Canberra, 2001.

E LEGISLATIVE AND REGULATORY SYSTEM

Article 18 (Implementing Measures)*: Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.*

Article 19 (Legislative and Regulatory Framework)

(1) Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.

(2) The legislative and regulatory framework shall provide for:

(i) the establishment of applicable national safety requirements and regulations for radiation safety;

(ii) a system of licensing of spent fuel and radioactive waste management activities;

(iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a licence;

(iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;

(v) the enforcement of applicable regulations and of the terms of the licences;

(vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.

(3) When considering whether to regulate radioactive materials as radioactive wastes, Contracting Parties shall take due account of the objectives of the Convention.

Article 20 (Regulatory Body)

(1) Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

(2) Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organisations are involved in both spent fuel or radioactive waste management and in their regulation.

The Commonwealth of Australia and all of its constituent states and territories have in place, within the framework of appropriate law, the legislative, regulatory, and administrative measures necessary for implementing all obligations under this Joint Convention.

In all cases, legislative measures involve an Act of Parliament that defines policy and details the enabling authorities. The legislative requirements are implemented by means of regulations, and administered by the appropriate regulatory authority in each jurisdiction.

Each Commonwealth, State and Territory Act is based on relevant national or international codes and standards.

These measures ensure that in all jurisdictions within the Commonwealth of Australia, all of the requirements under Article 19 are adequately met in terms of safety requirements, licensing of spent fuel and radioactive waste management activities, system of regulatory inspection, documentation and reporting, enforcement of applicable regulations and licence conditions, and clear allocation of responsibilities in the area of radiation safety.

In considering whether to regulate radioactive materials as radioactive wastes, all jurisdictions within the Commonwealth of Australia either currently practise, or are committed to practising in the future, measures consistent with the objectives of this Convention.

Generally it is expected that the appropriate regulatory authority already established in each jurisdiction for the purpose of implementing Commonwealth, State or Territory radiation safety regulations will also be designated with implementation and maintenance of the requirements of this Convention. These appropriate authorities will be adequately resourced for this role.

Within all jurisdictions in Australia, there is currently an effective independence between the appropriate regulatory authorities for radiation safety and other areas within organisations dealing with spent fuel or radioactive waste management. For example, in the Commonwealth jurisdiction, ARPANSA and ANSTO report to different ministers, and ARPANSA reports directly to parliament on a quarterly and annual basis.

F OTHER GENERAL SAFETY PROVISIONS

Article 21 (Responsibility of the licence holder)

(1) Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

(2) If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

Article 22 (Human and financial resources)

Each Contracting Party shall take the appropriate steps to ensure that:

(i) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

(ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;

(iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

***Article 23 (Quality Assurance**) - Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.*

Article 24 (Operational radiation protection)

(1) Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:

(i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;

(ii) no individual shall be exposed, in normal situations, to radiation doses, which exceed national prescriptions for dose limitation, which have due regard to internationally endorsed standards or radiation protection; and

(iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

(2) Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:

(i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and

(ii) so that no individual shall be exposed, in normal situations, to radiation doses, which exceed national prescriptions, which have due regard to internationally endorsed standards on radiation protection.

(3) Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

Article 25 (Emergency preparedness)

(1) Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.

(2) Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.

Article 26 (Decommissioning)

Each Contracting Party shall take appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

(i) qualified staff and adequate financial resources are available;

(ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;

(iii) the provisions of Article 25 with respect to emergency preparedness are applied; and

(iv) records of information important to decommissioning are kept.

Queensland has a purpose-built waste storage facility. WA has a large purpose-built waste disposal facility. All jurisdictions have small waste stores. In each jurisdiction, the legislation and regulations meet the requirements of the Convention. Each jurisdiction has detailed management plans in place for their facilities, including licensing requirements, clear delineation of responsibility for management and safety, human and financial resources, auditing and quality control, operational radiation protection, and provision and testing of emergency preparedness plans.

ANSTO's *Response Plan for Accidents and Incidents at ANSTO/LHSTC,* developed in close consultation with the emergency services agencies, covers all possible events at the ANSTO facility, including spent fuel and radioactive waste management facilities.

ANSTO's 100 kW Moata reactor was shut down and the fuel removed in 1995. Studies for decommissioning were completed in 1999, and a decision was taken to adopt a Long Term Storage option. Stage 1 of this option, including the removal of fuel and coolant from the reactor, has been completed. The main reactor structure is now in Stage II (Care and Maintenance) for a period presently estimated at 30 years. The Moata facility is licensed by ARPANSA, and a qualified Facility Officer and Licensing Officer are nominated. Adequate financial provisions for the current stages of decommissioning are identified in the Facility

Officer's budget. The reactor structure is enclosed and unauthorised access is prevented. The area is regularly surveyed for radiation. For emergency preparedness, Moata is included in the ANSTO *Response Plan for Accidents and Incidents at ANSTO/LHSTC*. Moata records, including reactor operation history, fuel irradiation records, radioactive inventory lists, manuals and drawings, are held in safe storage.

Queensland and WA do not have decommissioning plans in place for their purpose-built facilities. In both these states there is provision for decommissioning plans to be developed when the need arises.

G SAFETY OF SPENT FUEL MANAGEMENT

Article 4 (General safety requirements) *- Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards. In so doing, each Contracting Party shall take the appropriate steps to:*

(i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;

(ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;

(iii) take into account interdependencies among the different steps in spent fuel management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations.

Article 5 (Existing facilities) *- Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.*

Article 6 (Siting of proposed facilities)

(1) Each Contracting Party shall take the appropriate steps to ensure that procedures are established for a proposed spent fuel management facility:

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;

(iii) to make information on the safety of such a facility available to members of the public;

(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

(2) In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4

***Article 7 (Design and construction of facilities**) - Each Contracting Party shall take appropriate steps to ensure that:*

(i) the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;

(iii) the technologies incorporated in the design and construction of a spent fuel management facility are supported by experience, testing or analysis.

***Article 8 (Assessment of safety facilities**) - Each Contracting Party shall take the appropriate steps to ensure that:*

(i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

***Article 9 (Operation of facilities)** - Each Contracting Party shall take the appropriate steps to ensure that:*

(i) the licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;

(v) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vi) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

***Article 10 (Disposal of spent fuel)** – If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for*

disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.

Within the Commonwealth of Australia, none of the states or territories has responsibility for the management of spent fuel. Thus this Section is only applicable to the Commonwealth, which has jurisdiction over management of spent nuclear fuel.

As all the spent fuel produced in Australia comes from research reactors once operated, or currently operated, by ANSTO, ANSTO possesses the only facilities in Australia for managing spent fuel. The relevant regulatory authority, ARPANSA, has issued an operating licence to ANSTO for their spent fuel management facilities. A condition of licence is that the safety of these facilities must conform with ARPANSA's Regulatory Assessment Principles[6], which specify how individuals, society and the environment are to be protected against radiological hazards.

At ANSTO spent fuel is stored in several wet-store facilities for various periods after discharge from the reactor. One large dry store is also used for the interim storage of spent fuel prior to further handling, such as transport offshore for long-term storage or reprocessing, depending on its destination. For spent fuel that is reprocessed, the resulting intermediate-level waste is to be repatriated to Australia at some contractually-determined time, at which point an appropriate storage facility is expected to be available.

Article 4 (General safety requirements)

ARPANSA requires that facilities for the storage of spent fuel at ANSTO adequately address criticality and heat generation issues as part of their licence conditions. Both the wet and dry storage facilities currently in use for spent fuel adequately address criticality as well as the removal of any decay heat generated during the storage period. The generation of radioactive waste from spent fuel storage is kept to a minimum and consists largely of water filters and ion-exchange resins. The spent fuel handling equipment takes into account the interdependencies among the different steps in spent fuel management.

ARPANSA's Commonwealth nuclear safety legislation, the *Australian Radiation Protection and Nuclear Safety Act 1998*, accompanying regulations and subsidiary regulatory documents, such as ARPANSA's Regulatory Assessment Principles, provide for effective protection of individuals, society and the environment. These are based on internationally endorsed criteria and standards. The existing spent fuel management facilities will cease to be used within the next few years.

[6] ARPANSA, *Regulatory Assessment Principles for Controlled Facilities*, Commonwealth of Australia, 2001.

Article 5 (Existing facilities)

Commonwealth legislation and ARPANSA's licensing system require that appropriate steps be taken to review the safety of any existing spent fuel management facility and ensure that all reasonably practical improvements are made to upgrade facility safety.

Article 6 (Siting of proposed facilities)

Commonwealth legislation and ARPANSA's licensing system require that, for any proposed facility, an environmental assessment is undertaken and information on the safety of the facility is made available for public scrutiny.

Article 7 (Design and construction of facilities)

Commonwealth legislation and ARPANSA's licensing system require that design and construction of a spent fuel management facility incorporate suitable measures to limit radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases. In addition, at the design stage, plans and other provisions for decommissioning of a facility are to be developed. The technologies incorporated in the design and construction of a spent fuel management facility must be supported by experience, testing and analysis.

Article 8 (Assessment of safety of facilities)

Commonwealth legislation and ARPANSA's licensing system require that, before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility, and covering its operating lifetime, must be carried out. Before operation of a spent fuel management facility, updated and detailed versions of the safety and environmental assessments must be prepared.

Article 9 (Operation of facilities)

Commonwealth legislation and ARPANSA's licensing system require that the grant of a licence to operate is based on appropriate assessments and is conditional on the completion of a commissioning program demonstrating that the facility, as constructed, can be operated safely. Operational limits and conditions derived from tests, operating experience and assessments, must be defined and revised as necessary. Operation, maintenance, monitoring and inspection must be conducted in accordance with established procedures. Engineering and technical support in all safety-related fields must be available throughout the operating

life of the spent fuel management facility. Incidents significant to safety must be reported to the regulatory authority in a timely manner by the licence holder. Collection and analysis of relevant operating experience is required and the results must be acted upon, where appropriate. Decommissioning plans must be prepared, and updated, by means of information obtained during the operating life of the spent fuel management facility. Such plans are subject to review by the regulatory authority.

Article 10 (Disposal of spent fuel)

Commonwealth legislation and ARPANSA's licensing system require that where spent fuel has been designated for disposal, it will be handled as radioactive waste from the point in the nuclear fuel cycle where it is no longer regarded as spent fuel. Currently it is anticipated that all spent fuel managed in Australia by ANSTO will be transported overseas for either reprocessing or long-term storage and/or disposal, and thus will be regarded as spent fuel until it enters the off-shore jurisdiction.

H SAFETY OF RADIOACTIVE WASTE MANAGEMENT

***Article 11 (General Safety Requirements**): Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards. In doing so, each Contracting Party shall take the appropriate steps to:*

(i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;

(ii) ensure that the generation of radioactive waste is kept to the minimum practicable;

(iii) take into account interdependencies among the different steps in radioactive waste management;

(iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;

(v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;

(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

(vii) aim to avoid imposing undue burdens on future generations.

***Article 12 (Existing facilities and past practices**): Each Contracting Party shall in due course take the appropriate steps to review:*

(i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;

(ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

***Article 13 (Siting of proposed facilities**)*

(1) Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;

(iii) to make information on the safety of such a facility available to members of the public;

(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

(2) In so doing each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.

***Article 14 (Design and construction of facilities**): Each Contracting Party shall take the appropriate steps to ensure that:*

(i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;

(iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;

(iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

***Article 15 (Assessment of safety facilities**): Each Contracting Party shall take the appropriate steps to ensure that:*

(i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;

(iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

***Article 16 (Operation of facilities**): Each Contracting Party shall take the appropriate steps to ensure that:*

(i) the licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;

(v) procedures for characterization and segregation of radioactive waste are applied;

(vi) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;

(vii) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;

(viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;

(ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

***Article 17 (Institutional measures after closure**): Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:*

(i) records of the location, design and inventory of that facility required by the regulatory body are preserved;

(ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and

(iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.

Article 11 (General Safety Requirements)

The legislative systems in place in Australia, described in *Section E: Legislative and Regulatory System*, underpin the process of minimizing the risk of harm to individuals, society and the environment from exposures to ionizing radiation that result from the management of radioactive waste. These systems are based on the documents

Recommendations for Limiting Exposure to Ionizing Radiation and the *National Standard for Limiting Occupational Exposure to Ionizing Radiation (ARPANSA, 1995 - republished 2002)*.

Protection from non-radiological hazards is included in the process for ensuring the safety of radioactive waste management.

Details of the processes by which the generation of radioactive waste is minimized are to be supplied by the licensee in their plan for operation of the practice generating waste.

Each jurisdiction's legislation relating to the safety requirements for the management of radioactive waste are based on the national standards, codes of practice and safety guides which in turn are consistent with internationally endorsed criteria and standards.

Radioactive waste of sufficiently low-level is currently discharged into the air or sewer, incinerated, or disposed of as landfill. The national guideline for the disposal of such wastes is the *Code of Practice for the Disposal of Radioactive Wastes by the User* (NHMRC, 1985), which is currently under revision. Waste disposal via these methods is controlled by the regulatory authority in the jurisdiction in which the waste is produced.

Article 12 (Existing facilities and past practices)

Existing radioactive waste management facilities are licensed by the regulatory system of the jurisdiction in which they are located. Existing legislation allows for inspections of facilities to be performed in accordance with specified criteria. Should this review of safety reveal that a facility requires upgrading, then licence conditions may be amended to instigate facility improvements. In Queensland, legislation also allows for the issuing of Improvement Notices or Prohibition Notices by inspectors appointed under the Act to require any deficient radiation safety matters to be addressed.

Article 13 (Siting of proposed facilities)

Proposed radioactive waste management facilities require approval for siting according to the legislative and regulatory systems of the jurisdiction in which the facility is to be located. Legislative requirements in the selection of a site for a proposed facility are based on the national *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (NHMRC, 1992). This code of practice details the general characteristics of a site suitable for the establishment of a radioactive waste management facility, the criteria for site-selection and the need for a public consultation process.

In South Australia, mining operators are required to comply with the *Code of Practice on the Management of Radioactive Wastes from the Mining and Milling of Radioactive Ores*. (Commonwealth of Australia, 1982) for all phases of mining and milling activities. Similarly, under the present authorisation, uranium-mining operators in the Northern Territory are committed to comply with the above-mentioned Code for all phases of mining and milling activities.

For radioactive waste management facilities where a significant potential risk of harm exists, an environmental impact assessment/statement may be required. For example, in Australia, if a proposed radioactive waste management facility requires the approval of the Minister for the Environment and Heritage under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), which is binding on all jurisdictions, then an environmental impact statement may be requested to assist decision making in the approval process. Environmental impact assessments/statements are released for public comment as part of the public consultation process.

Article 14 (Design and construction of facilities)

The design and construction of a radioactive waste management facility are examined as part of the licensing process for the jurisdiction in which the facility is to be located. For a proposed facility, all design and construction-related, legislated, technical and safety requirements need to be met. Under the legislative system, conditions can be imposed to require, for instance, the use of 'best practicable technology' and the preparation of technical provisions for the closure of the facility.

Article 15 (Assessment of safety of facilities)

As part of legislative and regulatory requirements, an assessment of safety and environmental impact of a proposed radioactive waste management facility is required for approval before construction of the facility can commence. If deemed necessary by the appropriate regulatory authority the assessment of safety and environmental impact may be reviewed and updated prior to the operation of the facility.

Article 16 (Operation of facilities)

A licence to operate a radioactive waste management facility is required prior to operation of such a facility. The regulatory authority would not grant the licence until, amongst other requirements, it has been demonstrated that the facility meets the requirements for design and construction, and an assessment of safety and environmental impact has been made for the proposed facility. Additional licence conditions can be imposed as required. For instance,

conditions could be imposed to cover the reporting of significant safety incidents to the regulatory authority. In Queensland appropriate safety measures must be outlined in the licensee's proposed radiation safety and protection plan.

Article 17 (Institutional measures after closure)

The relevant regulatory body requires preservation of records of the location, design and inventory of radioactive waste management facilities in their jurisdiction. Post-closure recommendations are detailed in the national *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (NHMRC, 1992). These recommendations address site rehabilitation and security, and the need for an appropriate environmental monitoring program. All jurisdictions base their post-closure requirements on these recommendations.

In the case of Tasmania legislation[7] regarding contaminated sites is also relevant.

[7] Environmental Management and Pollution Control Amendment Act 2001 (No. 88 of 2001)

I TRANSBOUNDARY MOVEMENT

Article 27 (Transboundary movement)

(1) Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments. In so doing:

(i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

(ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

(iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;

(iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;

(v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

(2) A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.

(3) Nothing in this Convention prejudices or affects:

(i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;

(ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

(iii) the right of a Contracting Party to export its spent fuel for reprocessing;

(iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

International transboundary movement is covered by the IAEA Regulations for the Safe Transport of Radioactive Material, 1996 Edition (Revised), TS-R 1 (ST-1, Revised), 2000.

Within Australia, the Commonwealth, state and territory jurisdictions allow the movement of disused sealed sources across jurisdictional boundaries for return to the manufacturer, and the transboundary movement of radioactive materials. These movements must comply with all relevant legislative and regulatory requirements, and are covered by either the IAEA Transport Regulations or the *Code of Practice for the Safe Transport of Radioactive Material* (ARPANSA, 2001). In most cases a license is needed to transport radioactive material within and across jurisdictional boundaries.

The Commonwealth controls the import of radioactive materials and requires a permit to be obtained before such materials can enter Australia. The importation of radioactive waste is expressly prohibited.

Western Australia and the Northern Territory notify other Australian jurisdictions of transboundary movements of radioactive material into their jurisdictions, but do not notify other countries. Queensland requires the approval of other jurisdictions, including other countries, before sources are permanently relocated to that other jurisdiction.

The *Nuclear Waste Storage (Prohibition) Act 1999* (WA) (*NWSPA*) prevents the importation of "nuclear waste", as defined in the *NWSPA*, into Western Australia unless a consenting resolution from both houses of parliament is granted.

South Australia allows the transport of radioactive material across the state, but the *Nuclear Waste Storage Facility (Prohibition) Act 2000* (SA) prohibits transport of radioactive waste, other than Category A, B or C wastes (as defined in the *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (NHMRC, 1992), to a storage facility in South Australia.

Subject to certain conditions, Queensland may allow re-entry into its jurisdiction if a transboundary movement of a radiation source, for which an approval to relocate has been granted, is not or cannot be completed in conformity with Queensland's legislative requirements or the accepting jurisdiction's conditions of acceptance.

J DISUSED SEALED SOURCES

Article 28 (Disused sealed sources)

(1) Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.

(2) A Contracting Party shall allow for reentry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

NSW and Queensland are the only jurisdictions within which sealed radioactive sources are manufactured. In SA devices containing sealed radioactive sources are manufactured and exported to other states and overseas.

In each jurisdiction, possession of sealed sources (used or disused) requires a licence. Each jurisdiction allows the re-entry of disused sealed sources or devices containing sealed sources, under legislative and regulatory control and with the manufacturer's approval and Customs approval, provided that the source and/or device was manufactured within the jurisdiction and that the sealed source is ultimately to be returned to the manufacturer for recycling or disposal. Each jurisdiction requires that such manufacturers be licensed and have approved procedures in place for the disposal of sealed sources that are returned to them. WA may, under specific circumstances, prevent the entry of sealed sources for storage depending on whether they were legally generated within Australia.

K PLANNED ACTIVITIES TO IMPROVE SAFETY

The response of each jurisdiction is listed separately for this section.

Commonwealth

Planned future actions to improve safety include the construction and operation of facilities for centralised management of the range of radioactive waste produced nationally. These facilities will be a national repository for the disposal of low-level and short-lived intermediate-level radioactive waste and a national store for the storage of long-lived intermediate-level radioactive waste. All spent fuel from current and future reactor operations at Lucas Heights will eventually be shipped overseas for long-term storage or reprocessing. The wastes arising from the reprocessing will be repatriated to Australia and stored in the national store.

One of the roles of ARPANSA is to promote uniformity of radiation protection and nuclear safety policy and practices across all jurisdictions in Australia.

Current planning includes a complete revision of the *Code of Practice for the Disposal of Radioactive Wastes by the User* (NHMRC, 1985), plus the development of a Code of Practice for the pre-disposal management of radioactive waste.

New South Wales

NSW plans the following actions:

- Implementation of a site audit program, which would include verification of safe use, and inventory, of radioactive substances.
- Implementation of site registration for premises where unsealed radioactive substances are kept or used.
- Implementation of a registry of sealed radioactive sources above guideline levels.

Queensland

Queensland will continue to support the implementation of national uniformity radiation safety and protection measures. It is continually reviewing its standards and policies to ensure that any adverse health effects which may arise from exposure to ionizing radiation are prevented or minimised.

Queensland does not have a decommissioning plan for its radioactive waste management facility. This would be prepared if the need arises.

South Australia

An audit of all radioactive material stored under South Australian jurisdiction is currently being undertaken, to determine the nature and quantities of radioactive material, whether it is safely and securely stored, and to identify material that may be designated as radioactive waste. This will enable measures to be taken to ensure appropriate management and storage of radioactive materials and waste in order to minimise risks to people and the environment.

There are three main sites in South Australia containing radioactive wastes from past practices. These are the Maralinga lands (the site of former British nuclear tests, currently under Commonwealth jurisdiction), and the former Radium Hill Uranium Mine and Port Pirie Treatment Plant sites that are under South Australian jurisdiction and owned by Primary Industries and Resources South Australia, a South Australian government department.

The Radium Hill and Port Pirie sites are currently subject to registration under legislation. These sites had for many years been under administrative control and surveillance but had not been subject to a licence or registration under legislation. It was considered appropriate that they be formally registered, with conditions applied to their registration in order to achieve compliance with Article 12 of the Joint Convention. The conditions on registration of these sites require a characterisation of the sites and development of plans for improvements that should be made in the standards of management of radioactive wastes.

The Commonwealth and South Australian Governments are currently negotiating a proposal to transfer ownership of the Maralinga lands to the South Australian Government and the traditional owners (Maralinga Tjarutja). It is proposed that at the point of transfer, the Maralinga land will be registered under the *Radiation Protection and Control Act 1982* (SA), and appropriate conditions applied to the registration that would achieve compliance with the Joint Convention.

Tasmania

The storage location of some radioactive materials under Government control requires upgrading. Steps are in place to relocate the materials to a compliant location.

Western Australia

The State's inspection programme is currently being reviewed to correlate the frequency of inspection of sites/operations with the potential radiological risk associated with each site/operation. This will ensure that the limited resources available are effectively applied to those sites/operations that pose the greatest risk to occupationally exposed workers, the public and the environment.

It is planned to develop the system of notification of the movement of radioactive substances to other Australian jurisdictions to ensure that there is not only notification of the transfer but also prior notice of acceptance by the other jurisdiction(s) before permitting the substance to leave Western Australia.

Victoria, ACT and NT

These jurisdictions have no current planned activities to improve safety.

L ANNEXES

(a) List of spent fuel management facilities;

(b) List of radioactive waste management facilities;

(c) List of nuclear facilities in the process of being decommissioned;

(d) Inventory of spent fuel;

(e) Inventory of radioactive waste;

(f) References to national laws, regulations, requirements, guides, etc.;

(g) References to official national and international reports related to safety;

(h) References to reports on international review missions performed at the request of a Contracting Party; and

(i) Other relevant material.

Annex A - List of spent fuel management facilities

Commonwealth

Australian Nuclear Science and Technology Organisation (ANSTO)

Wet-Store (Spent Fuel) Facilities:	Spent fuel is stored in several wet-store facilities for various periods after discharge from the reactor.
Dry Store (Spent Fuel) Facility:	A large dry store used for the interim storage of spent fuel prior to transport off-shore for long term storage or reprocessing.

Annex B - List of radioactive waste management facilities

Commonwealth

ANSTO radioactive waste management facilities:

ANSTO operates several facilities for managing liquid and solid radioactive waste arising from its routine operations. In general, different facilities are used depending on radiation levels and the method of ultimate disposal, where this can be anticipated. ANSTO's storage facilities are considered to be for medium-term storage. Some higher activity waste undergoes treatment and conditioning during its period of management; for example, intermediate-level liquid waste is treated and solidified for interim storage.

ANSTO also has responsibility for a disposal facility called the Little Forest Burial Ground, which is a secure, shallow land burial site used by the former Australian Atomic Energy Commission for the disposal of some wastes up until 1968.

Other Commonwealth radioactive waste management facilities:

The radioactive waste store at Woomera is used to store large quantities of low-level and some intermediate-level waste on a temporary basis. Some of the waste is stored in a concrete bunker while other waste in drums is stored in a large hangar.

New South Wales

Non-operational store for waste generated in NSW.

Queensland

Purpose-built radioactive waste store owned by the Queensland State Government and operated by Queensland Health.

South Australia

Store for waste generated in SA.

Beverley Uranium Project:	Evaporation ponds, a liquid waste re-injection well and a solid waste disposal pit.
Honeymoon Uranium Project (not in operation):	Evaporation pond, a liquid waste re-injection well and a solid waste storage area.

Olympic Dam Uranium Project: Tailings dams, associated evaporation ponds and a solid waste disposal pit.

Port Pirie Plant: Uranium and thorium tailings dams.

Radium Hill Mine: Tailings dam incorporating a low-level waste repository.

Tasmania

Small store for waste generated in Tasmania.

Victoria

Whilst Victoria does not have any Radioactive Waste Management Facilities within the meaning of the Convention, Victoria has the Victorian Interim Storage for seized and abandoned radioactive materials.

Western Australia

Mt Walton East Intractable Waste Disposal Facility for the permanent disposal of intractable (chemical and radiological) waste generated within Western Australia.

Radiation Health Branch radioactive waste store.

ACT

Small store for waste generated in the ACT.

Northern Territory

Small store for waste generated in the NT.

ERA Ranger Mine: Tailings dam, evaporation ponds, solid waste disposal stockpiles.

Annex C - List of nuclear facilities in the process of being decommissioned

One small (100 kW) research reactor (Moata) at ANSTO.

Other historical ANSTO facilities, such as small accelerators and radiation laboratories are also planned to be decommissioned at some appropriate time in the future.

Annex D - Inventory of spent fuel

Inventory of spent fuel in storage in Australia

Material description	Number*	Mass of Uranium (total) kg
HIFAR spent fuel elements	904	192
Moata spent fuel plates	177	4

* As at 31/12/2002

Inventory of HIFAR spent fuel elements that have been sent abroad for re-processing and for which there is a contractual requirement for the return of waste to Australia

Location	Number	Mass of Uranium (total) kg
UKAEA, Dounreay, Scotland, UK	114	16
COGEMA, La Hague, France	668	104

Annex E - Inventory of radioactive wastes

Table E1: Total activities per radionuclide in waste stored in radioactive waste management facilities in Australia (not including ANSTO nor mining waste management facilities).

Radionuclide	Total Activity [MBq]
Am-241	122031
Am-241/Be	2143130
Am-241/Be & Cs-137	1188
Ba-133	0.011
Bi-207	0.141
C-14	2725
Cd-109	2400
Cl-36	0.065
Co-60	636248
Cs-137	14697816
Cs-137 / Co-60	415
Cs-137, Pu-238, Co-60, Gd-153	37000
Fe-55	4103
H-3	12997771
Ir-192	1030
Ir-192 (& possibly Co-60)	11206
Kr-85	64264
Mixed	57500
Na-22	0.036
Ni-63	463
Pb-210	0.007
Pm-147	59200
Po-210	800
Pu-238	4410
Ra-226	240644
Ra-226 & Pm 147	0.037

Ra-226/Be	5974
Sb-124	1200
Sn-113/In-113m	2.3
Sr-90	494641
Th-232	3300
Thorium Hydroxide	0.155
Thorium Nitrate	0.685
Tl-204	459
U-238	14040
U & Ra (Liquids)	4.41

NB: South Australia's contributed inventory consists of only category B & S wastes as per NHMRC (1992).

Inventory of radioactive waste being held in storage at Commonwealth-controlled radioactive waste management facilities in terms of waste volumes and generation rates.

Table E2: Radioactive waste in storage at ANSTO's radioactive waste management facility is comprised of:

Type of Waste	Volume	Generation Rate
Low-level Solid Waste	1185 m^3	30 m^3 per year
Intermediate-level Solid Waste	216 m^3	2 m^3 per year
Thorium and Uranium Residues (ILW)	165 m^3	nil
Intermediate-level Liquid Waste (to be solidified)	6.0 m^3	0.5 m^3 per year

Inventory of wastes from the mining and milling of radioactive ores

South Australia & Northern Territory

Site	Estimated Mass (Tonnes)	Type of Waste
Olympic Dam U Project (SA)	60,000,000	U Tailings
In-situ leach U projects (Beverley and Honeymoon) (SA)	< 300	Contaminated soil and solids from U processing
Port Pirie (SA) (Former U Treatment Plant)	200,000	U Tailings
Radium Hill (SA) (Former U mine) Repository on Site	400,000 400	U Tailings Contaminated soil and solids from U processing
ERA Ranger Mine (NT)	27,500,000	U Tailings

Inventory of radioactive waste that has been disposed of

Prior to 1968, the then Australian Atomic Energy Commission used the Little Forest Burial Ground (an area near ANSTO's facilities) for disposal of low levels of radioactive waste and beryllium oxide. Approximately 1675 m^3 of mixed radioactive waste, with an estimated activity of 150 GBq as at the time of its disposal, was disposed of at that site. This site is under ongoing ANSTO management and control.

Table E3: **Total activities per radionuclide in waste disposed of in Western Australia's Mt Walton East facility.**

Radionuclide	Total Activity [MBq]
Am-241	10586.442
Cd-109	286.179
Cl-36	0.105
Co-60	490.224
Cs-137	29153.093
H-3	131252697.541
I-129	0.007
Ra-226	1899.675

Annex F - References to national laws, regulations, requirements, guides, etc.

Commonwealth

- *Australian Nuclear Science and Technology Organisation Act 1987*
- *Australian Nuclear Science and Technology Organisation Amendment Act 1992*
- *Australian Radiation Protection and Nuclear Safety Act 1998*
- Australian Radiation Protection and Nuclear Safety Agency, *Recommendations for Limiting Exposure to Ionizing Radiation* and the *National Standard for Limiting Occupational Exposure to Ionizing Radiation*, Radiation Protection Series No. 1, (1995 - republished 2002).
- Australian Radiation Protection and Nuclear Safety Agency, *Code of Practice for the Safe Transport of Radioactive Material,* Radiation Protection Series No. 2, 2001.
- Australian Radiation Protection and Nuclear Safety Regulations 1999
- Commonwealth of Australia, *Code of Practice on the Management of Radioactive Wastes from the Mining and Milling of Radioactive Ores,* 1982.
- *Environment Protection and Biodiversity Conservation Act 1999*
- Environment Protection and Biodiversity Conservation Regulations 2000
- National Health and Medical Research Council, *Code of Practice for the Disposal of Radioactive Waste by the User*, Radiation Health Series No. 13, 1985.
- National Health and Medical Research Council, *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia*, Radiation Health Series No. 35, 1992.
- National Road Transport Commission and Federal Office of Road Safety, *Australian Dangerous Goods Code*, 6th ed., 1998.

New South Wales

- *Contaminated Land Management Act 1997*
- *Dangerous Goods Act 1975*
- Environmental Planning and Assessment Regulation 2000
- National Parks and Wildlife (Land Management) Regulation 1995
- *Occupational Health and Safety Act 2000*
- Occupational Health and Safety Regulation 2001
- *Protection of the Environment Operations Act 1997*

- Protection of the Environment Operations (Waste) Regulation 1997
- *Radiation Control Act 1990*
- Radiation Control Regulation 1993
- *Road and Rail Transport (Dangerous Goods) Act 1997*
- Road and Rail Transport (Dangerous Goods) (Rail) Regulation 1999
- *Uranium Mining and Nuclear Facilities (Prohibitions) Act 1986*
- *Waste Avoidance and Resource Recovery Act 2001*

Queensland

- Queensland Department of Health, *Queensland's Radioactive Waste Store - Operational Management Plan*.
- Queensland Department of Health, *Queensland's Radioactive Waste Store - Operational Procedures Manual*.
- Queensland Government, *Agreement for the establishment and operation of a Secure Radioactive Waste Storage Facility at Esk between State of Queensland and Council of the Shire of Esk*.
- *Radiation Safety Act 1999*
- Radiation Safety (Radiation Safety Standards) Notice 1999
- Radiation Safety Regulation 1999

South Australia

- Ionizing Radiation Regulations 2000
- *Nuclear Waste Storage Facility (Prohibition) Act 2000*
- *Radiation Protection and Control Act 1982*

Tasmania

- *Radiation Control Act 1977*
- Radiation Control Amendment Regulations 2002
- Radiation Control Regulations 1994

- *Environmental Management and Pollution Control Amendment Act 2001* (No. 88 of 2001)
-

Victoria

- *Health Act 1958*
- Health (Radiation Safety) Regulations 1994
- Health (Radiation Safety) (Amendment) Regulations 1997
- *Nuclear Activities (Prohibitions) Act 1983*

Western Australia

- *Nuclear Waste Storage (Prohibition) Act 1999*
- *Radiation Safety Act 1975*
- Radiation Safety (General) Regulations 1983
- Radiation Safety (Qualifications) Regulations 1980
- Radiation Safety (Transport of Radioactive Substances) Regulations 2001
- *Mines Safety and Inspection Act 1994*
- Mines Safety and Inspection Regulations 1995

Australian Capital Territory

- *Radiation Act 1983*

Northern Territory

- *Dangerous Goods Act 1996*
- *Mining Management Act 2002*
- *Radiation (Safety Control) Act 1978*
- Radiation (Safety Control) Regulations 1997
- *Radioactive Ores and Concentrates (Packaging and Transport) Act 2002*
- Radioactive Ores and Concentrates (Packaging and Transport) Regulations 1980

Annex G – References to official national and international reports related to safety

International Atomic Energy Agency, *Quality Assurance for Radioactive Waste Packages*, Technical Reports Series No. 376, Vienna, 1995.

International Atomic Energy Agency, *Site Investigations for Repositories for Solid Radioactive Waste in Shallow Ground*, Technical Report Series No. 216, Vienna, 1982).

Annex H - References to reports on international review missions performed at the request of a Contracting Party

To date, there have been no international reviews of spent fuel or radioactive waste management activities in Australia.

Annex I - Other relevant material

Tasmania

A copy of the licence application form for dealings with radioactive material is available from the following web address:

http://www.dhhs.tas.gov.au/publichealth/applicationforms/pdfs/rm_licenceapp.pdf

A copy of the application form for storage of radioactive materials is available from the following web address:

http://www.dhhs.tas.gov.au/publichealth/applicationforms/pdfs/rm_storageapp.pdf

ACRONYMS

ANSTO: Australian Nuclear Science and Technology Organization

ANU: Australian National University

ARPANSA: Australian Radiation Protection and Nuclear Safety Agency

BNFL: British Nuclear Fuels Limited

COGEMA: Compagnie Générale des Matières Nucléaires

CSIRO: Commonwealth Scientific and Industrial Research Organization

ERA: Energy Resources of Australia Ltd

IAEA: International Atomic Energy Agency

LEU: low enriched uranium

LHSTC: Lucas Heights Science and Technology Centre

NHMRC: National Health and Medical Research Council