



Australian Government

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

2024 National Report of the Commonwealth of Australia

8 August 2024



Contents

Contents	2
A. Introduction	4
B. Scope of Report	9
Article 3 Scope of application	9
C. Policies and Practices	11
Article 32 Reporting (1)	11
D. Inventories and Lists	16
Article 32 Reporting (2)	16
E. Legislative and Regulatory System	21
Article 18 Implementing Measures	22
Article 19 Legislative and Regulatory Framework	23
Article 20 Regulatory Body	32
F. Other General Safety Provisions	38
Article 21 Responsibility of the Licence Holder	38
Article 22 Human and Financial Resources	39
Article 23 Quality Assurance	41
Article 24 Operational Radiation Protection.....	43
Article 25 Emergency Preparedness	45
Article 26 Decommissioning	47
G. Safety of Spent Fuel Management	51
Article 4 General Safety Requirements	51
Article 5 Existing Facilities	53
Article 6 Siting of Proposed Facilities.....	53
Article 7 Design and Construction of Facilities.....	55
Article 8 Assessment of Safety of Facilities.....	56
Article 9 Operation of Facilities	57
Article 10 Disposal of Spent Fuel.....	58



H. Safety of Radioactive Waste Management 59

Article 11 General Safety Requirements 59

Article 12 Existing Facilities and Past Practices 61

Article 13 Siting of Proposed Facilities..... 68

Article 14 Design and Construction of Facilities..... 71

Article 15 Assessment of Safety of Facilities 72

Article 16 Operation of Facilities 74

Article 17 Institutional Measures after Closure 77

I. Transboundary Movement 79

Article 27 Transboundary Movement 79

J. Disused Sealed Sources 82

Article 28 Disused Sealed Sources..... 82

K. General Efforts to Improve Safety 83

L. Annexes 91



A. Introduction

This is the eighth Australian National Report, prepared for the Eighth Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the 'Joint Convention')¹. This National Report provides an update on all relevant issues under the terms of the Joint Convention. Sufficient background is included to enable it to be read as a stand-alone document; however, where noted, additional information can be found in previous National Reports.

The main developments in Australia since the seventh National Report are outlined below.

Establishing a site for a National Radioactive Waste Management Facility

- A siting process based around community volunteerism for a National Radioactive Waste Management Facility (NRWMF) for the disposal of low-level waste (LLW) and storage of intermediate-level waste (ILW) was conducted between 2015 and 2021. In November 2021, the former Minister for Resources and Water declared the property at Napandee, near the town of Kimba, in South Australia, as the proposed site for the facility. This followed a number of years of consultation through various processes. The traditional landowners, the Barnjarla people, exercised their right to seek judicial review of the former Minister's declaration of the Napandee site under the *National Radioactive Waste Management Act 2012*. This declaration was challenged in Federal Court and on 18 July 2023, a judge of the Federal Court set aside the declaration.

On 10 August 2023, the Minister for Resources stated that the Australian Government neither intends to pursue Napandee as a potential site for the facility, nor is the government intending to pursue the previously shortlisted Lyndhurst and Wallerberdina sites. The Australian Government remains firmly committed to safely storing and disposing of Australia's radioactive waste and has commenced work on alternative proposals for the disposal of civilian low level (LLW) and intermediate level (ILW) radioactive waste.

AUKUS trilateral security partnership

- In September 2021, the Australian Prime Minister, together with the US President and UK Prime Minister, announced the AUKUS trilateral security partnership. The central platform of the AUKUS partnership is for Australia to acquire conventionally-armed nuclear-powered submarines. On 23 March 2023, the three countries announced the optimal pathway for Australia to acquire the submarines. Australia is establishing a framework to operate and regulate its nuclear-powered submarine capability.

The AUKUS partnership decision has already triggered legislative changes, including

¹ The Joint Convention entered into force for Australia on 3 November 2003. The Australian Radioactive Waste Agency has begun work on alternative proposals for the storage and disposal of the Commonwealth's civilian low-level and intermediate-level radioactive waste.



amendment in 2023 of the *Environment Protection and Biodiversity Conservation Act 1999* and the *Australian Radiation Protection and Nuclear Safety Act 1998* (ARPANS Act) to enable regulation of the submarines and supporting infrastructure and facilities. The legislative changes do not disrupt Australia's moratorium on civil nuclear power, and further changes are expected in 2024 to establish the Australian Naval Nuclear Power Safety Regulator (ANNPSR) including clarification of interfaces between ARPANSA and ANNPSR. This development poses a significant workforce challenge to ensure that current and future needs of all parties with responsibility for radiation safety are suitably resourced.

Return of reprocessed waste

- The reprocessing of spent nuclear fuel is not permitted under Australian law. As such, all spent nuclear fuel is sent abroad for reprocessing under inter-governmental agreements and Australia receives an amount of intermediate level solid waste (ILSW) back that is equivalent, in radiological terms, to the spent fuel elements sent. In March 2022, under these agreements, Australia received 4 canisters of vitrified CSD-V material in a type B(U) TN-81 dual purpose storage/transport container from the Sellafield facility in the United Kingdom. This represented the radiological equivalence of 114 spent HIFAR fuel elements which were previously sent to the Dounreay facility for reprocessing into 51 cement drums². All returned ILSW produced from the reprocessing of spent fuel elements is held at the Interim Waste Storage (IWS) facility at ANSTO.

Increased waste storage capacity at ANSTO

- ANSTO submitted an application for a new waste storage facility (Intermediate Level Waste Capacity Increase – (ILWCI)). ARPANSA reviewed the application and conducted a public stakeholder consultation process to inform the CEO of ARPANSA when making a decision on the ANSTO submission. ARPANSA reviewed and approved the application from ANSTO to site the facility taking into account the public consultation comments, a detailed regulatory assessment and statement of reasons the CEO of ARPANSA considered when making the decision. ARPANSA requested that ANSTO are required to perform a severe accident analysis, assess design extension conditions and update the final safety analysis for the ILWCI accordingly. Furthermore, measures have been put in place to ensure design extension conditions continue to be considered for future nuclear installations. See Section G: Article 6 for more information.

IRRS follow-up mission

- In 2023, at Australia's request, the International Atomic Energy Agency (IAEA) conducted an Integrated Regulatory Review Service (IRRS) mission as a follow-up to its 2018 mission. An IRRS follow-up mission occurred in October 2023 to review progress on implementing the 2018 mission findings. The IAEA noted that Australia has made 'significant progress' in

² ANSTO and the United Kingdom (UK) Nuclear Decommissioning Authority enacted a substitution agreement in 2013, under which ANSTO gave up title to the reprocessed residues from the reprocessing of 114 HIFAR spent fuel elements at Dounreay. In exchange, ANSTO agreed to take a radiological equivalent to the Dounreay waste in the form of four canisters of CSD-V vitrified material currently held at Sellafield for ease of transport.



addressing the recommendations and suggestions resulting from the 2018 mission. For the 2023 follow-up mission, 16 out of 23 recommendations and 10 of 12 suggestions identified in 2018 were closed. Closure includes findings where sufficient actions have been taken to give confidence of resolution. Further information is provided in Section K of this report. The IAEA also highlighted two good practices for Australia.

Regulatory Updates

- The state of Queensland (QLD) conducted a significant regulatory review and implemented the new *Radiation Safety Regulation 2021* and the new *Radiation Safety (Radiation Safety Standards) Notice 2021*. The review led to several amendments being made to the *Radiation Safety Act 1999* and the new Regulation. Most of this work is now complete and being implemented (there will be several minor further amendments later this year);
- The state of South Australia (SA) introduced a new *Radiation Protection and Control Act 2021* (RPC Act) on 11 February 2023. The new legislation represents one of the most recent and contemporary radiation safety legislation amongst any Member State. The legislation has been reduced from 3 sets of regulations containing 218 regulations and 11 schedules down to a single set of regulations containing 138 regulations and 8 schedules. It ensures South Australia's regulatory framework is aligned with Standards and Codes established through ARPANSA and the IAEA. The Objectives of the RPC Act include clauses to ensure protection of people and the environment from the harmful effects of radiation but also recognises the benefits of radiation and promotion of the principle of Ecologically Sustainable Development. South Australia is a significant global producer of uranium and is presently developing the first proton therapy facility in the Southern Hemisphere. As the use of radiation in Australia becomes increasingly relevant to the global energy transition and emerging medical innovations, the legislation provides a sound basis for risk-based and outcomes-focussed regulation. In an operational context, the South Australian Environment Protection Authority, which administers the RPC Act, is engaging with users of radiation to ensure a balance is achieved between safety objectives and regulatory efficiencies;
- The state of New South Wales (NSW) conducted a review of its *Radiation Control Act 1990* in 2021. The Act required the Minister for Energy and Environment to review the Act to determine whether its policy objectives remain valid, and the terms of the Act are still appropriate for securing those objectives. Full details of the review, including an issues paper and final report are available on the NSW Environment Protection Authority (EPA) website³;
- ARPANSA has continued to publish new and updated national codes and guides in the Radiation Protection Series (RPS). Refer to Section E for a summary of Codes and Guides that have been updated or published since the previous National Report;
- ARPANSA has taken steps to apply the WHO definition of Health, 'Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity', when considering health protection of individuals and communities. These steps include

³ NSW Environment Protection Authority (EPA), [Review of the Radiation Control Act 1990](#), EPA, 2021, accessed 5 June 2024.



applying this definition of health in the ARPANSA *Code for Disposal Facilities for Solid Radioactive Waste* (RPS C-3, 2018) and the publication of the supporting Advisory Note (ARPANSA, 2022) that provides guidance on how the level of health protection (as defined by the WHO) should be optimised when siting a waste disposal facility. Traditionally, the focus of radiation protection has been to protect people from the established, physical health effects of radiation. This application of the WHO definition of health recognises that there can be impacts on society from radioactive waste management and spent fuel management in addition to physical health impacts of radiation exposure, all of which should be identified and considered in the optimisation process.

Measures taken to address challenges, suggestions and progress on overarching issues from the Seventh Review Meeting can be found in Section K of this report. Proposed good practices and areas of good performance can also be found in Section K of this report.

Background: Australia's federal system

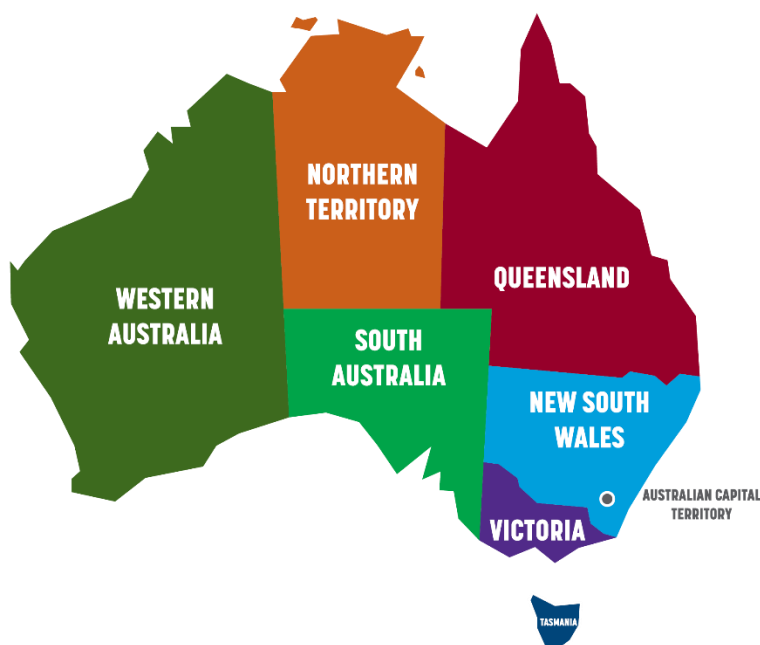


Figure 1: Map of Australia showing the states and territories.

Australia is a federation of 9 jurisdictions (Figure 1): the Commonwealth of Australia (the Commonwealth), 6 states [New South Wales (NSW), Victoria (VIC), Queensland (QLD), Western Australia (WA), South Australia (SA), Tasmania (TAS)], and 2 territories [Northern Territory (NT) and the Australian Capital Territory (ACT)].

In 1998, the Australian Government created a regulator for Commonwealth entities, the CEO of ARPANSA, to regulate the radiation protection and nuclear safety activities of Commonwealth entities, regardless of the jurisdiction in which the operations are undertaken. These entities include but are not limited to the Australian Nuclear Science and Technology Organisation (ANSTO) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Department of



Defence. In addition, one of the functions of the CEO of ARPANSA is to promote national uniformity in radiation protection across all jurisdictions.

The Australian Government Department of Industry, Science and Resources (DISR) administers the *National Radioactive Waste Management Act 2012*. In 2020, the Australian Government established the Australian Radioactive Waste Agency (ARWA). ARWA operates as a branded function (division) of DISR, with roles to:

- understand the national radioactive waste inventory;
- develop strategies to manage radioactive waste;
- implement agreed plans for managing and disposing of radioactive waste;
- deliver and operate Australia's National Radioactive Waste Management Facility (NRWMF).

Assessment of Australia's compliance with the Joint Convention

The Australian Government and each State and Territory governments reconfirm that each has in place the framework of appropriate law, and the legislative, regulatory and administrative measures, including a system of authorisation, monitoring and inspections, necessary for implementing all obligations under this Joint Convention.

It should be noted that while Australian states and territories supported ratification of the Joint Convention, compliance of the states and territories of Australia is not subject to separate Australian Government legislation. The Australian Government is committed to further development of a framework governing the long-term management of radioactive wastes arising from its activities, including, as appropriate and necessary, long-term storage and disposal.

Most Australian jurisdictions do not define radioactive waste in their legislation, and many do not classify radioactive materials in long-term storage as waste as defined by the Joint Convention. However, each jurisdiction has storage arrangements for radioactive materials and radioactive waste. This report can only assess compliance with the Joint Convention in relation to those facilities containing radioactive materials that have been characterised as waste for the purpose of the Joint Convention.



B. Scope of Report

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.

This report outlines Australia's policies and practices associated with the safety of the management of spent fuel and radioactive waste.

As a contracting party to the Joint Convention, Australia declares that:

- Reprocessing activities are not included in this Report. No spent fuel reprocessing facilities exist in Australia;
- Wastes that contain only naturally occurring radioactive materials (NORM) that do not originate from the nuclear fuel cycle are not declared as radioactive waste for the purpose of the Convention;
- Radioactive wastes managed within military programs are not declared as radioactive waste for the purposes of the Convention and no details of legacy radioactive waste held by the Australian Department of Defence are given in this report. Australia has no spent fuel within military or Defence programs.

However, wastes containing only NORM that are not managed at declared stores or disposal facilities, and radioactive waste held by Defence, are managed in accordance with applicable Australian legislation. This means their management takes international best practice into account, and is



consistent with IAEA general safety standards and specific national and international standards for radioactive waste management.



C. 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.

Spent fuel management policy

Australia's policy on spent fuel management has not changed since the 2020 National Report. Australia sends spent nuclear fuel to France for reprocessing. The spent fuel is not reprocessed in isolation, but rather in batches with spent fuel from other countries. In accordance with contractual obligations, the resulting intermediate level waste (ILW) is returned to Australia at a mutually agreed time for storage. Calculations are undertaken to ensure Australia receives processed waste with proportionate activity to the spent fuel sent.

In line with international conventions, reprocessed waste returned to Australia is considered Australian waste and is specified in the *National Radioactive Waste Management Act 2012* as controlled material that can be managed at a national radioactive waste disposal facility. ARWA is undertaking work to develop and assess potential future disposal pathways for such Australian reprocessed spent fuel.

Spent fuel management practices

In Australia, the Australian Government is the only jurisdiction in which spent fuel is managed. Practices remain unchanged since the 2020 National Report.

The OPAL reactor commenced operation in 2006 and is Australia's only operating reactor. OPAL is a 20 MW thermal, open pool, light water reactor designed for low-enriched uranium (LEU) aluminium-clad fuel. The reactor currently operates on uranium silicide (U_3Si_2-Al) fuel.



OPAL's spent fuel is stored onsite until it is periodically transported to La Hague, France, for reprocessing, with the waste arising from reprocessing to be returned to Australia as ILW. The first shipment of OPAL spent fuel to France occurred in mid-2018 and planning for the second shipment is underway and expected to occur in 2025. Assuming up to 30 spent fuel elements arising per year, it is envisaged that, on average, there will be one overseas shipment of spent fuel every 6 or 7 years. The returned ILW will be held in interim storage at ANSTO pending the availability of an appropriate long-term storage or disposal facility.

The High Flux Australian Reactor (HIFAR), a 10 MW research reactor, was permanently shut down in January 2007. As stated in previous National Reports, ANSTO and the United Kingdom (UK) Nuclear Decommissioning Authority enacted a substitution agreement in 2013, under which ANSTO gave up title to the reprocessed residues from the reprocessing of 114 HIFAR spent fuel elements at Dounreay. In exchange, ANSTO agreed to take a radioactive equivalent to the Dounreay waste in the form of four canisters of CSD-V vitrified material. The vitrified waste was transported from the UK to Australia in a TN-81 dual purpose package in February 2022 (Figure 2). This marked the completion of the return of ILW arising from reprocessing of HIFAR spent fuel.



Figure 2: TN-81 transport and storage package carrying reprocessed spent fuel waste residues being prepared for road transport to ANSTO (2022).



Radioactive waste management policy

The policy objective of the Australian Government is to ensure radioactive waste is managed in a safe, secure and sustainable manner over generations. The Australian Government is committed to ensuring there is adequate allocation of financial and human resources to achieve this over time.

Implementation of this policy objective will be achieved through the establishment of disposal pathways that are based on international best practice and, that conform to international treaty obligations, and contribute to the complete management of Australia's current and future radioactive waste.

The *Australian Radioactive Waste Management Framework* (the Framework) sets out the key elements for the long-term management of Australia's radioactive waste, including the storage or disposal of this waste at suitably sited facilities, after being categorised in accordance with the national classification scheme. The Australian Government is undertaking a review and update of the Framework to support the long-term management and permanent disposal of Australia's radioactive waste and align with international best practice in an Australian context.

A key responsibility of ARWA is to develop a final disposal pathway for ILW as per international obligations and best practice. ARWA is currently developing an optioning strategy framework in order to support evaluation of geological disposal concepts for current and evolving inventories.

Australia hosted an Integrated Regulatory Review Service (IRRS) mission in 2018. One finding from the mission was for Australia to establish and implement a strategy to give effect to the policy principles and goals in the Australian Radioactive Waste Management Framework. ARWA is helping to progress the implementation of this finding. A follow-up IRRS mission was conducted in 2023, and further information is provided in Section K.

Radioactive waste management practices

Radioactive waste management practices are largely unchanged since the 2020 National Report. Low and intermediate-level radioactive waste continues to be stored by Commonwealth, state and territory government regulators and licence holders at over 100 locations around Australia in both rural areas and urban centres.

ANSTO manages wastes arising from its research reactor operation, radioisotope production, and research and development activities in accordance with nationally and internationally accepted guidance and its radioactive waste management strategy. Waste volumes are minimised by conditioning and/or processing and releasing decayed and decontaminated material that is below criteria for discharge based on rigorous assessment and cautious assumptions.



The majority of medical waste from hospitals is short-lived and managed at the point of generation until it can be disposed of. Waste below exemption limits is managed with other non-radioactive medical wastes. Some major hospitals utilise delay tanks for control of radioactive liquid effluent⁴.

Although all Australian regulators have small stores for abandoned sources, legacy wastes or wastes that have arisen within their jurisdiction, many individual producers currently have responsibility for managing their own radioactive waste. As a result, most users of radioactive materials are encouraged to return disused sources to the supplier. If this is not possible, licence holders are expected to store their radioactive waste until it decays to a point below which it is no longer of regulatory concern, or until such time as an appropriate avenue for disposal becomes available.

ARWA will update the *Australian National Inventory of Radioactive Waste* in 2024, to be published in 2025. The national inventory was last updated in 2021 and a summary of the inventory was published in 2022. A key purpose of the inventory is to provide information on physical, chemical, and radiological characteristics of radioactive waste held by Australian organisations, especially by Australian Government agencies, to inform planning and development of disposal pathways for radioactive wastes. The level of detail required may vary by the type of waste and some waste streams may be more important to assess in terms of operational and long-term safety. ARWA will work closely with relevant organisations and agencies in this process.

A siting process based around community volunteerism for a National Radioactive Waste Management Facility (NRWMF) for the disposal of low-level waste (LLW) and storage of intermediate-level waste (ILW) was conducted between 2015 and 2021. In November 2021, the former Minister for Resources and Water declared the property at Napandee, near the town of Kimba, in South Australia, as the proposed site for the facility. This followed a number of years of consultation through various processes. The traditional landowners, the Barngarla people, exercised their right to seek judicial review of the former Minister's declaration of the Napandee site under the *National Radioactive Waste Management Act 2012*. This declaration was challenged in Federal Court and on 18 July 2023, a judge of the Federal Court set aside the declaration.

On 10 August 2023, the Minister for Resources stated that the Australian Government neither intends to pursue Napandee as a potential site for the facility, nor is the government intending to pursue the previously shortlisted Lyndhurst and Wallerberdina sites. The Australian Government remains firmly committed to safely storing and disposing of Australia's radioactive waste and has commenced work on alternative proposals for the disposal of civilian low level (LLW) and intermediate level (ILW) radioactive waste.

The Australian Government remains firmly committed to safely storing and disposing of Australia's radioactive waste and has begun work on alternative proposals for disposal pathways for the Commonwealth's radioactive waste. This is being led by ARWA and supported by other Commonwealth agencies.

⁴ Limits for disposal of radioactive medical waste are specified for the most common nuclides in the *ARPANSA Code for Disposal of Radioactive Waste by the User (RPS C-6, 2018)*.



Criteria used to define and categorise radioactive waste

Australia's radioactive waste classification system is described in ARPANSA *Classification of Radioactive Waste* (RPS G-4, 2020) based on the IAEA *Classification of Radioactive Waste* (GSG-1, 2009), adapted for the Australian situation. This ARPANSA Safety Guide provides a national classification system for radioactive waste based primarily on considerations of long-term safety and disposal of the waste. While the guidance is advisory, all jurisdictions have indicated their intention to adopt the scheme.

- A categorisation of radioactive waste for operational purposes, based on Australian holdings, has also been developed as part of the ARPANSA *Predisposal Management of Radioactive Waste* (RPS-16, 2008). In most cases, wastes are categorised for management purposes as long-lived or short-lived, liquid or solid, and sealed or unsealed. In some jurisdictions, waste is regulated according to whether it complies with the criteria in the ARPANSA *National Directory for Radiation Protection (2nd Edition, 2021)* (NDRP, 2021) for disposal or discharge of very low-level waste for which no authorisation is required, or if not, then under a special licence.

Uniform provisions for exemption based on international guidance from the IAEA have been agreed by all jurisdictions as part of the NDRP. An amendment to ensure application of exemptions to bulk quantities of raw material such as might be encountered in mining and mineral processing industries has been adopted into the NDRP (ARPANSA, 2021). Exposures that are not amenable to control are excluded.

The 2018 IRRS mission identified that there was no national protocol for clearance in Australia and recommended that, 'The Commonwealth Government, in conjunction with the state and territory governments, should progress the adoption and implementation of uniform clearance levels.' In response to this recommendation, the revised NDRP (ARPANSA, 2021) has adopted the clearance levels in Schedule 1 of the IAEA General Safety Requirements No. GSR Part 3 *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards* (GSR Part 3, 2014). Furthermore, to support implementation the RHC has commenced the drafting of guidance on for the exemption and clearance of radioactive material.



D. Inventories and Lists

Article 32 Reporting (2)

This report shall also include:

- (i) a list of the 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 this 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.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

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

List of spent fuel management facilities

The ANSTO site at Lucas Heights is the only site in Australia with spent fuel management facilities. These spent fuel management facilities are described in Section C of this report.



Spent fuel inventory

Inventory of OPAL spent fuel elements located at ANSTO:

Material description	Number*	Mass of Uranium (total) kg
OPAL spent fuel elements	218	~490

* As of 12 October 2023

The 2020 National Report detailed an inventory of OPAL spent fuel elements. These spent fuel elements were sent overseas (Orano, La Hague, France) for re-processing with a contractual requirement for the return of waste to Australia in the near future.

Radioactive waste management facilities

Commonwealth Radioactive Waste Management Facilities and Prescribed Legacy Sites

ANSTO operates several facilities for managing liquid and solid radioactive waste arising from its routine operations. These facilities have remained the same as reported in the 2020 National Report.

ANSTO also manages a prescribed legacy site known as the Little Forest Legacy Site. ARPANSA has approved construction of a multi-barrier engineered cap as a medium-term management solution for the Little Forest Legacy Site. The engineered multi-layer cap is on track to be installed within the next 2 years.

In addition to the facilities managed by ANSTO, the Australian Government is also responsible for:

- Four small radiation waste stores at 3 CSIRO sites located around Australia;
- The CSIRO Woomera Radioactive Waste Storage Facility – a store for the Australian Government’s radioactive waste located within the Woomera Prohibited Area, South Australia. It contains approximately ten thousand 200 litre drums of predominantly contaminated soil remediated from a former research site that undertook studies into uranium and thorium ore processing;
- Three waste storage rooms located at ARPANSA’s Yallambie (Victoria) site;
- A waste store operated by the Australian National University at its Acton Campus.

State and Territory Radioactive Waste Management Facilities

As detailed in the 2017 National Report, state and territory governments manage a number of facilities across Australia for the interim storage of radioactive waste.

Two near-surface disposal facilities are located in Western Australia:

- The Mt Walton East Intractable Waste Disposal Facility (IWDF) is used for the disposal of intractable (chemical and radiological) waste generated within Western Australia. Additional



details are provided in the 2017 National Report. There have been no radiological waste disposal operations at this facility since 2011;

- The Sandy Ridge Facility is a privately-owned and operated near-surface facility for intractable mixed waste. It is located approximately 5.5 kilometres to the west of the Mt Walton site. The facility was granted an authorisation amendment in 2023 to allow for the permanent disposal of low-level radiological waste at the facility. The facility authorisation permits the acceptance of Australian generated radioactive waste. A disposal permit must be granted by the Western Australia Radiological Council for disposal of radiological waste. The Sandy Ridge facility has approval to store radioactive material prior to final disposal and an inventory of all material is required to be kept and submitted to the regulator (Western Australia Radiological Council).

The Western Australia *Nuclear Waste Storage and Transportation (Prohibition) Act 1999* prohibits the storage, disposal or transportation in Western Australia of radioactive waste from a nuclear plant, or from the testing, use or decommissioning of nuclear weapons.

Waste facilities at current mining operations and from past practices

Mining operation	Waste structures
Ranger Uranium Mine (Northern Territory) - processing of ore stockpiles ceased in January 2021; rehabilitation underway.	Tailings dam, pit in-fill, water retention ponds, and solid waste disposal stockpiles
Beverley (including Beverley North & Four Mile) Uranium Project (South Australia) - operational	Evaporation ponds, liquid waste re-injection wells and low-level radioactive waste disposal facilities
Honeymoon Uranium Project (South Australia) - operational	Evaporation ponds, liquid waste re-injection wells and low-level radioactive waste disposal facilities
Olympic Dam Mine (South Australia) – operational	Tailings dams, associated evaporation ponds and a solid waste disposal pit
Port Pirie Plant (South Australia) – past practice	Uranium and thorium tailings dams
Radium Hill Mine (South Australia) – past practice	Tailings and a low-level waste repository
South Alligator Disposal Facility (Northern Territory) – disposal facility. Responsibility of the Australian Government Director of National Parks.	Near-surface disposal facility for abandoned uranium mining and milling tailings and contaminated materials from past practices in the South Alligator region

Radioactive waste management inventory

Australia has approximately 4437 m³ of radioactive waste suitable for near-surface disposal within civilian programs awaiting disposal. This total consists of the following approximations:

- 2100 m³ of lightly contaminated soil from ore-processing research;



- 2261 m³ of operational waste stored at the ANSTO site;
- 6 m³ waste stored at CSIRO sites;
- 70 m³ of miscellaneous waste including contaminated items, medical equipment and luminous signs.

It should be noted that these figures are estimates of waste volumes for disposal. Waste that has already been emplaced in a near-surface disposal facility is not included in the above volume estimates. This includes waste disposed at:

- Mt Walton East IWDF in Western Australia (near-surface disposal facility);
- Sandy Ridge Facility in Western Australian (near surface disposal facility);
- South Alligator Disposal Facility in the Northern Territory (Uranium Mine and Mill Tailings);
- Radium Hill Low-Level Radioactive Waste Repository in South Australia (near-surface disposal facility);
- Maralinga in South Australia (remediated nuclear weapons test site);
- Little Forest Legacy Site managed by ANSTO, New South Wales (legacy waste).

The current estimated inventory of radioactive waste in Australia that is not suitable for near-surface disposal consists of a waste volume of approximately 616.8 m³. Of this:

- 357 m³ is from irradiation cans, ion exchange resins (HIFAR and OPAL), irradiated aluminium cut from HIFAR spent fuel assemblies, HIFAR coarse control arms and general waste from radiopharmaceutical production;
- 168 m³ is uranium and thorium residues stored at ANSTO;
- 65 m³ is liquid waste from production at ANSTO of Mo-99 for radiopharmaceuticals;
- 7.32 m³ is ILW returned from overseas following reprocessing, currently stored at ANSTO⁵;
- 3.3 m³ is waste stored CSIRO sites;
- 16.2 m³ is miscellaneous waste held at various storage sites in Australia.

Annex A includes an inventory of radioactive waste stored in facilities in Australia and waste that has been disposed of at the Little Forest Legacy Site, South Alligator Disposal Facility, Maralinga, Mt Walton East and Sandy Ridge facility. Data has been provided by the relevant regulatory authorities with responsibility for maintaining the inventories of radioactive waste in their jurisdictions. Volumes of sealed sources, sources of unknown activity and sources of unknown radionuclides are not included. Where possible, the activities of waste with mixed radionuclides have been apportioned to individual nuclides. Inventories of sealed sources requiring disposal, radioactive waste in storage at

⁵ 4.32 m³ is vitrified ILW stored in two TN-81 casks, 3 m³ is cemented technological waste. Additional details regarding the ILW held in the TN-81 cask can be found at:
https://www.arpansa.gov.au/sites/default/files/legacy/pubs/regulatory/ansto/SOR_operationIWS.pdf



ANSTO's radioactive waste management facility and of wastes from the mining and milling of radioactive ores are also provided.

There have been no burials at the Mt Walton East IWDF in Western Australia since 2011 therefore the inventory is unchanged. A disposal campaign is planned for 2024.

Nuclear facilities in the process of being decommissioned

ARPANSA is currently assessing the licence application for decommissioning of the peripheral plant and equipment associated with the 10 MW multipurpose HIFAR Research Reactor (Phase A decommissioning). The reactor was permanently shut down in 2007 after 49 years of operation.



E. Legislative and Regulatory System

Developments since the Seventh Review Meeting:

Australia has continued to develop national guidance relating to radioactive waste management as part of the national uniformity process, in which standards are developed and adopted by Australian regulators.

The following Commonwealth developed Standards, Codes, Guides and Regulatory Guides have been published or updated since the 2020 National Report:

- ARPANSA *National Directory for Radiation Protection (2nd Edition, 2021)* (NDRP, 2021);
The purpose of the NDRP is to provide an agreed framework for radiation safety, including both ionising and non-ionising radiation, together with clear regulatory statements to be adopted by the Commonwealth, states and territories. The second edition of the NDRP (ARPANSA, 2021) replaced the first edition of the NDRP (ARPANSA, 2014), representing a modernisation and streamlined approach for the Commonwealth, the states and territories to work towards achieving the vision of a seamless regulatory framework for the safe generation and use of radiation across Australia.
- ARPANSA Regulatory Guide - *Holistic Safety* (ARPANSA-GDE-1753, 2021);
- ARPANSA Regulatory Guide - *Possess or Control and Extended Shutdown of a Facility or Source* (ARPANSA-GDE-1757, 2021);
- ARPANSA Regulatory Guide - *Preparation of the Safety Analysis Report for Non-Reactor Facilities* (ARPANSA-GDE-1925, 2021);
- ARPANSA Regulatory Guide – *Surrender of a Facility Licence and Release from Regulatory Control* (ARPANSA-GDE-1745, 2021);
- ARPANSA Regulatory Guide - *Construction of an Item Important for Safety* (ARPANSA-GDE-1760, 2021);
- ARPANSA Regulatory Guide - *Applying for a Source Licence (or Amendment)* (ARPANSA-GDE-1740, 2022);
- ARPANSA Regulatory Guide – *Applying for a Licence for a Nuclear Installation* (ARPANSA-GDE-1795, 2022);
- ARPANSA Regulatory Guide - *Applying for a Facility Licence for a Prescribed Radiation Facility* (ARPANSA-GDE-1798, 2022);
- ARPANSA Regulatory Guide - *Radiation Incidents* (ARPANSA-GDE-1749, 2022);
- ARPANSA Regulatory Guide - *Plans and Arrangements for Managing Safety* (ARPANSA-GDE-1735, 2023);
- ARPANSA Regulatory Guide - *Disposal of Sources* (ARPANSA-GDE-1733, 2023);



- ARPANSA Regulatory Guide - *Reporting Compliance* (ARPANSA-GDE-1741, 2023);
- ARPANSA Regulatory Guide - *Transport of Radioactive Material* (ARPANSA-GDE-1752, 2023);
- ARPANSA Licence Conditions - *Codes and Standards Applicable to Sources* (ARPANSA-SUP-1781, 2022);
- ARPANSA Licence Conditions - *Codes and Standards Applicable to Prescribed Radiation Facilities and Prescribed Legacy Sites* (ARPANSA-SUP-1782, 2023).

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.

Each jurisdiction has taken the necessary administrative steps to enable its regulatory body to undertake functions allocated to it under the enabling legislation. Details of the legislative and regulatory framework and regulatory body for each jurisdiction are contained below under Article 19. Annex B contains a list of the statutory instruments currently in force, as well as legislative, regulatory and administrative arrangements which are in place.



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. This 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 waste, Contracting Parties shall take due account of the objectives of this Convention.

Establishing and maintaining a legislative and regulatory framework

Australian Radiation Protection and Nuclear Safety Act 1998 (the Act)

The Act applies only to Australian Government entities and their contractors. It enables the regulatory framework to govern the safety of, among others, spent fuel and waste management facilities. The Act was amended in 2023 to clarify that the existing moratorium on civil nuclear power does not prevent the CEO of ARPANSA from exercising regulatory powers and performing functions in respect to the regulation of conventionally-armed, nuclear-powered submarines.

The objective of the Australian Government's radiation protection legislation includes protection of the health and safety of people and the environment from the harmful effects of radiation.

The legislation in each jurisdiction:

- establishes a regulatory body accountable to a Minister of the Crown and through that Minister to the Parliament;
- includes requirements to comply with accepted national standards for occupational exposure limits, public dose limits, disposal of radioactive waste, transport of radioactive material, and landfill, air and waterborne discharge limits (discharge limits are set in the ARPANSA *Code for Disposal of Radioactive Waste by the User* (RPS C-6, 2018));
- requires reporting of incidents and exposures above dose limits;

- gives the regulatory body powers to monitor and enforce compliance with legislative requirements.

A national regulatory framework for protection of the environment is established under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)⁶.

The *Australian Radioactive Waste Management Framework* released in 2018 describes the current arrangements and sets out the principles, responsibilities and long-term goals for radioactive waste management in Australia. It also provides for the establishment of a centralised waste management function within the Australian Government, undertaken by ARWA.

For radioactive waste that is also nuclear material, the security systems and physical protection infrastructure for nuclear material are required to comply with the permit issued and administered by the Australian Safeguards and Non-Proliferation Office (ASNO). In addition, the security of nuclear material is required to meet Australia's obligations under the *Convention on the Physical Protection of Nuclear Material* and its 2005 Amendment (A/CPPNM, entry into force May 2016), and accord with relevant IAEA guidance such as *IAEA Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities* (NSS 13, 2011).

Australian jurisdictions are working together to further develop and implement a uniform national set of policies and practices for the safety of radioactive waste management. The NDRP contains the agreed minimum regulatory requirements for all Australian jurisdictions and is the principal means for establishing consistency in radiation protection regulation across the various Australian jurisdictions. It provides an overall agreed framework for radiation safety, together with clear regulatory statements to be adopted by the Australian Government and the states and territories.

The NDRP is developed collaboratively through the Radiation Health Committee (RHC). This Committee, established under the ARPANS Act, includes radiation regulators from each jurisdiction. The NDRP is a dynamic document that evolves as nationally agreed positions are reached by jurisdictions and are made effective by adoption into jurisdictional laws or by inclusion as conditions of jurisdictional licenses. Additions to the NDRP require approval from the health ministers of the Commonwealth, state and territory governments before being adopted in the respective jurisdiction.

Australia updated the process in 2021, to maintain the key nationally agreed requirements captured in the original NDRP (ARPANSA, 2014) and the means for implementing national codes. Implementation and adoption of the NDRP will be assisted by enHealth, a cross-jurisdictional standing committee that advises on environmental health policy. The RHC continues as the existing statutory advisory body to the CEO of ARPANSA and will continue to focus on the development and publication of codes, standards, and guidance. The NDRP (ARPANSA, 2021)⁷ provides details on the updated governance arrangements for adoption of NDRP amendments.

⁶ Further information on this framework is available at <http://www.ea.gov.au/epbc/index.html>.

⁷ The aim of the *National Directory for Radiation Protection (2nd Edition, 2021)* is to provide nationally uniform requirements for the protection of people and the environment against the exposure or potential exposure to ionising and non-ionising



Safety requirements and regulations for radiation safety in Australia

ARPANSA publishes a range of publications (fundamentals, codes, standards, guides and recommendations) under the Radiation Protection Series (<https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-protection-series>) which are applied across all jurisdictions in Australia, as well as regulatory guides to assist ARPANSA's licence applicants and licence holders (<https://www.arpansa.gov.au/regulation-and-licensing/licensing/information-for-licence-holders/regulatory-guides>). These publications are based on international best practice. Stakeholders (including the public) are invited to make comment on new publications and significant amendments to existing ones.

Nationally accepted standards are imposed in each jurisdiction by way of Regulations made under the relevant Acts that establish the jurisdiction's regulatory framework. Standards may also be imposed as specific conditions of licence or registration. The key principles and requirements are detailed in the 2017 National Report.

The table below identifies documents relevant to radioactive waste management and spent fuel management by topic, and the IAEA or ICRP equivalent where applicable. These may be documents that are current and in place, under review, or under development. Copies of the published Australian documents are available on the ARPANSA website, at: <https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications>.

Regulatory topic	Australian Standard	International equivalent
Occupational and public exposure and dose limits	<p>ARPANSA <i>Fundamentals for Protection against Ionising Radiation</i> (RPS F-1, 2014)</p> <p>ARPANSA <i>Code for Radiation Protection in Planned Exposure Situations</i> (RPS C-1, 2020)</p>	<p>IAEA <i>Fundamental Safety Principles</i> (SF-1, 2006)</p> <p>IAEA <i>Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards</i> (GSR Part 3, 2014)</p> <p><i>The 2007 Recommendations of the International Commission on Radiological Protection</i> (ICRP Publication 103, ICRP 2007)</p>
Transport of radioactive material	<p>ARPANSA <i>Code for the Safe Transport of Radioactive Material</i> (RPS C-2, 2019)</p>	<p>IAEA <i>Regulations for the Safe Transport of Radioactive Material 2018 Edition</i> (SSR-6, 2018)</p>

radiation and for the safety of radiation sources, including provision for the national adoption of codes and standards. The NDRP has been developed to assist radiation protection regulators and other sectors involved in implementing radiation controls such as mine operators and occupational health and safety regulators.



Regulatory topic	Australian Standard	International equivalent
<p>Mining and milling of radioactive ores</p>	<p>ARPANSA <i>Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing</i> (RPS 9, 2005).</p> <p>In January 2015, <i>Annex B - Health Effects of Ionising Radiation and Standards for Control of Exposure</i>, was removed from RPS 9, resulting in RPS 9.1 (2015). For information on the health effects of ionising radiation, refer to RPS F-1.</p> <p>To bring the dose coefficients provided in RPS 9 and RPS 9.1 in line with updates to the occupational dose coefficients presented in the International Commission for Radiation Protection (ICRP) <i>Occupational Intake of Radionuclides</i> (OIR) document series, RPS 9 <i>Tables 1 and 2</i>, and RPS 9.1 <i>Tables A1 and A2</i> have been amended.</p> <p>*Currently RPS 9 is under review to accommodate the IAEA <i>Occupational Radiation Protection</i> (GSG-7, 2018) and IAEA <i>Management of Residues Containing Naturally Occurring Radioactive Material from Uranium Production and Other Activities</i> (SSG-60, 2021)</p>	<p>IAEA <i>Management of Radioactive Waste from the Mining and Milling of Ores</i> (WS-G-1.2, 2002)</p> <p>IAEA <i>Occupational Radiation Protection in the Mining and Processing of Raw Materials</i> (RS-G-1.6, 2004)</p> <p>IAEA <i>Application of the Concept of Exemption</i> (GSG-17, 2023)</p> <p>IAEA <i>Application of the Concept of Clearance</i> (GSG-18, 2023)</p>
<p>Disposal of radioactive waste</p>	<p>ARPANSA <i>Code for Disposal Facilities for Solid Radioactive Waste</i> (RPS C-3, 2018)</p> <p>ARPANSA <i>Regulatory Guide - Applying for a licence for a radioactive waste storage or disposal facility</i> (ARPANSA-GDE-1736, 2019)</p> <p>ARPANSA <i>Code for Disposal of Radioactive Waste by the User</i> (RPS C-6, 2018)</p>	<p>IAEA <i>Disposal of Radioactive Waste</i> (SSR-5, 2011)</p> <p>IAEA <i>Regulatory Control of Radioactive Discharges to the Environment</i> (GSG-9, 2018)</p>



Regulatory topic	Australian Standard	International equivalent
Classification of Radioactive Waste	ARPANSA <i>Classification of Radioactive Waste</i> (RPS G-4, 2020)	IAEA <i>Classification of Radioactive Waste</i> (GSG-1, 2009)
Transition from emergency to planned or existing exposure situation	ARPANSA <i>Guide for Radiation Protection in Emergency Exposure Situations – The Framework Part 1</i> (RPS G-3, 2019) ARPANSA <i>Guide for Radiation Protection in Emergency Exposure Situations – Planning, Preparedness, Response and Transition Part 2</i> (RPS G-3, 2019)	IAEA General Safety Requirements No. GSR Part 7 <i>Preparedness and Response for a Nuclear or Radiological Emergency</i> (GSR Part 7, 2015)
Remediation of contaminated site and associated waste management	ARPANSA <i>Guide for Radiation Protection in Existing Exposure Situations</i> (RPS G-2, 2017)	IAEA General Safety Requirements No. GSR Part 3 <i>Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards</i> (GSR Part 3, 2014)
Decommissioning	ARPANSA Regulatory Guide - <i>Decommissioning of Controlled Facilities</i> (ARPANSA-GDE-1731, 2020)	IAEA <i>Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities</i> (SSG-47, 2018)
Codes and Guides Under Development	ARPANSA RPS Guide - <i>Exemption and Clearance of Radioactive Material</i> (under draft) ARPANSA Regulatory Guide - <i>Exemption and Clearance of Radioactive Material</i> (under draft)	IAEA <i>Application of the Concept of Exemption</i> (GSG-17, 2023) IAEA <i>Application of the Concept of Clearance</i> (GSG-18, 2023)



Licensing system, including prohibition without a licence, for spent fuel and radioactive waste management activities

Spent fuel

The ARPANS Act prohibits the siting, construction, operation, possession and control, or decommissioning of nuclear or radiation facilities (e.g. spent fuel facility, research reactor) by a Commonwealth entity without a licence issued by the CEO of ARPANSA. Applicants for a licence are required to submit, among others, 'plans and arrangements' to demonstrate how the applicant will maintain effective control, manage safety and security, and protect the environment. Licences may contain conditions that the licence holder must comply with.

Radioactive waste management activities

The legislative framework established by all Australian jurisdictions prohibits the use of non-exempt radioactive material (including radioactive waste) and apparatus without an authorisation or licence and requires the material/apparatus and premises to be registered, or the subject of a licence condition requiring a detailed inventory to be maintained and amenable to regulatory inspection. In most jurisdictions, licensing is also required where premises are operated by the regulator, such as stores for radioactive waste. Radiation regulators in most jurisdictions also licence the transport of radioactive material.

Naturally occurring radioactive material (NORM)

Guidance for deciding whether natural sources should be controlled is provided in ARPANSA *Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM)* (RPS 15, 2008). This is consistent with the IAEA *Assessing the Need for Radiation Protection Measures in Work Involving Minerals and Raw Materials* (SRS-49, 2006). This does not apply to undisturbed ore-bodies or areas of high natural background. Additional detail on NORM management in Australia is provided in previous National Reports.

Radioactive ores

Radiation protection regulation of the mining and milling of uranium ores is undertaken by radiation regulators in the states or territories where such ores are mined. In some states and territories, uranium mining and transport activities are managed via legislation established under other relevant Acts establishing the jurisdictions regulatory framework. Additional detail is provided in previous National Reports. It is noted that since the 2020 National Report, South Australia has adopted the values of GSR Part 3 Table I.3 (IAEA, 2014) for specifying clearance values of radioactive minerals.

Institutional control, regulatory inspection, documentation and reporting

Through implementation into respective jurisdictional laws, users of radioactive materials, including radioactive waste, are subject to the responsibilities detailed in ARPANSA *Code for Radiation*



Protection in Planned Exposure Situations (RPS C-1, 2020) and RPS C-3 (ARPANSA, 2018). This includes requirements for institutional control, documentation, record keeping and reporting.

Each jurisdiction has legislation in place to provide powers to conduct inspections and to monitor and enforce compliance with regulations. For example, Part 7 of the ARPANS Act prescribes powers available to the Agency to conduct inspections⁸ to monitor and enforce compliance with the Act, Regulations⁹ and licence conditions. ARPANSA's Regulatory Activities Policy¹⁰ provides the framework within which ARPANSA's regulatory activities are carried out. ARPANSA has developed a risk-informed approach to the planning of its inspection program, which is designed to emphasise its safety assurance role.

When conducting inspections, ARPANSA uses performance objectives and criteria (PO&C)¹¹. These PO&Cs are used by inspectors for a transparent and graded approach to assess licence holders' practices and is consistent with the risk of the facility or the activity.

The ARPANS Regulations require licence holders to review and update any plans and arrangements for managing a controlled facility, controlled material or controlled apparatus at least once every 3 years, to ensure the health and safety of people and protection of the environment. Section 36 of the ARPANS Act allows the CEO of ARPANSA to impose additional conditions, or vary existing licence conditions. Licence condition requires licence holders to provide to the CEO of ARPANSA within 28 days of the end of each quarter information about compliance with the Act, the Regulations and licence conditions for the previous quarter year. ARPANSA has published guidelines¹² on how Commonwealth licence holders should report their compliance with the Act, the Regulations and licence conditions.

Further detail, including examples of the regulatory requirements for the operation of the Mt Walton East IWDF and for the mining of radioactive ores in South Australia, can be found in the 2017 National Report.

ANSTO radioactive waste and spent fuel

Under the ARPANS Act, ANSTO must comply with the following statutory conditions set out in the subordinate Regulations in the management of waste facilities and spent fuel:

- The licence holder must investigate suspected breaches of licence conditions. If a breach is identified, the licence holder must rectify the breach and any of its consequences as soon as

⁸ A copy of ARPANSA's Inspection Manual is also available for viewing at:

<https://www.arpansa.gov.au/regulation-and-licensing/regulation/our-regulatory-services/how-we-regulate>

⁹ A copy of the ARPANS Act and Regulations is available at:

www.arpansa.gov.au/regulation-and-licensing/regulation/about-regulatory-services/why-we-regulate/arpans-legislation

¹⁰ The Regulatory Activities Policy is at <https://www.arpansa.gov.au/about-us/our-policies/regulatory-activity-policies>

¹¹ The Performance Objectives & Criteria are at <https://www.arpansa.gov.au/regulation-and-licensing/licensing/information-for-licence-holders/inspections/performance-objectives-and-criteria>

¹² These guidelines can be found at: <https://www.arpansa.gov.au/regulation-and-licensing/licensing/information-for-licence-holders/regulatory-guides/regulatory-guide-reporting-compliance-arpansa>



reasonably practicable. The licence holder must also inform the CEO of ARPANSA about the breach as soon as reasonably practicable;

- The licence holder must take all practicable steps to prevent accidents involving controlled material, controlled apparatus or controlled facilities described in the licence. If an accident happens, the licence holder must take all practicable steps to control the accident, minimise its consequences (including injury to any person and damage or harm to the environment), tell the CEO of ARPANSA about the accident within 24 hours of it happening and submit a written report within 14 days.

Waste Disposal Facilities in Western Australia

The safe operation of the disposal facilities in Western Australia are assessed regularly by the site operators as required by the conditions of the authorisations. The operators report in writing to the Radiological Council the results of monitoring and any other factors relating to human health and the environment, and the inventory of material following disposal.

The site operators must hold a registration under the *Radiation Safety Act 1975 (Western Australia)* and are required to have other approvals from the Western Australian State Government. The conditions imposed on the registration under the WA Radiation Safety Act cover aspects of predisposal management, technical expertise, transport, operational requirements, reporting and independent audit. Direct reference is made to such documents as the *Radiation Safety (General) Regulations 1983*, RPS C-1 (ARPANSA, 2020), *ARPANSA Code for the Safe Transport of Radioactive Material* (RPS C-2, 2019) and RPS C-3 (ARPANSA, 2018).

For the Mount Walton East IWDF, there is an additional reference to the *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (NHMRC 1992) while work continues in the transition to requiring full compliance with RPS C-3 (ARPANSA, 2018).

Enforcement of regulations and licence conditions

The aim of ARPANSA's regulatory activities is to verify that licence holders and controlled persons comply with the Act, the Regulations and licence conditions.

ARPANSA adopts a graded and risk-based approach to compliance and enforcement as reflected in:

- ARPANSA Regulatory Guide - *Graded Approach to Dealing With Licence Holder Non-Compliance* (REG-COM-SUP-270J, 2018) and the *ARPANSA Compliance and Enforcement Manual* (REG-COM-MAN-270W, 2019) which details options for enforcement.

When non-compliance is identified the regulatory response is graded and proportionate to the actual or potential significance of the non-compliance. The minimum response necessary is used to achieve the desired result which in most cases will be a return to compliance.

Legislation in each jurisdiction provides for authorisations to regulate various dealings with radiation sources. The holding of the relevant authorisation is a mandatory condition of engaging in a particular



dealing unless exemptions apply. The authorisation can be affected through a single authorisation covering various dealings or through separate authorisations covering particular dealings.

Legislation in each jurisdiction enables the regulator to refuse to grant an authorisation if:

- the applicant is not a fit and proper person;
- it is necessary to do so in the interests of public health and safety;
- the proposed use of radiation is inappropriate or unjustified.

Legislation in each jurisdiction also enables the regulator to suspend, vary or cancel an authorisation in specific situations.

Compliance is assessed by inspections of controlled facility, controlled material or controlled apparatus, and routine and non-routine reporting by the licence holder. The frequency and extent of inspections depend on the risk posed by the facility, equipment or material concerned and past conduct of the licence holder. The regulatory body in each jurisdiction has legislative powers to undertake inspections, gather evidence and enforce conditions of licence.

Clear allocation of responsibilities

The Australian regulatory frameworks require that a ‘responsible person’ be primarily responsible for radiation protection and safety, and that regulators establish and enforce standards through a system of regulation. Responsible persons¹³ are required to make notifications or gain approvals and authorisations from regulators before conducting a practice. Authorisations include registrations, licences and accreditations.

In jurisdictions where mining of radioactive ores takes place, radiation regulation can be undertaken in conjunction with regulators of mining and transport. Additional detail outlining these arrangements is provided in the 2017 National Report.

¹³ The definition of a responsible person is stated as the following in RPS C-1 (ARPANSA, 2020):

In relation to any radiation source, prescribed radiation facility or premises on which radiation sources are stored or used means the legal person: (a) having overall management responsibility including responsibility for the security and maintenance of the radiation source, facility or premises (b) having overall control over who may use the radiation source, facility or premises (c) in whose name the radiation source, facility or premises would be registered if this is required.



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 fulfill 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 organizations are involved in both spent fuel or radioactive waste management and in their regulation.

Regulatory authorities (responsibilities, competence and resources)

The regulatory authority established in each jurisdiction for the purpose of implementing their radiation safety regulations is also designated with implementation and maintenance of the requirements of this Joint Convention.

All jurisdictions have reported that regulatory authority staff possess the essential skills, knowledge and expertise to assess the safe management of radioactive materials and waste within their jurisdiction and to conduct the necessary inspections for regulatory compliance monitoring. The staffing of radiation protection regulators in each jurisdiction varies from 2 to more than 20 staff depending on the population and scale of operations within that jurisdiction. A majority of license holders in state and territory jurisdictions are medical users of radiation sources.

The 9 radiation protection regulatory bodies within Australia are as follows:



Jurisdiction (population)	Radiation protection regulatory body (and relevant section)	Approximate number and type of licensees/licences	Number of staff involved in regulatory activities and their areas of expertise*
Commonwealth (N/A)	Australian Radiation Protection and Nuclear Safety Agency (Regulatory Services Branch)	32 facility licences including radioactive waste management facilities, research reactors (1 operating and 1 shutdown), fission molybdenum production facilities (1 operating and 1 shutdown) 60 source licences covering approximately 35,000 sources of radiation	24 (22 regulatory officers, senior regulatory officers and managers, and 2 administrative staff. In addition, expertise and support functions can be sourced from other branches for specific purposes)
South Australia (1,759,200)	Environment Protection Authority	7,437 use licences 3,845 registrations (3,054 apparatus registrations, 120 premises registrations, 671 sealed source registrations) 947 business activities licences (including facilities)	17 (15 regulatory and scientific officers and managers and 2 administrative staff)
New South Wales (8,129,000)	Environment Protection Authority (Regulatory Practice and Services Division)	3,046 radiation management licences to sell/possess radioactive substances or radiation apparatus, under which are held 1,544 sealed source devices and 534 premises where radioactive substances are kept or used 20,748 radiation users licences (either radiation apparatus or radioactive substances)	6 staff within Regulatory Practice and Services Division (scientific/technical, policy and administrative) 2 Policy staff 3 Licensing staff (radiation specific) c.300 Regulatory Operations staff (29 trained in radiation protection)



Jurisdiction (population)	Radiation protection regulatory body (and relevant section)	Approximate number and type of licensees/licences	Number of staff involved in regulatory activities and their areas of expertise*
Queensland (5,418,000)	Queensland Health (Radiation Health Unit, Health Protection and Regulation Branch)	2,762 possession licensees 20,064 use and transport licensees 5,983 sealed radioactive sources registered 14,086 radiation apparatus registered	20 within the Health Protection and Regulation Branch (12 scientific / technical, and 8 licensing / administrative) 8 of the scientific officers are appointed as inspectors under the Radiation Safety Act 1999 A further 112 Environmental Health Officers from Public Health Units across Queensland have been appointed as inspectors to assist in the department's compliance monitoring and enforcement activities
Tasmania (537,000)	Department of Health (Radiation Protection Unit)	474 licences (consisting of 2156 apparatus, 474 radioactive materials, 2560 authorised persons) 502 registered premises	5 (3 scientific and 2 licensing officer)
Victoria (6,766,600)	Department of Health (Health Regulator)	17,240 use licences 2,875 management licences 50 approved testers	12 dedicated (11 scientific / compliance, 1 scientific / policy) plus 4 shared managers plus shared licencing & administrative



Jurisdiction (population)	Radiation protection regulatory body (and relevant section)	Approximate number and type of licensees/licences	Number of staff involved in regulatory activities and their areas of expertise*
Western Australia (2,639,100)	Radiological Council (Radiation Health Unit)	10722 licences (covering users, service, manufacture, transport and sale), 3005 registered premises (a registration is equivalent to a management licence) including 41 registrations covering the mining and milling of radioactive ores and including 2 operating disposal facilities 7637 sealed sources registered 7972 radiation apparatus registered	14 (9 scientific and policy staff, 5 administrative staff)
Australian Capital Territory (469,194)	Australian Capital Territory Health Directorate (as of 30 May 2024) (Radiation Safety Section of the Health Protection Service)	873 registrations, 1707 licensees	2 (2 scientific)
Northern Territory (244,800)	Department of Health (Radiation Protection Section of Public Health Directorate)	Approximate number of authorities: 203 (possess licences) 1134 (use licences including AMR notifications) 666 registered apparatus 313 registered sealed sources 438 Registered radiation places	2.5 (2 scientific, 0.5 administrative)

* These personnel numbers represent a current snapshot of staffing resources that underwent variation during the period covered by this report.



ARPANSA

ARPANSA's regulatory personnel have competency in a wide variety of technical fields related to spent fuel management and radioactive waste management to perform regulatory responsibilities. If specialist technical advice is required to support regulatory activities and this is not available within the agency, financial resources and contractors are available to source such expertise externally.

ARPANSA staff competencies have been maintained through targeted training programs. This is done through annual formal training as well as on-the-job training and supervision. Staff also undertake ongoing professional development through participation in international meetings, workshops and technical consultancies.

ARPANSA has developed and implemented a Qualification Card system with associated defined competencies that all regulatory officers must meet before being appointed as an inspector. Competencies of each candidate are formally assessed prior to their appointment under section 62 of the ARPANS Act.

Recruiting qualified staff is sometimes an issue, as there is a relatively small pool of qualified radiation protection and nuclear safety experts within Australia. Measures have been put in place to maintain training and professional development opportunities for younger or less experienced staff and to allow staff to attend courses, seminars and conferences as needed. A number of staff are supported by ARPANSA to complete graduate studies at Australian universities. ARPANSA has continued to develop cooperative relationships with key universities and other partner organisations to support the research and innovation programs and ARPANSA.

Effective independence of the regulatory function

The CEO of ARPANSA has multiple functions in addition to being the nuclear and radiation regulator, and is required by Section 15 (2) of the ARPANS Act to take all reasonable steps to avoid any conflict of interest between their regulatory function and other functions. Establishment of the Regulatory Services Branch (RSB) which has delegated regulatory functions for licensing, inspections, compliance management, and enforcement, provides structural clarity to the regulatory function. All staff members across the agency are required to make annual declarations of interests that could potentially conflict with the performance of their duties.

Although ARPANSA regulates other government entities (e.g. ANSTO), they are separated by portfolios managed by separate ministers. For example, ARPANSA is within the Commonwealth Department of Health portfolio, while ANSTO is a government-owned business within the Industry, Science, Energy and Resources portfolio. Besides this structural separation, ARPANSA's independence is further assured through requirements in the ARPANS Act. These include:

- a requirement to report quarterly and annually to Parliament on the operations of ARPANSA and any finding of breach of licence condition or legislation;
- a requirement to report to Parliament about any serious accident or malfunction that occurs at a nuclear installation, including spent fuel or waste management facilities;



- a requirement for the Minister to table in Parliament any direction that he or she makes to the CEO of ARPANSA;
- the right of the CEO of ARPANSA to, at any time, cause a report about matters relating to the CEO's functions to be tabled in Parliament.

Jurisdictions typically store a small quantity of disused sources and/or radioactive waste, and manage their independency in various ways. For example, some jurisdictions have a form of executive management, independent of the regulatory body that can make decisions upon the safe management of facilities belonging to the regulatory body. Other jurisdictions maintain requirements for regular, independent audits and/or inspections. Additional detail can be found in the 2017 National Report.



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.

In accordance with the NDRP, legislation in all jurisdictions requires that a 'Responsible Person' be primarily responsible for radiation protection and safety. The responsible person is defined as the person who has overall management responsibility for the safety, security and maintenance of the sources, apparatus, installation or facility, in whose name these aspects would be registered if required.

ARPANS Regulations place prime responsibility for safety on the licence holder. This is primarily done through section 60, which provides:

Managing safety

(1) *The holder of a facility licence must take all reasonably practicable steps to manage the safety of the facility described in the licence, including:*

- (a) *having in place plans and arrangements described in paragraph 46(1)(d); and*
- (b) *ensuring that such plans and arrangements are implemented to the extent reasonably practicable.*

Other provisions in the ARPANS Act and Regulations reinforce that primary responsibility for safety rests with the licence holder. These include requirements on the licence holder to proactively investigate and rectify any breaches, prevent, control and minimise accidents, and report accidents to ARPANSA within 24 hours.

The uranium mine facilities in South Australia and in the Northern Territory are privately owned and any liability will be carried by the owner. To protect against the contingency of a private company ceasing to exist, the South Australian and Northern Territory regulatory bodies require a bank guarantee or cash deposit before operations can commence. As the Ranger Uranium Mine (Northern Territory) operates under a specific (s41) authority issued under the *Atomic Energy Act 1953*, a security (comprising a combination of cash and financial guarantees) is held by the Commonwealth.



Each jurisdiction in Australia (Commonwealth, states and territories) own and operate waste storage facilities that are typically licenced to the radiation-related regulatory body in that jurisdiction. Management of these storage facilities is required to be compliant with the applicable legislation enacted in each jurisdiction, fully consider the principles enshrined in the NDRP, and observe the requirements and guidance documented in applicable national codes of practice.

Article 22 Human and Financial Resources

- (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.

Spent fuel and radioactive waste management facilities

All jurisdictions require operators and licence holders to be responsible for providing qualified staff and financial resources to enable appropriate controls and monitoring of radioactive waste. A number of different approaches are used commensurate with the types of sources and expertise of the licence holder.

ARPANSA requires its licence holders to demonstrate adequate managerial structure and resources to ensure positive safety attitudes and high standards of human performance and competence. This includes demonstrating clear lines of authority as well as systems for staff selection, training, and personnel stability.

In making a licence decision, the CEO of ARPANSA must consider whether the applicant has shown a capacity to comply with the Regulations and any licence condition that may be imposed. ANSTO must provide evidence of adequate resources, including financial capability, before it is issued with an operating licence as per ARPANSA-GDE-1795 (ARPANSA, 2022).

Since ANSTO is a government agency, its funding for nuclear safety and reliability of its installations, including decommissioning, will be underwritten by the Australian Government throughout its life.

Under the *Mining Management Act 2001* (Northern Territory) and the *Work Health and Safety (National Uniform Legislation) Act 2011* (Northern Territory) the operator of a mine must ensure all workers are trained and competent to perform the work they are employed for. In the case of the Ranger Uranium Mine, the authorisation requires the operator to implement a system to control radiological exposure of people. There are radiation reporting and monitoring requirements under the *Radiation Protection Act 2004* (Northern Territory) and the need for a radiation safety officer as defined in the ARPANSA



Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (RPS 9, 2005).

Tasmania requires that all licence holders who are authorised to possess a radiation source have radiation management plans that specify a radiation safety officer, their duties and the roles and responsibilities of all persons expected to be dealing with radiation sources. Changes to the plan or personnel specified must be approved in advance. Other jurisdictions specify in conditions of licence that adequate staffing is required or that a list of all holders of authority be provided. In remaining jurisdictions, inspection of premises to ensure necessary safety requirements are being met and an emphasis on the responsibility of licensees to comply with requirements are used. With respect to operator capabilities, if the support required is of a significant level, authorised practices that generate radioactive wastes are generally advised to access commercially available health physics support to assist with waste management.

The Victorian *Nuclear Activities (Prohibition) Act 1983* prohibits nuclear fuel cycle activities and as a result there is no spent fuel within Victoria. There is not a specifically dedicated radioactive waste management facility within the meaning of the Convention within Victoria. The *Victorian Radiation Act 2005* provides for the possession and use of radioactive materials via a licensing regimen. Companies possessing radioactive material under licence are required to ensure that possessed radioactive materials are used, managed and stored appropriately to ensure both safety and security. The Victorian Government maintains an Interim Storage Facility for radioactive material seconded solely for the purposes of public and environmental protection acquired as a result of company wind-ups, abandonment, or accident recovery. Victoria is currently examining disposal options and associated costs related to future decisions concerning the fate of the inventory of the Interim Storage Facility.

ANSTO

Australia's Nuclear Science and Technology Organisation (ANSTO) is the only organisation that operates spent fuel facilities. In addition, they operate a number of waste management facilities. Within ANSTO, staff who are responsible for the management of radioactive waste and spent fuel are appropriately trained and suitably qualified to carry out their tasks using defined procedures and instructions. ANSTO use training as a strategic performance tool to enhance both operator and facility performance. Managers are responsible for the competence of their staff and work effectively with training staff to ensure their qualification.

ANSTO has implemented a multi-competency training program for the radioactive waste technicians. This means that the team is trained in many skills and tasks, including liquid waste management, remote handling techniques, decontamination activities and laundry operations. This versatility allows for the team to be deployed where the demand is.

The adequacy of human resources is reviewed on an ongoing basis to ensure that operations are safe and is captured as part of the Effective Control Plan required by the ARPANS Regulations.

As an Australian Government organisation ANSTO has significant technical and financial resources through a mixture of government appropriation and commercial services.



ARWA

The Australian Government, through the Safely Managing Australia's Radioactive Waste and Update on Radioactive Waste Management measures committed to long-term funding to support the safe and sustainable management and disposal of Australia's radioactive waste. These budget measures include funding for increased staffing, supported by ARWA's workforce strategy to aid attraction and growth of Australia's future nuclear workforce capabilities.

Recruitment is undertaken domestically and internationally, and ARWA has been successful in recruiting individuals with expertise from the nuclear medicine industry, nuclear power and waste industry and project management experience within major construction and mining industries to bolster its existing subject matter expertise.

Financing of institutional controls and monitoring after closure

This article (Article 22) is currently only applicable to the Mt Walton East IWDF and Sandy Ridge Facility in Western Australia. The Mt Walton East IWDF facility is owned by the Western Australian Government and the financial responsibility for post-closure monitoring will be borne by the Western Australian Government. There are no specific funds set aside for monitoring after closure. For the Sandy Ridge Facility, although provisions for funding through the institutional control period do not exist under the Radiation Safety Act, financial assurances are required by the Western Australian Government.

In the event that a licence application is submitted to ARPANSA for the proposed NRWFM, the ARPANSA Regulations require the CEO of ARPANSA to consider whether the applicant has the ability to maintain effective control of the facility. This would include having adequate financial, human and technical resources in place to manage the facility throughout its lifetime, including the ability to undertake any environmental monitoring required post-closure.

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.

Establishment and implementation of quality assurance programs

ARPANSA has a quality policy which articulates the commitment to high quality service delivery and describes the responsibilities of management and staff in achieving the quality objectives. The policy guides the development and implementation of the ARPANSA Management System (AMS) and the application of the AMS to all agency activities. ARPANSA uses its Management System (AMS) to develop and maintain policies, procedures, forms and guides of a regulatory nature. The AMS provides



assurance to stakeholders that regulatory processes are open and accountable and services are provided in an effective and efficient manner and subject to continuous improvement. The AMS meets the requirements of AS/NZS ISO 9001 standard and ISO17025.

ARPANSA-GDE-1735 (ARPANSA, 2023) requires a licence applicant to demonstrate that arrangements are in place to establish and manage a facility and the interdependencies between such arrangements should be documented in a management system. The management system must be designed to support the object of the Act and integrate safety, health, environmental, security, quality, societal and economic elements.

Use of appropriate quality system by licence holders is considered by Australian radiation regulators in granting authorisation for spent fuel and waste management facilities applying a graded approach. For example, Australian Government organisations managing such facilities use ISO accredited quality system including ISO 9001 and ISO 14001 for spent fuel operations and radioactive waste management facilities, as well as ISO 45001 – Occupational Health and Safety Management Systems. In 2023, ANSTO also received certification in ISO 19443; a nuclear-specific quality management standard to optimise safety and quality throughout the nuclear supply chain. At ANSTO, implementation of appropriate quality system is verified through regulatory compliance monitoring processes.

Radioactive management operations regulated by the states and territories operate under appropriate quality assurance systems as part of the safety management plan required by the regulator.



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 on 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 for dose limitation 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.

The Regulations require ARPANSA to be satisfied that licence holders optimise radiation protection. The Regulations also set out statutory effective dose limits, as well as equivalent dose limits for the skin, extremities and eye. The dose limits to the lens of the eye specified in the Regulations implements the most recent recommendations from the International Commission on Radiological Protection. ARPANSA monitors whether the licence holders ensure that radiation doses arising from normal operation and anticipated operational occurrences throughout the life of the reactor are optimised and do not exceed the dose limits.

RPS C-1 (ARPANSA, 2020) sets out the requirements in Australia for the protection of occupationally exposed persons, the public and the environment in planned exposure situations. This includes the control of radiation exposure during the operating lifetime of a spent fuel or radioactive waste management facility. The primary means of controlling exposure in planned exposure situations is by good design of facilities, equipment, operating procedures and through training – all of which contribute to optimisation of protection.

RPS C-1 (ARPANSA, 2020) stipulates an effective dose limit of 20 mSv per year for workers, averaged over a period of 5 consecutive calendar years with no more than 50 mSv in one year. For women who declare a pregnancy, the dose limit is 1 mSv to the foetus for the remainder of the pregnancy. Dose



constraints are developed as appropriate for each operation. They are proposed by the operator and reviewed by the regulator.

For spent fuel facilities and waste management facilities at ANSTO, task-specific dose constraints are used for occupational workers. Further, dose constraints for members of the public within the controlled site and outside the controlled site, and investigation levels, are used as part of optimisation of protection and safety. Such information is contained in the radiation protection plan and are assessed by the regulator in granting approval of operation of a spent fuel or radioactive waste management facility.

In addition to dose limits, some jurisdictions use management plans such as those required in RPS C-3 (ARPANSA, 2018) and RPS 9.1 (ARPANSA, 2015). The management plan must be directed towards meeting the objectives of all relevant requirements, including those in RPS C-1 (ARPANSA, 2020), and must be in accordance with best practicable technology and take into account the potential dose delivery pathways. Plans should also address the measures that will be taken to avoid unplanned and uncontrolled releases and emergency management. Independent audits are generally used by Australian jurisdictions to verify compliance with management plans.

The radioactive discharges from spent fuel and radioactive waste management facilities are subject to compliance with statutory requirements and limits. For example, the airborne discharges from ANSTO's licenced facilities must comply with regulatory notification levels, which are based on conservative modelling to ensure that there is no undue risk from such discharges. For ANSTO's facilities, estimates of public radiation doses based on the measured radioactive discharges are reported quarterly to ARPANSA.

The design features of the spent fuel and radioactive waste management facilities incorporate systems to control release of radioactive materials during normal operation and anticipated operational occurrences, and as appropriate under design-basis accident conditions. These aspects are considered in the safety analysis of these facilities. In addition, the operating arrangements and procedures for such facilities describe the corrective measures to be implemented in the event of an unplanned or uncontrolled release of radioactive materials. Additional information on emergency management is provided under Article 25.

ANSTO's operational radiation protection policies, procedures and measures with regard to spent fuel and radioactive waste management are substantively unchanged since the 2020 National Report. Radiation monitoring results show that ANSTO's spent fuel and radioactive waste management facilities continue to be operated without undue risk to the health and safety of people and the environment.



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.

Emergency plans

The Regulations require a licence applicant to include its emergency plans in its submissions that support a licence application. The Regulations also require the plans and arrangements to be reviewed at least once every 3 years. Under the regulatory guide on review of plans and arrangements, ARPANSA expects emergency plans to be in place for any action that could give rise to a need for urgent protective measures or other actions and be based on an assessment of the consequences of reasonably foreseeable accidents including those with off-site consequences.

Emergency plans must also aim to minimise consequences and ensure protection of on-site personnel, the public and the environment; have comprehensive procedures, and require all external organisations identified in the emergency plan to be prepared for emergencies with adequate and well-maintained facilities and equipment.

For radioactive waste storage facilities operated by state and territory radiation regulators, a variety of measures are employed to ensure preparedness for an emergency, including:

- establishing and maintaining emergency preparedness plans for the institution (such as a hospital) in which the waste facility is located;
- remediation procedures in the event of an incident, requirement for periodic incident response exercises and the review of results of exercises;
- advice to fire services and other emergency services of the locations of radioactive materials;
- use of a model reference incident for response planning purposes of a scale that can be directly applied to a radiological emergency;
- provision of additional radiation monitoring equipment for emergency services and enhanced equipment and training for staff.

An incident management software system has been introduced to manage the response to exercises and real events in line with Australasian Interservice Incident Management System (AIIMS) including the tracking of actions to address lessons learned. It is also currently being used in ARPANSA to record routine day-to-day health and safety incidents, and some business continuity incidents.



In Western Australia, the two operating low-level radioactive waste disposal facilities are required to address emergency response and contingencies in their radiation management plans.

ANSTO

On-site arrangements for emergencies at the OPAL Research Reactor and associated spent fuel management and waste management facilities at ANSTO's Lucas Heights campus are the responsibility of ANSTO. The off-site arrangements for emergencies at the Lucas Heights facility are covered in a NSW State Sub-Plan and these are reviewed and exercised regularly, in line with other NSW State Plans.

ANSTO's emergency plans and arrangements for spent fuel and radioactive waste management facilities comprise a facility-specific plan, a site-specific plan and the relevant state plans that are integrated to ensure that both on-site and off-site response personnel and decision makers act in a coordinated and harmonised manner to efficiently and effectively respond to the emergency. The efficacy of emergency plans and arrangements are verified by ARPANSA by observing a field emergency response exercise based on a scenario agreed with ARPANSA that demonstrates that the emergency response arrangements are commensurate with the emergency preparedness category of the facility.

Commonwealth support

The National Emergency Management Agency (NEMA, formerly Emergency Management Australia) is a division of the Australian Government's Department of Home Affairs. NEMA is the Australian Government agency responsible for coordination of Australian Government consequence management activities in support of state and territory governments, in accordance with existing emergency management arrangements.

Australian state and territory governments have responsibility for coordinating and planning for the response to and recovery from a disaster within their borders. When the total resources (government, community and commercial) of an affected jurisdiction cannot reasonably cope with the needs of the situation, the nominated official can seek non-financial assistance from the Australian Government under the *Australian Government Disaster Response Plan* (COMDISPLAN).

In the event of a radiological or nuclear incident, COMDISPLAN indicates that the Commonwealth Department of Health maintains national health emergency plans including for Chemical, Biological, Radiological and Nuclear incident management. COMDISPLAN also indicates that ARPANSA is postured 24/7 to provide specialist technical advice and operational field support if requested to assist during a nuclear or radiological incident. This includes operational planning support, deployment of technical assets and the provision of geospatial products across all elements of the prevention, preparedness, response and recovery phases of an event. ARPANSA is the IAEA-designated national authority for radiation emergencies both domestic and overseas.

Further to support that may be sought from ARPANSA in the event of an incident, the Commonwealth may also provide supporting resources from other national departments and organisations, such as the Department of Defence and ANSTO.



Radiological emergencies in the vicinity of Australian territory

Given Australia's geographical position, it is unlikely that Australia could be affected by a radiological emergency at a spent fuel or radioactive waste management facility in a neighbouring country. However, emergency plans in all jurisdictions could be applied in responding to regional emergencies if necessary.

Article 26 Decommissioning

Each Contracting Party shall take the 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.

National Policy and Strategy

It was observed during the IAEA IRRS mission to Australia in 2018 that the Australian Government has not established a national policy and strategy for decommissioning including timing and financial aspects. Recommendation No. 3 of the 2018 mission report indicated that the 'Commonwealth Government should establish a national policy and strategy for decommissioning of facilities.' The Australian Radioactive Waste Agency (ARWA) is responsible for establishing a national decommissioning policy and strategy and has gained budget funding in 2023 (see Section F) for this work to take place over the following 4 years in consultation with relevant organisations, including facility owners and regulators. The IAEA's IRRS missions to Australia including the 2023 follow-up mission are addressed in greater detail in Section K of this report.

ANSTO

Section 30(1) of ARPANS Act requires authorisation to decommission a controlled facility including spent fuel and radioactive waste management facilities. The ARPANSA Regulatory Guide - *Decommissioning of Controlled Facilities* (ARPANSA-GDE-1731, 2020) is based on the requirements of the IAEA General Safety Requirements GSR Part 6 *Decommissioning of Facilities* (GSR Part 6, 2018), and aims to assist in ensuring that the decommissioning of these facilities is conducted in a safe and environmentally acceptable manner in accordance with international best practice. It is also used by ARPANSA for regulatory assessment of a licence application for decommissioning of a controlled facility.

When assessing an application for decommissioning of a controlled facility, ARPANSA considers the provision of staffing, qualification and training. Further, it is a legislative requirement (s53 of ARPANS Regulations) that the applicant demonstrates a capacity to comply with the regulations and any



conditions likely to be imposed on the licence. This includes adequate financial and human resources to manage the decommissioning of a nuclear facility. Appropriate programs for radiation protection and emergency arrangements are required to be submitted with the final decommissioning plan for approval. Implementation of such programs are monitored through regulatory compliance monitoring process.

A preliminary decommissioning plan was submitted as part of the application for a licence to operate the OPAL reactor. This included the choice of materials to minimise activation, provision of space for access and minimisation of the radioactive waste that will be produced during decommissioning. In licensing OPAL for operation, ARPANSA was satisfied that ANSTO has plans and arrangements to satisfy decommissioning requirements.

A detailed characterisation program has been completed for the HIFAR Facility allowing for an accurate estimate of waste. That program revealed that 80 per cent of the HIFAR Facility is free-release, 18 per cent is LLW and only 2 per cent of the HIFAR Facility is ILW. A phased approach to decommissioning HIFAR has been implemented with an application to undertake the first phase submitted to ARPANSA in 2023.

At the time of writing, ARPANSA is in the process of assessing the application to undertake the initial phase of decommissioning. A decision with regard to the licensing of this activity has not yet been made. In accordance with section 48 of the Regulations the CEO of ARPANSA invited submissions from individuals, organisations and groups in relation to the application. ARPANSA also directly engaged with staff of the local council to ensure they were aware of the application and the scope of the planned activities. Engagement with the public has been through a dedicated website designed to facilitate consultation. An online public forum was held in October 2023 and a recording of this was made available for the duration of the consultation period. In making a decision to issue a licence authorising ANSTO to undertake this work, the CEO of ARPANSA is required by section 53 of the Act to consider the content of any submissions made by members of the public about the application. It has also been customary for the CEO of ARPANSA to prepare a Statement of Reasons which is published on the ARPANSA website in relation to substantial licensing decisions.

ANSTO is actively working to ensure appropriate resources for decommissioning in future years. The staged decommissioning of the HIFAR facility will enable nuclear decommissioning knowledge transfer, including training and professional development of younger, less experienced workers.

Appropriate records and documentation related to the operating history of the facility including design specifications, structural and materials specifications, drawings and diagrams, modifications and changes to the design, and event records are maintained for decommissioning. Such information and records form part of the plans and arrangements for managing safety in decommissioning. A final decommissioning report is kept that summarises decommissioning activities undertaken including dismantling of the facility; waste management including clearance of radioactive materials or objects from regulatory control; the final status of the site at the time for release from regulatory control or for conversion to other use; and any remaining restrictions on the site.

State and territory radioactive waste storage facilities



Current regulatory requirements adequately address the provision of resources, operational limits, emergency plans and record keeping in regard to decommissioning and closure of storage facilities as required by Article 26. The majority of storage facilities operated by the state and territory governments do not require complex procedures to be undertaken in order to decommission the facility. Hence, some do not have decommissioning plans in place but require development of plans prior to undertaking specific decommissioning activities. More complex facilities require a preliminary or conceptual decommissioning plan as part of the overall radiation management plan for the facility. Emergency plans in all jurisdictions can be applied to the operation of facilities as well as decommissioning.

Decommissioning of mining sites

Radiation protection regulation, including provision for decommissioning, for the exploration, mining and milling of radioactive ores is undertaken by radiation regulators in the states or territories where such ores are mined.

In South Australia, uranium and mineral sands mining companies are expected to provide appropriate technical expertise and resources for the decommissioning of their mining facilities. Provisions of the South Australian radiation protection legislation can be applied to require a company to provide appropriate resources and personnel for decommissioning.

Under the *Mining Act 1971 (SA)*, a bond may be set by the relevant Minister to recover costs of rehabilitation of mining sites. The bond is set at a level to cover the estimated cost for rehabilitation of the mine and milling site. The value of these bonds is revised periodically. In the case of the Olympic Dam project, the *Roxby Downs (Indenture Ratification) Act 1982 (SA)* (Indenture Act) applies. While there is no provision for a bond under the Indenture Act, the mining company is required to maintain an ongoing rehabilitation program at the site.

In the Northern Territory, securities for all exploration sites and mines (other than Ranger Uranium Mine) are calculated by the Northern Territory Government, based on the disturbance and estimated rehabilitation cost. Mines must annually review and, if necessary, submit a Mining Management Plan for approval. The appropriate security is reviewed and upgraded where necessary, based on this plan and planned future operations. The security is lodged with the relevant government department and is held against the operator to ensure satisfactory closure and rehabilitation of the site. On successful completion and rehabilitation of the site, the security held by the department is refunded to the operator. Securities are held against all authorised exploration and mining sites.

The Ranger Uranium Mine ceased production in January 2021. The operator of Ranger Uranium Mine is required to submit an Annual Plan of Rehabilitation to be used for assessment of the security bond that should be held by the Commonwealth if the operator becomes insolvent. Relevant stakeholders including the Australian and Northern Territory Governments and Mirarr traditional owner representative bodies, the Northern Land Council and Gundjeihmi Aboriginal Corporation review the plan. The plan requires approval by the Australian Government Minister responsible for administering s 41 of the *Atomic Energy Act 1953*. The operator of Ranger Uranium Mine must also submit an annual mine closure plan for approval by the Australian and Northern Territory Governments. This plan is made public on the operator's website. A recent assessment of rehabilitation costs in 2022 indicated



that the currently held bond was insufficient compared to updated costings. The operator and its major shareholder are currently sourcing funding.



G. Safety of Spent Fuel Management

The Australian Nuclear Science and Technology Organisation (ANSTO) is the only organisation in Australia that manages spent fuel. Accordingly, this Section only refers to ANSTO and ARPANSA, which as the regulator, issues licenses for the spent fuel management facilities. The spent fuel management facilities for the OPAL reactor form part of the OPAL reactor facility and includes a separate spent fuel pond. As such, ANSTO's compliance with the requirements of Chapter 2 of the Joint Convention was examined in detail as part of the consideration of its applications for authorisations to prepare a site, construct and operate the facility. ANSTO has safely managed its spent fuel since commencement of reactor operations and has stored that spent fuel in both dry and wet facilities. Currently, only wet storage of spent fuel is in practice at ANSTO (**Error! Reference source not found.**).

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.

Measures to address the general safety requirements in Article 4 are largely unchanged from those reported in the 2017 National Report. In summary:

- ARPANSA requires that facilities for the storage of spent fuel at ANSTO demonstrate that sub-criticality is maintained by a suitable margin under conditions of normal operation, anticipated operational occurrences and accident conditions. Such safety analysis uses a rigorous and conservative method that considers defence in depth in design safety features of spent fuel



management to ensure safety through redundancy and diversity. The safety analysis also addresses the use of safety systems which ensure residual heat removal in the design basis analysis and in the design of the facility. This must be considered in the Safety Analysis Report required under Section 46 (1) (e) of the ARPANS Regulations;

- Minimisation of the production of radioactive wastes under operational conditions is considered in the design in a manner that is commensurate with the safety analysis. ARPANSA's expectations of arrangements for the minimisation of radioactive waste generation are described in the ARPANSA-GDE-1735 (ARPANSA, 2023);
- Measures to take into account interdependencies among the different steps in spent fuel management remain unchanged since the 2017 National Report;
- Commonwealth nuclear safety legislation, the ARPANS Act, together with accompanying Regulations and subsidiary regulatory guidance provide for effective protection of staff, members of the public and the environment. These are based on internationally endorsed criteria and standards;
- Assessment of biological, chemical and other hazards are considered in the Safety Analysis Report as required under Section 46 (1) (e) of the ARPANS Regulations.

According to Principle 7 of ARPANSA *Fundamentals for Protection Against Ionising Radiation* (RPS F-1, 2014), people and the environment, present and future, must be protected against radiation risks. The implementation of this principle through jurisdictional legislation and imposition of licence conditions anticipates current and future impacts of spent-fuel facilities, and as such, the 'undue burden on future generations' is considered when assessing an application to operate or use a nuclear facility, equipment or material.

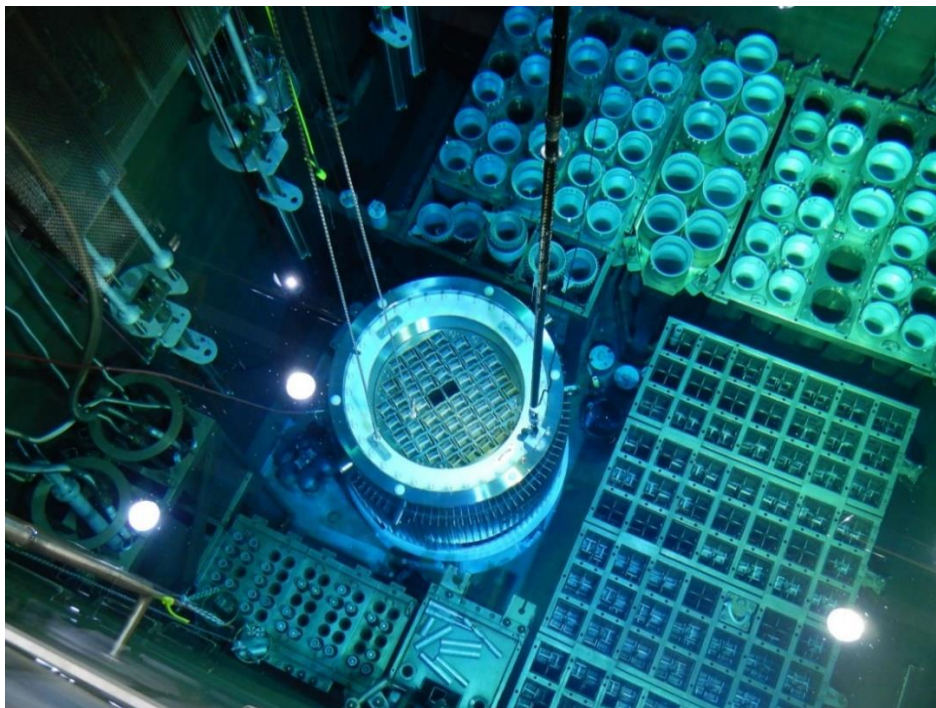


Figure 3: OPAL Reactor Service Pool with spent fuel storage rack and loaded transport cask (2018).



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.

Two spent fuel ponds and a dry spent fuel storage at ANSTO existed at the time the Convention entered into force for Australia in 2003. One storage pond is currently used as a contingency and the other is used for storage of various radioactive sources. The spent fuel dry storage is currently used to store spent uranium filter cups generated from ANSTO fission molybdenum-99 production process. The spent fuel ponds are subject to all relevant regulatory requirements as are the other facilities at the ANSTO site.

Article 6 Siting of Proposed Facilities

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented 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.

The ARPANS Regulations require that, when deciding whether to issue a facility licence authorising the preparation of a site, the CEO of ARPANSA must consider:

- a detailed site evaluation establishing the suitability of the site for the facility;
- the characteristics of the site, including the extent to which the site may be affected by natural and human events;



- any environmental impact statement required by a government agency and the outcome of the environmental assessment.

The ARPANSA Regulatory Guide - *Applying for a Licence for a Nuclear Installation* (ARPANSA-GDE-1795, 2022) and related guidance, provides detailed guidance on meeting the requirement of the Regulations and relevant IAEA guidelines including the requirement to provide detailed information on:

- the site's seismology, geology, topography, demography, ecology, hydrology, and meteorology;
- the effect of nearby facilities and land usage;
- the availability and reliability of off-site services such as electricity, water, transportation, and communication systems;
- the feasibility of emergency response.

In line with the above licence application information requirements, ARPANSA has taken account of IAEA *Site Evaluation for Nuclear Installations* (SSR-1, 2019) for evaluation of characteristics when assessing a licence application for site preparation, including ANSTO's application for the Intermediate Level Waste Capacity Increase (ILWCI) Facility. Specifically, SSR-1 (IAEA, 2019) requires the following characteristics to be evaluated: geography, demography, meteorology, hydrology, geology, ecology, seismology, site services, review of nearby facilities, transport routes, baseline environmental radioactivity, suitability of the design for external natural events and external human induced event.

In accordance with Section 48 of the ARPANS Regulations, ARPANSA must invite public submissions on any application involving a nuclear installation. The CEO of ARPANSA is required to take into account the content of any public submissions in deciding whether or not to issue a facility licence that authorises conduct in relation to a nuclear installation.

In addition, the EPBC Act requires that an application for a proposed facility that is characterised as a nuclear action¹⁴ must be referred to the Minister for the Environment for determination of approval and the required level of assessment.

As noted in the 2017 National Report, in accordance with the ARPANS Act, public submissions were invited as part of assessing the application for licences to prepare a site for, construct and operate ANSTO's OPAL research reactor, including its spent fuel management facilities. The EPBC Act also has statutory public engagement requirements.

For example, ARPANSA published a notice of the intention to make a decision for a new waste storage facility (Intermediate Level Waste Capacity Increase – ILWCI)¹⁵ which included details of ANSTO's

¹⁴ Commonwealth actions or actions affecting Commonwealth land that have, will have or may have a significant impact on the environment are also required to be referred under the EPBC Act.

¹⁵ See <https://www.arpansa.gov.au/notice-intention-make-decision-facility-licence-application>



submission. Similarly, the outcome of the licence decision was announced along with the report detailing the regulatory assessment of the application¹⁶ and a statement of reasons¹⁷ published by the CEO of ARPANSA when making the decision. The submissions made by the public¹⁸ were also made available on the ARPANSA website. ARPANSA reviewed and approved an application from ANSTO to site the facility. The application included the commitment to consider the requirement for design extension conditions of the research reactor during the detailed design of this facility. This was noted in section 4.5.2 of ARPANSA's regulatory assessment. ARPANSA has required ANSTO to perform severe accident analysis, assess design extension conditions and update the final safety analysis for the ILWCI accordingly. Furthermore, measures have been put in place to ensure design extension conditions continue to be considered for future nuclear installations.

Consultation with other Contracting Parties

Considering the geographical position and size of Australia, it is unlikely that Australian spent fuel management facilities would have impacts on other Contracting Parties.

Article 7 Design and Construction of Facilities

Each Contracting Party shall take the 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.

ARPANSA-GDE-1795 (ARPANSA, 2022) is structured to reflect and guide licence applicants to internationally accepted principles of defence in depth. The guide refers to the need for proven engineering practice and standards in the siting, design, manufacture, construction, installation, and commissioning of a nuclear installation.

ARPANS Regulations require that the design of the facility includes ways in which the design deals with the physical and environmental characteristics of the site.

At the design stage, plans and other provisions for decommissioning a facility are required in conceptual form. They must be revised and updated as the facility moves through the different

¹⁶ See <https://www.arpansa.gov.au/news/arpansa-approves-siting-licence-ansto-waste-facility>

¹⁷ See https://www.arpansa.gov.au/sites/default/files/regulatory_assessment_report_-_a0339_siting_licence_rar_-_ilwci_facility.pdf

¹⁸ See https://www.arpansa.gov.au/sites/default/files/a0339_ilwci_facility_licence_application_-_ceo_statement_of_reasons_1.pdf



licensing stages. The technologies incorporated in the design and construction of a spent fuel management facility must be supported by proven design, experience, testing and analysis. As noted in the 2020 National Report, spent fuel from the OPAL reactor is stored in a service pool adjacent to the reactor pool, the design of which was subjected to a rigorous safety assessment process by ANSTO and INVAP (the Argentinian company that constructed the OPAL reactor) prior to approval by the CEO of ARPANSA.

Article 8 Assessment of Safety of 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).

ARPANS Regulations require that safety assessment of a spent fuel or waste management facility is performed against the plans and arrangements for managing safety described in ARPANSA Regulatory Guide - *Plans and Arrangements for Managing Safety* (ARPANSA-GDE-1735, 2023). These plans require to demonstrate that appropriate arrangements are in place to maintain effective control, and should include a safety management plan, radiation protection plan, radioactive waste management plan, security plan, emergency plan, environmental protection plan and decommissioning plan. A Safety Analysis Report (SAR) is required for each stage of the facility. The SAR will demonstrate the appropriate application of defence in depth principles and that the plant, its processes, controls, activities, and the management of future modifications are in accordance with ARPANSA's regulatory requirements and conform to good engineering practice and to appropriate standards and codes. These requirements are to ensure that the operations of the facilities are adequately safe during normal operations and accident conditions. For preparing a site of such facility any environmental impact statement (however described) requested or required by a Commonwealth, State, Territory or local government agency in relation to the site or the facility, and the outcome of the environmental assessment is also required.



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.

Australian Government legislation and ARPANSA's licensing system require that the approval of a licence to operate is based on appropriate safety, health and environmental impact assessments and is conditional on the completion of a commissioning program demonstrating that the facility, as constructed, can be operated safely.

The Regulations require an applicant for an operating licence to specify the operational limits and conditions (OLC). Failure to comply with an OLC may be a breach of a condition of licence. ARPANSA continues to monitor that OLCs are derived from the SAR within the Safety Case. The licence holder must not make any change to the design or operation of the spent fuel facility that would invalidate the assumptions and conditions on which the current SAR is based without prior approval from ARPANSA. Operational limits and conditions derived from tests, operating experience and assessments must be defined and revised as necessary.

ARPANSA-GDE-1735 (ARPANSA, 2023) sets expectations on how to demonstrate that procedures for inspection, testing and maintenance are documented and implemented. The licence holder should also demonstrate that inspection, testing and maintenance throughout the life of the facility ensure the availability and reliability of systems at the levels mentioned in the SAR and avoid common cause failures.

The Regulations requires every licence holder to report any significant incident to ARPANSA within 24 hours of its occurrence. Guidance on reporting incident is provided on the ARPANSA website, including what constitutes a reportable incident:



- <https://www.arpansa.gov.au/regulation-and-licensing/licensing/information-licence-holders/radiation-incidents-and-reporting-notifiable-incident>

In addition, a licence holder is required to report the breach of any licence condition to ARPANSA within a reasonable time after the breach is first discovered.

Compliance is ensured through regular inspections by the regulatory authority. Under ANSTO's Business Management System and Work Health, Safety and Environment System, ANSTO collects and analyses data on operating experience, and acts upon that data where appropriate. Decommissioning plans for spent fuel management facilities are in place and will be reviewed and updated by ANSTO before submitting to ARPANSA for approval prior to decommissioning. ARPANSA expects that the operating organisation will progressively update the decommissioning plan throughout the life of the facility and that each separate application for authorisation under the ARPANS Regulations (siting, construction, operation and eventually decommissioning itself) will include a decommissioning plan. Each updated plan must take into account recent experience derived from international developments in decommissioning practice.

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.

As Australia has no plans to undertake the direct disposal of spent fuel, this provision has no current application to Australia.



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 so doing, 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.

Measures to address the general safety requirements in Article 11 are largely unchanged from those reported in the 2017 National Report. The legislative systems in place in Australia, described in *Section E: Legislative and Regulatory System* of this report, underpin the process of minimising the risk of harm to individuals, society and the environment from exposures to ionising radiation that result from the management of radioactive waste. In summary:

- ANSTO holds some radioactive wastes with fissile material associated with its production of molybdenum-99 for nuclear medicine. Criticality safety analysis is considered in the Safety Analysis Report as required by the ARPANS Regulations to demonstrate that sub-criticality is maintained by a suitable margin under conditions of normal operation and anticipated operational occurrences and accident conditions. ARPANSA routinely inspects these facilities to ensure compliance with the licence conditions and adherence to safety standards;
- In most jurisdictions, licensees are required to prepare plans for the management of waste, including the processes by which the generation of radioactive waste is minimised. ARPANSA *Safety Guide for the Predisposal Management of Radioactive Waste* (RPS 16, 2008) provides detailed guidance on methods of minimising waste generation both at the facility design stage and during operations. Waste minimisation practices undertaken in Australia include



segregation of wastes at the source (radioactive from non-radioactive) to reduce the potential for cross-contamination, processes to identify waste that meets the regulatory criteria for free-release, decontamination of large items to reduce the volume, and the separation of short-lived from long-lived wastes to allow for delay and decay;

- Interdependencies have been carefully considered in the development of RPS 16 (ARPANSA, 2008). The guidance includes consultation with responsible personnel and organisations;
- In addition to safety, safeguards requirements may apply to waste material containing uranium, plutonium or thorium. Australia is examining how the need to condition nuclear material into a practicably irrecoverable form (from a safeguards perspective) interacts with radiation protection principles such as waste minimisation;
- RPS 16 (ARPANSA, 2008) and ARPANSA-GDE-1735 (ARPANSA, 2023) advise that the radioactive waste management plan, safety assessment and management system should include consideration of the physical, chemical and/or biological characterisation of waste. These guides also advise that the design and operation of facilities for the predisposal management of radioactive waste should take into account any potential hazards due to non-radioactive physical, chemical or biological characteristics of the waste. Protection from non-radiological hazards should be provided in accordance with the relevant standards on health and safety and environmental protection;
- The RPS C-3 (ARPANSA, 2018) provides requirements for the safety case and supporting safety assessment which provide the basis for demonstration of safety and for authorisation. They will evolve with the development of the disposal facility, and will assist and guide decisions on its siting, design, operation and closure. It is expected that a site should have suitable geochemical and geotechnical properties in order to retard migration of radionuclides;
- As part of the application of the optimisation principle, RPS C-1 (ARPANSA, 2020) states that the risks to individuals in the case of potential exposures should be optimised, taking social and economic factors into account. This requirement extends not just to the current generation but also to future generations;
- ‘Burden on future generations’ is taken into account in the decision on whether or not to issue a licence to operate or use the facility, equipment or material. Some jurisdictions require that responsible persons must have adequate measures in place before they can acquire a radioactive source. These measures include an appropriate facility to store the source, measures in place to relocate or dispose of the radioactive source, return of sealed sources to the supplier as a condition of licence, and demonstration of the optimisation principle for the proposed application. Other jurisdictions have a strategy for the sustainable management of radioactive waste within their jurisdiction.

These systems are based on RPS C-1 (ARPANSA, 2020), which in turn is consistent with GSR Part 3 (IAEA, 2014) and ICRP Publication 103 (2007). RPS C-1 (ARPANSA, 2020) is in the process of being adopted into legislation by each jurisdiction. Some of the state and/or territory regulations predate the ICRP 103 recommendations and are not yet up to date with respect to current dose coefficients.



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.

In this report, the term ‘existing facilities’ is taken to refer to radioactive waste management facilities that were under regulatory control at the time the Joint Convention entered into force in Australia on 3 November 2003. Existing radioactive waste management facilities are licensed under 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 a review of safety reveal that a facility requires upgrading, licence conditions may be amended to instigate facility improvements.

The majority of ANSTO’s waste management facilities were in existence at the time the Joint Convention entered into force in Australia. These facilities, and any new facilities constructed since the Joint Convention entered into force for Australia, are subject to regulatory requirements including inspection and ongoing review for compliance (see Annex A – Inventory of Radioactive Wastes). All other existing storage facilities are currently under regulatory control in the appropriate jurisdictions.

A summary of existing facilities for disposal of radioactive waste including uranium mining and milling tailings in Australia is provided below.

Radium Hill

The Radium Hill Low-Level Radioactive Waste Repository in South Australia was operated by the South Australian Government from 1981 to 1998. The material disposed of at this repository was mostly NORM from mining and mineral processing operations conducted in South Australia. The site was registered as a premises under Section 29 of the South Australian *Radiation Protection and Control Act 1982* in 2003. The site is now licensed under section 29A of this Act as a facility containing unsealed radioactive substances resulting from past practices. Conditions were attached to the licence to provide for development of an appropriate long-term management plan for the site. A comprehensive risk assessment was completed in 2010. The assessment showed dose levels well below the public dose limit of 1 mSv/year. The repository is now closed.

Port Pirie

The site of the former Port Pirie Treatment Plant, also in South Australia, is a legacy site where radioactive tailings remain from the processing of uranium ore concentrate from the Radium Hill



uranium mine from 1954 to 1962. The site is also licensed under section 29A of the *Radiation Protection and Control Act 1982* as a facility containing unsealed radioactive substances resulting from past practices. Conditions on the licence provide for the development of an appropriate long-term management plan for the site.

Mt Walton East IWDF

The disposal of radioactive wastes at the Mt Walton East IWDF in Western Australia (Figure 4) has been regulated by the radiation regulator since 1992. The site was chosen based on criteria in the IAEA *Site Investigation for Repositories for Solid Radioactive Waste in Shallow Ground, Technical Report* (TECDOC-216, 1982). All aspects of the design, operational requirements, monitoring duties and responsibilities must comply with the Western Australian legislation, RPS C-3 (ARPANSA, 2018) and the NHMRC *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (RPS 35, 1992) while work continues to transition to requiring full compliance with RPS C-3 (ARPANSA, 2018).



Figure 4: The Mt Walton East Intractable Waste Disposal Facility in Western Australia.



Maralinga

The former British Atomic Weapons Test Site at Maralinga, South Australia, was rehabilitated through the 1990s. The organisation responsible for the ongoing management of the site was licensed by ARPANSA to possess and control radioactive material collected during the clean-up from 30 October 2000 until responsibility for regulating the site was transferred to the South Australian Government on 16 November 2009. The site is now licensed under Section 29A of the *Radiation Protection and Control Act 1982* as a facility containing unsealed radioactive substances resulting from past practices. The site is subject to the South Australian regulator's surveillance of environmental radiation and public radiation safety.

Ranger Uranium Mine

The Ranger Uranium Mine commenced operations in 1981, it ceased mining ore in 2012 and processing operations stopped in January 2021. Current activities focus solely on closure and rehabilitation of the Ranger Project Area. *The Atomic Energy Amendment (Mine Rehabilitation and Closure) Bill 2022* was passed to extend the rehabilitation timeframe of the Ranger Project Area from January 2026 for an indefinite time until it meets the criteria established for rehabilitation. Current project planning indicates that this will be after 2035.

Rehabilitation of the Ranger Project Area must comply with the Environmental Requirements of the *Atomic Energy Act 1953* (Cth). The Supervising Scientist Branch, established under the *Environment Protection (Alligator Rivers Region) Act 1978* (Cth), ensures the protection of the Alligator Rivers Region and local communities from the effects of uranium mining by conducting research, monitoring, participating in and overseeing the regulatory process and developing standards and practices for environmental protection. The Supervising Scientist Branch is required to ensure Energy Resources Australia (ERA) complies with the Environmental Requirements. Recently ERA have entered into an agreement with their largest shareholder, Rio Tinto, for Rio Tinto to manage the Ranger Rehabilitation Project.

In accordance with the *Ranger Uranium Project Agreement 1980* between ERA and the Commonwealth, ERA submits an Annual Plan of Rehabilitation, describes the plans and costing of progressive rehabilitation during operations. This is used to determine the securities amount to be held by the Commonwealth for Ranger rehabilitation obligations.

The *Mining Management Act 2001* requires ERA to provide a plan of closure as part of their Mine Management Plan. A Mine Closure Plan (MCP) is also a requirement under the Environmental Requirements.

Annex B of *Ranger Authorisation 0108-18* under the *Mining Management Act 2001* requires ERA to submit an updated Mine Closure Plan on or before 1 October each year. The plan describes rehabilitation and closure activities which have been completed in the preceding year, and details those planned for the forthcoming year demonstrating how closure activities will achieve the relevant Environmental Requirements. ERA have taken the decision to make their Mine Closure Plan publicly available through their website at <https://www.energyres.com.au/sustainability/closureplan>.



Review of past practices

In this report, the term ‘past practices’ is taken to refer to radioactive waste management facilities that were not under regulatory control at the time the Joint Convention entered into force in Australia on 3 November 2003.

Little Forest Legacy Site

From 1960 to 1968, the Australian Atomic Energy Commission (AAEC), ANSTO’s predecessor organisation, operated a near-surface (trench) disposal facility (Little Forest Legacy Site) near the boundary of the Lucas Heights site. Since its closure in 1968, this site has been continuously under care and maintenance, inspection, and monitoring by the AAEC and, subsequently, by ANSTO. Monitoring results are provided to ARPANSA in the biannual licence holder’s report. Ongoing monitoring has shown that there is minimal migration of radionuclides away from the disposal area. A medium-term management strategy is being implemented to ensure ongoing safety prior to determining the long-term strategy for managing and/or remediating the site. Assessment of options such as engineered caps, in-situ grouting, and exhumation and their effectiveness for medium to long-term management of the site has been undertaken. The selected option is an engineered cap which will control water ingress to the trenches.

A detailed scientific study of the site, including investigations of radionuclide migration, characterisation of soils, vegetation and geology and compilation of inventory records, has been continuing since the 2014 National Report, as part of an ongoing research project implemented by ANSTO. This project has been extended to evaluate the effectiveness of the engineered cap. The results of this work are being published in external ANSTO reports and in refereed scientific publications. Information on the research project of the LFLS, including background material, is available on ANSTO’s public website.

The site is licensed as a Prescribed Legacy Site by ARPANSA. A condition has been applied to the licence, requiring ANSTO to develop a medium to long-term plan for the site. To address this licence conditions ANSTO submitted a medium-term management solution, and ARPANSA approved the construction of multilayer engineered cap as part of medium-term management solution for Little Forest Legacy Site.

Australian Radium Laboratory, Parkville

Building 164 at the University of Melbourne, Parkville Victoria, was operated by the Australian Government as the Commonwealth Radiation Laboratory (CRL) from the late 1920s to the 1970s. The activities that were conducted at the CRL during this time resulted in legacy contamination. The building was demolished, and the site remediated during 2017 to 2019 under the regulatory oversight of Victoria. Low-level waste consisting of building materials and soil contaminated with radium is currently being stored by the Commonwealth at the ARPANSA Yallambie site awaiting disposal in a NRWMF.



Abandoned uranium mines

Several former uranium mines (including South Alligator Disposal Facility) in the Northern Territory and Queensland were abandoned in the past. Some of these sites have been rehabilitated. A summary of former uranium mine sites in Australia can be found in Figure 1.

Operations at the Rum Jungle Mine site in the NT between 1954 and 1971 produced uranium, copper, nickel and lead, which resulted in significant environmental impacts primarily due to acid mine drainage and heavy metal mobilisation. From 1983 to 1986, Rum Jungle was rehabilitated under an \$18.6 m cooperative agreement between the Commonwealth and the Northern Territory. The objectives included reduction of surface water pollution and public health hazards, including radiological hazards.

Between 1961 and 1963, the nearby former Rum Jungle Creek South Mine site was mined for uranium ore as part of the Rum Jungle operation. Between 1990 and 1991, hazard reduction works were successfully undertaken at the site to reduce potential radiological exposure to site visitors while maintaining its use as a recreational reserve.

The rehabilitation program at Rum Jungle met its original objectives, but gradual deterioration of the site's historic reclamation works has been documented over a number of years. The current environmental issues are primarily due to acid mine drainage and heavy metal mobilisation. Further funding has recently been provided to complete a final rehabilitation strategy, including design and costing, for the former Rum Jungle Mine site and to undertake maintenance of the waste rock cover material at the nearby former Rum Jungle Creek South Mine site.

Recognising Rum Jungle's social and cultural importance, quarterly consultation meetings are held with the site's traditional Aboriginal owners. Broad engagement of other stakeholders (e.g. environmental NGOs, the local Coomalie Council) also occurs on a regular basis.

In August 2013, the Commonwealth and NT Governments signed a new *Project Agreement for the Management of the Former Rum Jungle Mine Site (Stage 2)*.

The NT, through the Department of Industry, Tourism and Trade (DITT), project-manages staged rehabilitation activities at the Rum Jungle site. The department is currently working to complete stage 2B and preparing to enter stage 3 of the remediation plan. Activities under stage 2B include the establishment of a Kungarakana and Warai traineeship program, the commencement of revegetation works, soil treatment, weed and fire management, safety works and the ongoing environmental monitoring.

Detailed business case for stage 3 of the project was also developed and submitted to the Australian Government for funding consideration. Funding has subsequently been supported by Cabinet and was included in the 2021 Federal Budget announcement.

The stage 3 scope of work will include all physical site works to complete the planned rehabilitation of the site including:

- groundwater and surface water treatment;



- bulk earthworks to deconstruct existing waste rock dumps and reform storage facilities for chemically and physically safe long term storage;
- establishment of cover systems for new storage facilities;
- pit backfilling with lime amended rock and establishing cover system;
- realignment of water course and installation of erosion and sediment control features including fish passage features;
- establishment, operation, and closure of clean fill borrow pits;
- ecological restoration of site and surrounds including revegetation, weed, feral animals and fire management;
- supporting management of radiation, safety, environment, and cultural requirements;
- public road upgrades and modifications to support safety.

The full construction program is expected to be a 10-year program and will require a period of post-construction stabilisation and maintenance of the site alongside a long-term monitoring program to measure project success. It is likely that a post-construction stage 4 project will be required.

The Mary Kathleen mine in Queensland was commissioned in 1956 and closed in 1963, only to reopen in 1974 when another 4,800 tonnes of uranium oxide was mined from the pit. The mine was considered 'mined out' after the second campaign which ceased in 1982. The site then entered rehabilitation. The mine, processing plant, tailing storage facilities, evaporation ponds and the township were all decommissioned between 1982 and 1985, and the mining leases were relinquished in the late 1980s.

The site consists of an open cut pit, waste rock dumps, tailing storage facilities, evaporation ponds, and remnants of the processing plant and township. Studies have found some environmental issues including seepage of radioactive waters from the base of the tailings dam wall into the former evaporation ponds and local drainage system, and colonisation of rehabilitated areas with weed species.

Remediation is ongoing, and completed works include:

- a review to understand the environmental impact of the site;
- care and maintenance of residual infrastructure;
- initiation of an environmental monitoring survey;
- studies to determine the resource development potential of rare earth elements in the mine tailings;
- assessment of seepage management options for the tailing storage facilities.



Summary of former uranium mine sites in Australia

**1. Nabarlek**

Operated 1979 to 1988. Decommissioned 1994/5. Rehabilitation objectives agreed with Traditional Owners and supervising authorities; safe for traditional hunting and gathering activities to take place. A regular monitoring program is in place.

2. Rum Jungle

Operated 1954 to 1971. Rehabilitation from 1983 to 1986. Since this time there has been a gradual deterioration of the rehabilitation works therefore a project to review and improve the rehabilitation has commenced.

3. South Alligator Valley

13 uranium mines operated between 1954 and 1964. Ore transported to Rum Jungle for processing. Mix of open cut and shaft mines. Complete rehabilitation of some sites not undertaken due to need for additional funding, but as a priority, a program of physical and radiological hazard reduction was carried out for the safety of National Park users. Radiation doses do not exceed public exposure limits. Regular monitoring & surveillance program in place.

4. Mary Kathleen

Operated from 1956 to 1982. Decommissioning from 1982 to 1985. Rehabilitation started in 1982 and is on-going.

5. Radium Hill

Mined for radium between 1906 and 1931 and for uranium between 1954 and 1961. Rehabilitation undertaken in 1962 and again in 1981.

Figure 5: Summary of former uranium mine sites in Australia.



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.

Proposed radioactive waste management facilities require approval for siting according to the legislative and regulatory systems of the jurisdiction applicable to the site of the facility. If the site is to be operated by or on behalf of the Australian Government, then ARPANSA will be the regulator, regardless of the location.

In addition to the general requirements for licensing (see Article 19), the Regulations provide that an application for a siting licence must contain:

- a detailed site evaluation establishing the suitability of the site;
- the characteristic of the site, including the extent to which the site may be affected by natural and man-made events;
- any environmental impact statement prepared for the site (required by the *Environment Protection and Biodiversity Conservation Act 1999*).

ARPANSA-GDE-1795 (ARPANSA, 2022) and related guidance such as *ARPANSA Applying for a Licence for a Radioactive Waste Storage or Disposal Facility* (ARPANSA-GDE-1736, 2019), provides detailed guidance on meeting the requirement of the Regulations and relevant IAEA guidelines including the requirement to provide detailed information on:

- the site's seismology, geology, topography, demography, ecology, hydrology, and meteorology;
- the effect of nearby facilities and land usage;



- the availability and reliability of off-site services such as electricity, water, transportation, and communication systems;
- the feasibility of emergency response.

RPS C-3 (ARPANSA, 2018) provides site selection criteria and clear requirements for public consultation. The Code sets out the general characteristics of a site suitable for the establishment of a radioactive waste management facility, as well as describing site characteristics that will facilitate the long-term stability and provide adequate isolation of the waste. The site selection criteria include socio-economic, ecological and land use factors as well as natural physical characteristics of the proposed site.

ARPANSA Regulatory Guide - *Siting of Controlled Facilities* (ARPANSA-GDE-1756, 2014) was developed to assist in the preparation of an application for a siting licence. The guidance is applicable for the siting of nuclear or radiation facilities at new sites and for the collocation of new facilities at existing sites. Applying relevant lessons learned from the Fukushima Daiichi accident, the guidance emphasises the need to consider other nearby (collocated) on or off-site facilities which could potentially increase the risk to the public or the environment in emergency situations and which may also require local services, taking into consideration all interdependencies.

ARPANSA more recently has applied international best practice when assessing siting of proposed facilities, including ensuring alignment with SSR-1 (IAEA, 2019), including: (i) analysis of population and regional characteristics around the site for difficulties in implementing emergency response actions, and (ii) assessment of interactions between the site and installation for operational states and accident conditions, including those warranting an emergency response action.

The ARPANS Regulations stipulate that the CEO of ARPANSA may request any environmental impact statement requested or required by any Australian Government, state, territory or local government agency, and may take that into account in deciding whether to issue a facility licence authorising the preparation of a site. The CEO of ARPANSA may also request:

- a detailed site evaluation establishing the suitability of the site for the facility;
- the characteristics of the site, including the extent to which the site may be affected by natural and human events.

There is a separate national regulatory framework for protection of the environment established under the EPBC Act, which is binding on all jurisdictions. The definition of environment in the EPBC Act makes reference to people and communities as part of ecosystems and requires social and economic impacts, in addition to environmental impacts, to be considered. If a proposed action is referred to the Australian Government Minister for the Environment, and the Minister decides that the proposed action requires approval, an assessment process (including an environmental impact assessment) must be carried out.



Public consultation

Public consultation is required as part of the environmental approval process under the EPBC Act and the ARPANS Regulations. Licence applications to ARPANSA for the siting of a radioactive waste management facility are also subject to public consultation, if defined as a nuclear installation. This entails release of the application for public comment and the requirement for the CEO of ARPANSA to take into account the content of public submissions in deciding whether to issue a licence.

RPS C-3 (ARPANSA, 2018) requires the proponent and the regulatory body to consult with stakeholders to achieve the most informed decision and best practicable outcomes. This must include consideration of the health of impacted communities. RPS C-3 (ARPANSA, 2018) introduces and applies for the first time the World Health Organization's (WHO) definition of health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. This is a significant shift away from the traditional definitions of health relied upon by the radiation protection community both in Australia and internationally.

In 2022, an advisory note supporting RPS C-3 (ARPANSA, 2018) was published that provided an explanation of how the level of health protection should be optimised under prevailing circumstances, having regard to economic and societal factors. It is recognised that there are potential impacts on society that are not directly related to radiation exposure that need to be identified and considered in the optimisation process. This advisory note explores how the health and well-being of an involved community throughout all stages of a proposed Disposal Facility informs the processes of optimisation and decision making.

ARWA understands the importance of social licence to the success of any process for siting and operating a radioactive waste disposal facility and is developing a strategy for building and maintaining social licence for radioactive waste management activities.

Consultation with other Contracting Parties

Considering the geographical position and size of Australia, it is not foreseeable that waste management facilities in Australia would have impacts on other Contracting Parties (outside Australia) that would require consultation.



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.

Limiting possible radiological impacts

The design safety features of radioactive waste management facilities must consider the engineering and administrative controls that will be in place in these facilities to ensure that the radiological impact on the health and safety of people and environment is expected to be negligible. RPS C-3 (ARPANSA, 2018), RPS 16 (ARPANSA, 2008) and ARPANSA Advisory Note - *Dose and risk criteria for protection of people following the closure of a disposal facility for radioactive waste* (2019) provide guidance on design and performance expectations relevant to the waste processes, operations and activities and the criteria for protection of workers, the public and the environment.

RPS C-3 (ARPANSA, 2018) provides detail on the importance of passive means of achieving safety in the containment and isolation of the waste and the demonstration of defence in depth in the design of the disposal facility.

ARPANSA-GDE-1795 (ARPANSA, 2022) is structured to reflect and guide licence applicants to internationally accepted principles of defence in depth. The guide refers to the need for proven engineering practice and standards in the siting, design, manufacture, construction, installation, and commissioning of a nuclear installation.

Consideration of decommissioning/closure

Plans and other provisions for decommissioning a radioactive waste management facility must be developed at the design stage of a facility. These must be revised and updated as the facility moves through the licensing stages.

In the case of a near-surface disposal facility, RPS C-3 (ARPANSA, 2018) requires that prior to commencement of operations, the operator prepare draft or conceptual plans for closure and decommissioning of the facility and rehabilitation of the site, and that these plans be submitted for



approval. These plans must be reviewed, updated if appropriate, and resubmitted for approval as required by the regulator. Approval to cease operations must also be sought prior to the proposed closure date.

Validation of technologies used

ARPANSA licensing process requires the technologies incorporated in the design and construction of a radioactive waste management facility must be supported by proven design, experience, testing and analysis. For example:

- The design and construction of SyMo Facility (Synroc plant) incorporated proven technologies in the design that were developed through innovation, laboratory scale demonstrations, operating prototypes and use in other facilities. A full-scale demonstration plant of the front-end and back-end processes has been built to demonstrate, test and improve the processes, using non-radioactive material, as they will be configured in the operating facility. The SyMo facility is in the final stages of construction and cold commissioning has commenced;
- For a near-surface disposal facility, RPS C-3 (ARPANSA, 2018) requires that the structure be constructed in accordance with best engineering practice. In the case of uranium mining operations, RPS 9.1 (ARPANSA, 2015) requires the use of 'best practicable technology' as part of an approved Radioactive Waste Management Plan, to ensure the release of radioactive material is minimised and to provide for the protection of people and the environment from the possible harmful effects associated with mining and milling operations.

Article 15 Assessment of Safety of 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).

An assessment of the safety and environmental impact of a proposed radioactive waste management facility during the operational period must be approved before construction of a facility can commence. The assessment must be reviewed and updated prior to the operation of the facility. Regulators consider both safety and security when reviewing these assessments.



For example, ARPANS Regulations require that safety assessment of waste management facility is performed against the plans and arrangements described in ARPANSA-GDE-1735 (ARPANSA, 2023). These plans require to demonstrate that appropriate arrangements are in place to maintain effective control, and should include plans for safety management, radiation protection, radioactive waste management, security, emergency preparedness, environmental protection, and decommissioning. As part of a siting licence application, any environmental impact statement (however described) requested or required by a Commonwealth, State, Territory or local government agency in relation to the site or the facility, and the outcome of the environmental assessment, must be provided to ARPANSA.

In addition, a Safety Analysis Report (SAR) is required for each stage of the facility. The SAR should provide details of the site and facility, any hazards and risks associated with the facility, how the facility will be used and managed, and the controls that must be in place to mitigate the risks. The SAR should contain an analysis of the hazards associated with the operation of the facility and should demonstrate compliance with the regulatory requirements. It should also contain analyses of accidents and of the safety features incorporated in the design for preventing accidents or minimising the likelihood of their occurrence and for mitigating their consequences in accordance with the concept of defence in depth. These requirements are to ensure that the operations of the facilities are adequately safe during normal operations and accident conditions. Further details about the content of a SAR are provided in ARPANSA Regulatory Guide - *Preparation of the Safety Analysis Report for Non-Reactor Facilities* (ARPANSA-GDE-1925, 2021).

For disposal facilities, RPS C-3 (ARPANSA, 2018) requires a safety case and supporting safety assessment at all stages of authorisation. The safety assessment must consider the projected long-term integrity of the site after closure. The operator must remain responsible for the site and all necessary site rehabilitation work until the completion of the work has been approved by the regulator and the licence is surrendered. ARPANSA-GDE-1736 (ARPANSA, 2019) also address the requirement for provision of a safety case during the application process for a radioactive waste storage or disposal facility.



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.

In all jurisdictions, a licence to operate a radioactive waste management facility is required prior to operation of such a facility. The regulatory authority cannot grant the licence until, amongst other requirements, the proposed facility meets the requirements for design and construction, and an assessment of safety and environmental impact has been undertaken and approved.

For the Commonwealth, these requirements are presented in the ARPANSA-GDE-1736 (ARPANSA, 2019). Additional licence conditions can be imposed as required. For example, conditions can be imposed to cover the reporting of significant safety incidents to the regulatory authority. As indicated earlier, ANSTO facilities are subject to ongoing licensing processes under the ARPANS Act and to internal safety and environmental reviews in accordance with the requirements of the ANSTO management system.



All jurisdictions require that:

- Where appropriate, operational limits and conditions (OLCs) are derived from systematic safety assessments and/or safety analysis conducted for the facilities. These limits and conditions are to be derived from the safety analysis, which are consistent with the design and safety requirements. The OLCs aim to prevent situations arising that could lead to anticipated operational occurrences or accident conditions, and to mitigate the consequences of such events if they do occur. These operational limits and conditions are revised as necessary;
- Operation, maintenance, monitoring, inspection and testing 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 waste management facility. For example, ARPANSA has prepared regulatory guidance for use in the Commonwealth jurisdiction by applicants for licences for near-surface disposal facilities and storage facilities. The guidance advises that applicants should describe in detail the knowledge, skills and experience of the operator of the proposed facility for the initial campaign and the requirements that will be placed in operators for subsequent campaigns;
- Waste holders are responsible for the characterisation and segregation of radioactive waste. RPS 16 (ARPANSA, 2008) and RPS G-4 (ARPANSA, 2020) provides specific advice on the management of wastes typical of Australia's current waste inventory and on approaches to the characterisation and segregation of waste;
- Incidents significant to safety must be reported to the regulatory authority in a timely manner by the licence holder. In addition, ARPANSA maintains the Australian Radiation Incident Register. A radiation incident is defined in the NDRP as: 'Any unintended or ill-advised event when using ionising radiation apparatus, specified types of non-ionising radiation apparatus or radioactive substances, which results in, or has the potential to result in, an exposure to radiation to any person or the environment, outside the range of that normally expected for a particular practice, including an event resulting from operator error, equipment failure, or the failure of management systems that warranted investigation.'

The ARPANS Regulations requires every licence holder to report any significant incident to ARPANSA within 24 hours of its occurrence. In addition, a licence holder is required to report the breach of any licence condition to ARPANSA within a reasonable time after the breach is first discovered. ARPANSA guidance includes what constitutes a reportable incident, and is provided on the ARPANSA website: <https://www.arpansa.gov.au/regulation-and-licensing/licensing/information-for-licence-holders/reporting-an-accident>.

The regulatory authority in each jurisdiction conducts a risk-informed, routine program of radiation safety monitoring to assess a responsible person's compliance with the legislation and the required level of radiation safety. These monitoring activities may lead directly to investigations and inspections, followed by enforcement actions when breaches of the relevant legislation have been identified. ARPANSA-GDE-1735 (ARPANSA, 2023) set expectations on how to demonstrate that procedures for operation, inspection, testing and maintenance are documented and implemented. The licence holder should also demonstrate that inspection, testing and maintenance throughout the



life of the facility ensure the availability and reliability of systems at the levels mentioned in the SAR and avoid common cause failures.

Inspections and investigations are only conducted by an appointed inspector. Inspectors also have a number of prescribed powers, for example, issue of prohibition notices and improvement notices, seizure of radiation sources and the ability to take emergency actions.

The legislation in each jurisdiction contains reporting requirements on matters such as abnormal or unplanned exposure to radiation, out of control radiation sources, damage or malfunction of a radiation source, loss or theft of a radiation source, contamination by a radioactive substance, unintentional or accidental release of a radioactive substance, and any corrective actions taken.

ARPANSA-GDE-1735 (ARPANSA, 2023) set expectations for an operating organisation to have mechanisms:

- for assessment, verification and feedback, including through utilisation of independent reviews;
- to review and audit all activities important to safety and establish an ongoing safety assessment program;
- to learn lessons from operating experience and safety research from within the organisation and internationally;
- to analyse abnormal occurrences, incidents and safety performance of similar facilities worldwide;
- to ensure that results of periodic testing, maintenance and modifications, and emergency preparedness exercises are fed back into safety analyses, design modifications, procedures and quality assurance systems.

Collection and analysis of operating experience

In South Australia, the responsible persons conducting mining or mineral processing operations that are licensed under the *Radiation Protection and Control Act 1982* are required to provide the regulator with the results of periodic assessments and reviews of operational experience. Quarterly and annual reports are provided for uranium mining operations. These reports provide detailed information about waste management activities, including the qualities of wastes (both solid and liquid) in storage or disposed of during the relevant reporting period.

Preparation and update of decommissioning plans

RPS 16 (ARPANSA, 2008) and ARPANSA-GDE-1731 (ARPANSA, 2020) recommends that decommissioning be considered in the design of facilities to be used for the predisposal management of radioactive waste. The complexity of this consideration should be commensurate with the facility's size and operations. The guide advises that design options and operating practices that will facilitate



decommissioning should be chosen, and that a decommissioning plan that can be updated during the life of the facility should be prepared.

The ARPANS Regulations require licence applications to contain plans and arrangements to ensure the safety of a facility throughout all stages of its life, including a decommissioning plan. For a new facility, planning for decommissioning begins at the design stage, and the decommissioning plan needs to be prepared and maintained throughout the lifetime of the facility. ARPANSA-GDE-1925 (ARPANSA, 2021) and ARPANSA-GDE-1735 (ARPANSA, 2023) both provide guidance on the expected information on decommissioning plans including the provisions and measures considered in the facility's design, construction, commissioning and operation to facilitate decommissioning, information to demonstrate that an appropriate decommissioning plan has been prepared and will be maintained throughout the lifetime of the facility and that decommissioning can be accomplished safely and in such a way as to meet the defined end state.

Uranium mines and production facilities are required under code RPS 9.1 (ARPANSA, 2015) to submit a mine management plan (or equivalent) addressing all facets of mine management including decommissioning and site rehabilitation. The Code is applied as a condition of licence by jurisdictions.

For disposal facilities, RPS C-3 (ARPANSA, 2018) requires that closure is considered in the initial design of the facility. Before construction activities commence, there has to be sufficient evidence that the performance of backfilling, sealing and capping will function as intended to meet the design requirements. Plans for closure and seal or cap designs must be updated as the design of the facility is developed.

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.

RPS C-3 (ARPANSA, 2018) requires that:

- Detailed records of all waste consigned to and received at the facility be kept by the operator and the regulator. This must include the waste generator, the type of waste, the volume and weight of the waste packages, the chemical and physical form and concentration of radionuclides in the waste and details of any conditioning;



- All data from environmental and area monitoring at and around the facility must be retained along with details of any accidents and incidents and occupational dose records for all radiation workers, site records of disposal structures, the location and contents of waste packages or containers and details of backfilling and cover materials must be kept at least until the end of the institutional control period in two widely separated locations, one of which must be the government archives of the relevant jurisdiction;
- A program of surveillance involving site inspections and environmental monitoring be carried out during the institutional control period and that the historical records of the waste disposed are maintained. This includes the location and purpose of the disposal site being marked on land titles as caveats or mentions for the institutional control period;
- The perimeter fence and site markers must be maintained during the institutional control period.

The institutional control period can only end with the approval of the relevant regulatory authority. In addition, licence conditions may be imposed in certain instances. For example, conditions requiring post-closure environmental monitoring were imposed in the licence to possess the Maralinga atomic weapons test site subsequent to its rehabilitation.

Any unplanned release of radioactive materials into the environment that is detected during the institutional control period would trigger regulatory assessment of the resulting impact(s) followed by intervention measures and changes to the control procedures as required.

Records of the location, design and inventory of radioactive wastes at the former Radium Hill uranium mine and Port Pirie Treatment Plant sites will be preserved by the South Australian radiation regulator and the owner of the sites, the South Australian Government Department for Energy and Mines. Records relating to waste disposed at Maralinga are held by the Australian Government and can be accessed by the South Australian regulator.

As mentioned under Article 12, ANSTO has one closed facility (Little Forest Legacy Site – formerly the Little Forest Burial Ground) that was used for disposal of radioactive material between 1960 and 1968. This site is secure and undergoes regular monitoring for any contamination to the groundwater, airborne, and surface contamination. The monitoring results are publicly available through the ANSTO website and confirm that the site is being safely managed. Planning is underway to install an engineered multi-layer cap over the trenched area to minimise water infiltration as part of medium-term management solution for Little Forest Legacy Site.



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.



Requirements on import

Legislation restricting the import of radioactive substances, including waste, appears in Regulation 4R(2) of the *Customs (Prohibited Imports) Regulations 1956*.¹⁹

4R Importation of radioactive substances

- (2) The importation into Australia of a radioactive substance is prohibited unless:
- (a) a permission in writing to import the substance has been granted by the Minister for Health or an authorised officer; and
 - (b) the permission is produced to a Collector.

This Regulation defines ‘radioactive substance’ as any radioactive material or substance including radium, any radioactive isotope or any article containing any radioactive material or substance.

Permissions are normally granted by officers in ARPANSA who have been appointed by the Minister for Health. The Customs Regulations establishing the import control give the Minister the power to vary or revoke applications that have been granted by authorised officers. If the authorised officer has formed an opinion that the permission should not be granted, the application must be referred to the Minister for Health for the final decision, which may be to grant, or refuse to grant, the permission. There is no overlap or conflict of decision-making authority.

The *National Radioactive Waste Management Act 2012* only allows for the management of radioactive waste that is of domestic origin at the proposed NRWMF. This includes waste from the reprocessing overseas of spent fuel from the operation of Australian research reactors (HIFAR and OPAL).

Requirements on export

Australia has controls on the export of specific types of radioactive material and to certain destinations. In particular, authorisation is required from the relevant Australian Government minister in the following circumstances:

- For the export of radioactive waste to Pacific Island states;
- For the export of high activity sources as defined in the IAEA *Code of Conduct on the Safety and Security of Radioactive Sources* (IAEA/CODEOC/2004);
- For the export of fertile and fissile materials.

Australia’s *Customs (Prohibited Exports) Regulations 1958*²⁰ prohibit the export of most uranium and thorium source material, most special fissionable material and other fissionable materials (as set out

¹⁹ Federal Register of Legislation, [Customs \(Prohibited Imports\) Regulations 1956](#), Australian Government, accessed 5 June 2024.

²⁰ Federal Register of Legislation, [Customs \(Prohibited Exports\) Regulations 1958](#), Australian Government, accessed 5 June 2024.



in Schedule 7 to Regulation 9) without the prior written permission of the Minister administering the *National Radioactive Waste Management Act 2012*.

The export of radioactive waste to the Pacific Island Developing Countries is prohibited in Regulation 13G of the *Customs (Prohibited Exports) Regulations 1958* unless permission in writing to export the radioactive waste has been granted by the Minister administering the *National Radioactive Waste Management Act 2012*, taking into account the international obligations of Australia. The Regulation defines 'radioactive waste' as waste consisting of material that emits ionising radiation as a result of the spontaneous transformation of the nucleus of the atom but does not include material that has an activity concentration below 1 Bq/g or an activity below 1000 Bq.

Return to manufacturer

The Australian Government and state and territory jurisdictions allow the trans-boundary movement of disused sealed sources for return to the manufacturer. These movements must comply with all relevant legislative and regulatory requirements, and are covered by ARPANSA *Code of Practice for the Security of Radioactive Sources* (RPS 11, 2019) and the national ARPANSA *Code for the Safe Transport of Radioactive Material (Rev. 1)* (RPS C-2, 2019), which follows the IAEA *Regulations for the Safe Transport of Radioactive Material 2018 Edition* (SSR-6, 2018).



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 re-entry 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

Australia has strongly supported IAEA initiatives to explore synergies between the IAEA *Code of Conduct on the Safety and Security of Radioactive Sources* (IAEA/CODEOC/2004) and the Joint Convention.

Legislative requirements for dealing with disused sealed sources

The focus of Australia's legislative control over disused sealed sources is through a requirement on the owner of the source to have a confirmed arrangement with the supplier for the return of the source at the end of its useful life. Details of the requirements are described in the 2017 National Report.

Re-entry of disused sources

Sealed radioactive sources are refurbished in a number of jurisdictions and exported to other states/territories 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 management of sealed sources that are returned to them.



K. General Efforts to Improve Safety

IAEA 2023 IRRS Follow-Up Mission to Australia

ARPANSA hosted an IAEA Integrated Regulatory Review Service (IRRS) Mission to Australia in October 2023. The 2023 IRRS Mission was a ‘follow-up mission’ to the 2018 Mission, and reviewed progress against the 2018 Mission findings <https://www.arpansa.gov.au/regulation-and-licensing/regulation/independence/independent-review-of-regulatory-activities/integrated-regulatory-review-service>.

The IRRS missions reviewed Australia’s national, legal, and governmental framework for nuclear and radiation safety against IAEA Safety Standards. While Australia has an excellent track record in radiation safety, these missions presented an opportunity to ensure Australia continues to meet international best practice and ensure the health and well-being of Australians and our environment. The Australian IRRS missions also represented the IAEA's first full reviews of an entire federated system for nuclear and radiation safety, encompassing Australia’s nine Commonwealth, State and Territory regulators.

2018 IRRS Mission and 2023 Follow-up IRRS Mission Findings

The 2018 IRRS Mission identified 4 good practices, 23 recommendations and 12 suggestions for improvement. There were 19 findings related to work that spans across jurisdictions (national findings) and 16 that related to specific bodies (specific findings – 14 addressed to ARPANSA; and 2 to other bodies). Key recommendations and suggestions from the 2018 IRRS Mission in relation to radioactive waste management covered the areas of implementation strategy, facility decommissioning licencing and policy, financial provisions, clearance levels, and independent monitoring.

The 2023 IRRS follow-up mission recognised 16 recommendations and 10 suggestions as successfully addressed and closed. The 2023 IRRS follow-up mission also identified one new suggestion, a further 2 good practices, and 2 new suggestions.

The 2 good practices noted for Australia in 2023 are practices which the IAEA consider will help ‘lift the bar’ of international best practice. The first related to ARPANSA publishing the results of its self-assessment of leadership for safety and safety culture (undertaken in 2019) on its public-facing website. The second related to ARPANSA using the same incident management system for routine recording of health and safety incidents and for emergency response activities. This ensures that staff are familiar with the system and will be able to use it effectively to manage the response to a nuclear or radiological emergency. The 2023 IRRS Mission acknowledged, as well as the Covid-19 pandemic the impact of significant changes in Australia’s operating landscape (such as the announcement of AUKUS) on the progress of actions taken to address the 2018 IRRS findings.



While the 2023 IRRS Mission is the conclusion of the review cycle, work continues to achieve consistent approaches to radiation safety regulation across all Australian jurisdictions.

Actions taken by Australia

The 2023 IRRS mission recognised Australia's significant progress since 2018 in building a resilient and adaptable regulatory infrastructure for radiation safety, despite challenges such as the Covid-19 pandemic and significant changes to the federal policy landscape. Australian jurisdictions have continued to modernise radiation legislation or regulations to better reflect contemporary regulatory approaches.

The actions taken by Australia which address the recommendations and suggestions related to radioactive waste safety made in the 2018 IRRS mission include the following.

- ARWA was established in July 2020 as a branded function (division) of DISR, with the responsibilities of a national Radioactive Waste Management Organisation, to implement the policy principles and goals of the Australian Radioactive Waste Management Framework;
- ARWA have taken steps towards the development of a decommissioning strategy through a detailed Frazer-Nash 2021 report, *Decommissioning Nuclear Facilities in Australia: Scoping Paper for National Decommissioning Strategy*;
- The 2023-24 financial budget of the Australian Government provides significant funding to implement a responsible and sustainable approach for the long-term management and permanent disposal of the Commonwealth's radioactive waste. This funding includes ongoing support for ARWA to continue the development of the national policy and strategy for decommissioning of radioactive waste;
- A number of additions were included in the NDRP (ARPANSA, 2021):
 - A requirement for authorised persons ensures that adequate provisions (including financial provisions) are made to cover the cost of managing a disused radioactive source, and that jurisdictions have capacity to bear costs for orphaned source where other mechanisms have failed;
 - National values for exemption and clearance from GSR Part 3 (IAEA, 2014), enacted in all but one jurisdiction as of 2024.
- In addition, RPS C-6 (ARPANSA, 2018) has been implemented nationally, which provides permissible levels for the disposal of common radioactive sources by the user to conventional waste streams;
- Commonwealth Regulations have been updated to include a requirement for a decommissioning plan to be provided at all stages in the lifecycle of a facility (including siting and construction). The decommissioning plan is required to be periodically reviewed;
- ARPANSA Regulatory Guide - *Decommissioning of Controlled Facilities* (ARPANSA-GDE-1731, 2019) was updated in 2020. It outlines the expectations for managing safety during decommissioning and identifies instances whereby the licensee should update the decommissioning plan;



- Progress has been made by ANSTO on the decommissioning of its nuclear facilities. The Australian Government has provided funding to ANSTO to undertake decommissioning work, including decommissioning of the shutdown HIFAR reactor. ANSTO has sought approval for the decommissioning of HIFAR under the EPBC Act. This has been approved by the Department of Climate Change, Energy, Environment and Water (DCCEEW) and a decommissioning licence application for HIFAR was submitted to ARPANSA in May 2023.

Commitment to openness and transparency

Australia is strongly committed to openness and transparency in implementing its obligations under the Joint Convention. All of Australia's National Reports are available to the public on the ARPANSA website, along with other readily available relevant information. In this regard, Australia commits to the decision of the 3rd Extraordinary Meeting of the Contracting Parties (Vienna, May 2017) for the IAEA Secretariat to make publicly available each National Report, 90 days after the Review Meeting (unless a Contracting Party notifies the Secretariat otherwise).

Research and Innovation

Australian organisations are involved in several research projects regarding the long-term management of radioactive waste. Projects on the following topics are ongoing:

Waste characterisation and minimisation

A pilot-trial project to understand the composition of the radioactive material stored at Woomera in South Australia has been assessed and completed by CSIRO. The project will also investigate appropriate segregation and processing techniques in advance of a further project to process, treat and pre-condition the 9,726 drums of waste. 911 drums were characterised with approximately 50% of drums being deemed above the exempt threshold. No non-exempt waste was disposed of throughout the pilot trial.

As part of the Legacy Radiation Disposal and Consolidation Project, this project currently underway by CSIRO, to consolidate its waste stores to a single location and is investigating options to dispose of most of its waste holdings via appropriate disposal pathways.

Predisposal management

Synroc Technology is a waste treatment technology for the immobilisation of intermediate level liquid waste, which has been developed by ANSTO to manage liquid waste arising from its nuclear medicine production. This technology shall convert the liquid waste into a solid durable wastefrom product that is suitable for disposal, and rendering it low-risk and safe for disposal at a national repository. ANSTO is moving closer to full integrated cold commissioning of this technology.



Targeted research and development programs by ANSTO are ongoing to advance treatment technology for other intermediate level wasteforms. As part of this program, researchers have developed and implemented methods for the chemical and radiological characterisation of targeted intermediate-level wasteforms. Development includes verification of the chemical speciation and radiological source terms of its waste inventory using sampling techniques. This will provide engineering data that shall support an overall strategy for assessing waste treatment options and form part of the quality assurance program for a waste treatment facility.

Decommissioning

A novel radiation imaging technology, CORIS360®, which has been developed by ANSTO, can quickly identify and locate gamma emitting isotopes across a broad energy spectrum (40 Kev – 3 MeV) over a large 360° x 90° field of view. This technology has applicability in supporting both radioactive waste management and decommissioning activities.

Disposal methods

CSIRO, ANSTO and the US-based, SANDIA National Laboratories, created an international partnership to progress research, development and demonstration (RD&D) towards deep borehole disposal of Intermediate Level Waste (ILW) in Australia. The project aimed to demonstrate the technical feasibility of the long-term safety of borehole disposal of ILW in deep geological formations. The RD&D has delivered novel enabling tools that assist with site investigations, borehole design, and post-closure safety assessments. CSIRO has published a total of 21 peer-reviewed conference and journal papers between 2018 and 2022 on deep borehole disposal. Following completion of the initial concept phase, ARWA partnered with CSIRO for follow-up studies in which Deep Borehole Disposal is evaluated as one of several other potentially suitable geological disposal concepts - including conventional mined repositories - for Australia's ILW.

Construction of new facilities at ANSTO

ANSTO is finalising the construction of and, has begun cold commissioning of a new radioactive waste treatment facility (SyMo) to process (condition) intermediate level liquid wastes from radiopharmaceutical production into a solid and stable immobile form suitable for disposal. Since the 2020 National Report, ANSTO received approval from ARPANSA to start siting for a new intermediate level waste storage facility for solid waste. The new facility will provide at least an additional 10 years' worth of storage for intermediate level solid waste once complete. Currently ANSTO is investigating an additional inclusion to the building to hold legacy intermediate level liquid waste.

Impact of the COVID-19 pandemic

The COVID-19 pandemic posed a significant public health challenge, and measures were used to control outbreaks. These included travel and border restrictions, including international travel bans, mandatory quarantine requirements, the closure of state borders, intra-state movement restrictions for non-essential workers and in some instances lockdowns. There were mask and vaccine mandates



and the publication of guidelines on social distancing. Remote working was mandatory in most workplaces – including regulatory bodies and regulated entities – and this remains at a much higher level than was in place before the pandemic.

As many radiation safety regulatory bodies operate within the public health area, resources were impacted, including reassignment of staff. Travel for the purpose of regulatory inspection was very difficult in some jurisdictions, requiring regulators to pursue alternate methods including virtual inspections, and to focus on areas of highest risk. ARPANSA managed this period by proactively approaching the licensees and analysing the safety implications of their reported operations and restrictions. ARPANSA embraced communication and collaboration technology to perform the routine regulatory functions that previously were performed in-person. An example is the transition from in-person forums used to engage with licensees to an online forum performed from a studio with professional grade cameras and broadcasting equipment. Following the easing of COVID-19 infection rates, concerted efforts were made to undertake 'face-to-face' inspection campaigns to ensure that licensees had confidence that ARPANSA was monitoring compliance with radiation protection and nuclear safety requirements. ARPANSA now has more regular meetings and better engagement with licensees and other national and international groups

During the period where COVID-19 was a substantial concern, ARPANSA continued to undertake its statutory responsibilities and work in accordance with the organisational purpose of protecting people and the environment from harmful radiation. Although this period was challenging, the focus upon the greatest radiological risks was a reminder of the licensee's primary responsibility for safety and has left a lasting reminder of the importance of applying the graded approach in all regulatory activities.

Measures taken to address challenges and suggestions from the Seventh Review Meeting

Five challenges for Australia were identified at the Eighth Review Meeting:

- resourcing, skill recruitment and retention;
- establishing and implementing a national decommissioning policy;
- development of a national policy and strategy for disposal of ILW;
- establishment of the NRWFM as the process places a strong emphasis on community consent;
- achieving national uniformity of legislation and regulatory requirements for management of legacy sites across Australia.

While progress has been made since the previous National Report, these challenges remain an ongoing focus of effort for Australia, with the following significant advances observed below.



Resourcing, skill recruitment and retention

The Australian Government has made a significant commitment to fund a responsible and sustainable approach for the regulation, operation and the long-term management and permanent disposal of the Commonwealth's radioactive waste by providing ongoing resources to ARPANSA, ANSTO and ARWA.

There is high demand for skilled staff in the radiation protection and nuclear safety industry in Australia, therefore recruiting qualified staff is sometimes an issue due to a relatively small pool of qualified experts within Australia. Measures have been put in place to maintain training and professional development opportunities for younger or less experienced staff and to allow staff to attend courses, seminars and conferences as needed. Both ARPANSA and ANSTO now run graduate development programs, with ARPANSA's program re-commencing in 2023 and a number of staff are supported to complete graduate studies at Australian universities.

Since our last national report, a number of post-graduate courses related to radiation protection and nuclear engineering have also been established or expanded at Australian universities. These courses provide an opportunity for local graduates to gain critical skills and establish networks within the radiation protection and nuclear safety industry in Australia.

Development of a national policy and strategy for disposal of ILW

The DISR *Australian Radioactive Waste Management Framework* (2008, updated 2023) outlines the Commonwealth Government's approach to the long-term management of radioactive waste. The long-term policy is for disposal of LLW and ILW at a site separate to the NRWMF and ARWA is tasked with progressing this work following the establishment of the NRWMF. In its 2023-24 Budget, the Commonwealth Government committed its first ever funding to develop a pathway for the long-term disposal of Australia's intermediate-level radioactive waste generated from non-defence activities. The relevant reference is Page 166 of Commonwealth Government's *Budget 2023-24, Budget Paper No.2* (2023-24 Budget Paper No. 2, 2023).

Establishing and implementing a national decommissioning strategy

ARWA has taken steps towards the development of a decommissioning strategy through a detailed Frazer-Nash 2021 report on *Decommissioning Nuclear Facilities in Australia: Scoping Paper for National Decommissioning Strategy*. The 2023-24 financial budget of the Commonwealth Government provides significant funding to implement a responsible and sustainable approach for the long-term management and permanent disposal of the Commonwealth's radioactive waste. This funding includes ongoing support for ARWA to continue the development of the national policy and strategy for decommissioning of radioactive waste.

While the work to establish and implement a national decommissioning strategy is ongoing, Australia has continued to take steps to ensure that progress towards the safe decommissioning of existing facilities continues. This includes:



- An update of Commonwealth Regulations to include a requirement for a decommissioning plan to be provided at all stages in the lifecycle of a facility (including siting and construction). The decommissioning plan is required to be periodically reviewed;
- An update in 2020 of ARPANSA Regulatory Guide - *Decommissioning of Controlled Facilities* (ARPANSA-GDE-1731, 2019). It outlines the expectations for managing safety during decommissioning and identifies instances whereby the licensee should update the decommissioning plan;
- Progress has been made by ANSTO on the decommissioning of its nuclear facilities. The Australian Government has provided funding to ANSTO to undertake decommissioning work, including decommissioning of the shutdown HIFAR reactor. ANSTO has sought approval for the decommissioning of HIFAR under the EPBC Act. This has been approved by the Department of Climate Change, Energy, Environment and Water (DCCEEW) and a decommissioning licence application for HIFAR was submitted to ARPANSA in May 2023.

Establishment of the NRWMF, as the process places a strong emphasis on community consent

This remains an ongoing challenge for Australia. Under the *National Radioactive Waste Management Act 2012*, a national radioactive waste facility will only be established where it is accepted by a willing host community. See Section C. Policies and practices – Radioactive Waste Management Practices for more information.

Achieving national uniformity in regulating management of legacy sites across Australia

Australia has in place a guide on existing exposure situations based on GSR Part 3 (IAEA, 2014) requirements. This ARPANSA *Guide for Radiation Protection in Existing Exposure Situations* (RPS G-2, 2017) has been implemented by all jurisdictions (Commonwealth, States and Territories) and forms a suitable basis for the site-specific management of legacy sites in Australia. RPS G-2 (ARPANSA, 2017) has an established comprehensive framework that addresses existing exposure situations including the methodology to be used for the identification of legacy sites, the establishment of appropriate reference levels and explaining their application to stakeholders. RPS G-2 (ARPANSA, 2017) also addresses the transition from an emergency situation to an existing exposure situation and the strategies for effective management of legacy situations. Australia was one of the first Member States to do this in national guidance. In addition, the ARPANS Act provides the CEO of ARPANSA with the power to bring legacy sites under regulatory control.

Suggestions

Australia received one suggestion to address at the Eighth Review Meeting, which was ‘Developing a comprehensive assessment of nuclear and radioactive installations and liabilities for decommissioning planning’.

Australia does not currently treat liability for damage caused by nuclear activities any differently from how it deals with liability for damage caused by any other activity (that is, Tort Law applies) and,



therefore, in the current circumstances, release of an installation from regulatory control will not affect how liability will attach for harm caused by the facility either before or after such release. Consequently, Australia does not consider there will be any significant benefit for decommissioning planning achieved by undertaking such an assessment.

Overarching issues from the Seventh Review Meeting

During the Seventh Review Meeting, the Contracting Parties identified several overarching issues during the Country Group discussions. Some of these issues had already been identified at the Sixth Review Meeting and continue to be overarching issues. Australia continues to prioritise our efforts to address the overarching issues identified at the previous review meetings. Australia has worked towards addressing these overarching issues. Details can be found within the Eighth National Report for Australia as indicated below:

- Inclusive public engagement on radioactive waste management and on spent fuel management programs (see Section F: Article 26 – Decommissioning);
- Funding of long-term projects (see Section F: Article 22 - Human and Financial Resources);
- Legacy wastes linked to decommissioning and remediation projects (see Section K: Research and Innovation).

Proposed Good Practices and Areas of Good Performance

The following proposed good practices and areas of good performance have been identified by Australia:

- The Australian Government has made a substantial ongoing commitment and investment of resources and funding into Australia’s radioactive waste management program across the Commonwealth regulatory body (ARPANSA), operator (ANSTO) and newly-established waste management organisation (ARWA) which is mandated to develop a comprehensive national waste policy and strategy which is fit for purpose for Australia’s changing operating landscape.
- ARPANSA has taken steps to apply the WHO definition of Health, ‘Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’, when considering health protection of individuals and communities. These steps include applying this definition of health in the ARPANSA *Code for Disposal Facilities for Solid Radioactive Waste* (RPS C-3, 2018) and the publication of the supporting Advisory Note (ARPANSA, 2022) that provides guidance on how the level of health protection (as defined by the WHO) should be optimised when siting a waste disposal facility. Traditionally, the focus of radiation protection has been to protect people from the established, physical health effects of radiation. This application of the WHO definition of health recognises that there can be impacts on society from radioactive waste management and spent fuel management in addition to physical health impacts of radiation exposure, which should be identified and considered in the optimisation process.



L. Annexes

Annex A – Inventory of Radioactive Wastes

The following inventory of radioactive waste held in Australian storage and disposal facilities is provided by the relevant regulatory authorities with responsibility for maintaining the inventories of radioactive waste in their jurisdictions. Volumes of sealed sources, sources of unknown activity and sources of unknown radionuclides are not included. Where possible, the activities of waste with mixed radionuclides have been apportioned to individual nuclides. In all cases, if the date of activity measurement was unknown, it was conservatively assumed that the activity was for the date the information was provided and updated as appropriate for the given reference date in the following tables.

Inventory of disused sealed sources held in Australian storage facilities:

Site: Australian Capital Territory

Activity Reference Date: 01/11/2023

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	720*	unknown*
Am-241/Be	1	1.67E+00
Cd-109	7	3.4E-11
Co-60	22	4.3E-05
Cs-137	10	2.0E+00
Fe-55	12	6.3E-05
Kr-85	20	2.3E-01
Ra-226	3	7.2E-04
Sr-90	6	4.0E+00
U (nat)	3	7.1E-04

* smoke detectors



Site: Northern Territory

Activity Reference Date: 29/02/2024

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	64	3.81E-01
Am-241/Be	3	1.06E+02
C-14	3	3.89E-05
Co-60	5	4.48E-03
Cs-137	5	2.03E-01
H-3	10	2.56E+02
Sr-90	4	1.80E+00

Site: Commonwealth (ANSTO)

Activity Reference Date: 15/11/2023

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	457	2.7E+00
Am-241/Be	16	3.1E+02
Ba-133	19	1.0E-04
Bi-207	2	1.2E-04
C-14	7	1.0E-04
Cd-109	1	0.0E+00
Cl-36	6	1.1E-02
Co-56	2	0.0E+00
Co-57	28	1.5E-05
Co-60	1777	2.8E+05
Cs-134	1	1.8E-10
Cs-137	170	1.4E+04
Eu-152	8	6.5E-04
Eu-154	4	1.6E-05
Ge/Ga-68	9	2.0E-05
Hg-203	6	0.0E+00



Radionuclide	Number of Sources	Total Activity (GBq)
Ho-166m	5	1.5E-02
Ir-192	2	0.0E+00
Mn-54	8	0.0E+00
Na-22	20	1.7E-07
Pb-210	9	2.6E-06
Pm-147	2	0.0E+00
Po-210	1	1.7E-04
Pu-238, Pu-239, Pu-241	54	1.6E+02
Ra-226	14	1.7E-02
Ra-226/Be	5	2.1E+01
Sr-90	181	2.4E-01
Sr-90, Y-90	35	1.0E-03
Tc-99	3	8.8E-04
Th-228	2	0.0E+00
Th-230	2	4.1E-07
Th-232	10	4.1E-04
Tl-204	3	0.0E+00
U-235	5	4.1E-05
U-238	1	1.8E-05
Y-88	6	0.0E+00
Zn-65	1	0.0E+00

Note: ANSTO has an obligation to take back and manage sources from past manufacturing activities. These are collected and stored as disused sources. In addition, a large number of Am-241 sources were identified since the previous reporting period as no longer required and were moved to waste. Simultaneously, the number of waste sources ANSTO manages decrease as they decay and are disposed of as non-radioactive materials. A program of disused source re-characterisation has also resulted in sources that had previously been grouped together, now being identified individually. Characterisation, rationalisation and accounting improvement activities will continue to support future disposal activities and as such, these number are expected to fluctuate year on year.



Site: Commonwealth (ARPANSA)

Activity Reference Date: 28/02/2024

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	2	1.77E+01
Am-241/Be	1	1.06E+00
Co-60	7	1.36E-01
Cs-137	19	5.72E+01
Kr-85	1	7.19E-03
Ra-226	18	7.32E+00
Ra-226/Be	2	6.40E-01
Sr-90	10	7.51E-01
Tl-204	3	2.05E-04

Site: Commonwealth (CSIRO)

Activity Reference Date: 29/11/2023

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	32	8.72E+01
Am-241/ Be	13	9.88E+02
Am-241/ Li	1	2.84E+01
Ba-133	18	7.59E-01
Bi-207	1	0.00E+00
Bi-210	1	0.00E+00
C-14	2	0.00E+00
Cf-252	3	2.85E+00
Co-60	23	1.63E+00
Cm-244	6	1.56E+00
Cs-137	26	1.46E+00
Eu-152	1	1.11E-04
Fe-55	2	4.42E-02
H-3	1	1.86E-01



Radionuclide	Number of Sources	Total Activity (GBq)
I-129	4	3.18E-02
Kr-85	6	7.32E+00
Ni-63	16	6.24E+00
Pb-210	1	0.00E+00
Pu-238	5	5.76E+00
Pu-238/Be	1	2.04E+02
Pu-239	2	7.84E-03
Pm-147	1	1.50E-04
Ra-226	76	2.68E+01
Ra-226/Be	5	1.47E+00
Sr-90	14	2.85E+00
Th-232	2	3.82E-03
Sn-119m	1	0.00E+00
Mixed groups/miscellaneous sources and unknown radioisotope sources	3	1.39E+01

Note: As of mid-2019, CSIRO provisioned funding to consolidate and dispose of its radiation waste holdings via appropriate disposal pathways. CSIRO’s current inventory of radioactive sources has significantly reduced as part of this project and will continue to be consolidated and disposed of via appropriate disposal pathways. As of November 2023, CSIRO is in the process of working with ANSTO to decommission one of the stores, disposing of waste through appropriate pathways and consolidating the remaining waste at a consolidated waste store.



Site: New South Wales

Activity Reference Date: 28/11/2022

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	161	unknown
C-14	19	unknown
Cd-109	1	unknown
Cm-244	2	unknown
Co-60	83	1.80E-01
Cs-137	50	2.42E+02
Eu-152	9	1.80E-04
Fe-55	2	unknown
Gd-153	4	unknown
H-3	6	unknown
Kr-85	2	6.67E+03
Na-22	8	unknown
Ni-63	6	unknown
Pb-210	1	unknown
Pu-238	27	1.5E-02
Pu-239	2	unknown
Ra-226	89	1.18E+01
Sr-90	289	5.07E+01
Th-232	1	unknown
Tl-204	12	1.99E-05
U-238	6	unknown
U (depleted)	1	1.60E-02
U (natural)	1	unknown



Site: Queensland

Activity Reference Date: 1/11/2023

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	125	1.9E+01
Am-241 (ICSDs)	3380	7.0E+00
Am-241/Be	62	4.9E+02
Ba-133	19	4.3E-02
Bi-207	3	3.3E-02
C-14	26	4.3E-01
Cd-109	3	3.2E-06
Cl-36	5	8.1E-05
Cm-244	1	2.5E-01
Co-60	242	2.4E-01
Cs-137	202	3.8E+03
Eu-152	6	1.4E+01
Fe-55	7	3.5E-03
Ge-68	1	4.7E-05
H-3	101	3.4E+03
Ho-166m	1	4.9E-05
I-129	4	9.2E-06
Kr-85	1	2.9E-02
Na-22	10	1.8E-02
Ni-63	14	4.6E+00
Pb-210	24	6.9E-03
Pm-147	9	4.0E-05
Po-210	5	3.7E-06
Pu-238	6	4.9E+00
Pu-239	2	3.7E-06
Ra-226	310	1.3E+02
Ra-226 (ICSDs)	222	8.1E-02
Ra-226/Be	5	9.7E-01
Sr-90	227	3.4E+01



Radionuclide	Number of Sources	Total Activity (GBq)
Tc-99	1	1.4E-06
Th-232	6	6.0E-04
Th (nat)	4	7.4E-04
Tl-204	20	8.9E-05
U-233	1	3.4E-02
U (depleted)	9	8.9E-01
U (nat)	4	1.9E-04

Site: South Australia

Activity Reference Date: 1/11/2023

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	15	1.79E+01
Am-241	1400*	3.6E-02
Am-241/Be	10	4.07E+02
Am-241 (Am/Be), Cs-137	1	1.10E+00
Ba-133	3	3.28E-05
Cf-252	1	2.70E-02
Co-60	3	1.15E+00
Cs-137	28	4.22E+01
H-3	8	1.30E-04
Pu-238	5	5.66E-07
Pu-239	3	2.15E-07
Ra-226	19	3.72E-02
Sr-90	5	2.00E+00
Th-232	11	2.34E-07

* *smoke detectors*



Site: Tasmania

Activity Reference Date: 11/1/2024

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	94*	5.33E+01
Cm-244	3	5.92E+0
Co-57	1	unknown
Co-60	2	2.43E-01
Cs-137	51	6.63E+01
Gd-53	1	unknown
Ir-192	4	2.48E+01
H-3	4	5.3E+01
I-125	1	4.5E+0
I-129	3	8.43E-6
Pu-238	4	9.44E+0
Ra-226	47	1.45E+1
Sr-90	12	1.39E+01
Tl-204	1	7.4E-2

* 10 Sources listed as Am-241 are sealed custom constructed type A containers. Each container holds numerous Am-241 foils.



Site: Victoria

Activity Reference Date: 22/04/2024

Radionuclide	Number of Sources	Total Activity (GBq)
Am-241	83	3.25E+02
Am-241/Be	15	2.08E+02
Ba-133	12	3.40E-02
Bi-207	1	1.56E-04
C-14	2	7.39E-06
Cd-109	3	3.74E-12
Cf-252	1	2.11E-02
Co-60	182	1.62E-01
Cs-137	131	1.89E+02
H-3	45	1.62E+02
I-129	1	3.70E-06
Ir-192	1	1.79E-17
Kr-85	27	3.86E+01
Ni-63	8	4.41E-01
Pb-210	3	1.71E-04
Pm-147	5	1.27E-06
Po-210	0	0.00E+00
Pu-238	1	2.94E-07
Ra-226	146	1.36E+01
Ra-226/Be	2	5.44E-01
Ru-106	2	0.00E+00
Sr-90	168	1.79E+01
Th-232	11	7.26E-02
Tl-204	33	1.78E-01

Note: The number of sources has changed significantly since the previous report following a recent review and reclassification of sources in storage. The previous report classified sources as disused sealed sources that were in fact disused unsealed sources and vice versa. In addition, the previous report also considered a package containing multiple sources to be one single source. Each of the sources in these packages is now counted separately.



Inventory of disused sealed sources disposed of at Mt Walton East Intractable Waste Disposal Facility, Western Australia

Activity Reference Date: 1/07/2011

Radionuclide	Number of Sources*	Total Activity (GBq)
Am-241	2732	7.4E+01
Am-241/Be	5	8.2E+00
Ba-133	10	3.5E-02
C-14	1	8.3E-03
Cf-252	1	6.4E-04
Co-60	55	2.3E+00
Cs-137	142	2.6E+02
H-3	2810	4.4E+05
Ni-63	5	1.5E+00
Ra-226	21	5.8E+00
Ra-226/Be	3	5.7E-01
Sr-90	12	3.5E+00
Th-232	12	1.2E-02
Tl-204	3	1.1E-02

* The records that are available for more recent disposal campaigns are more detailed than those for earlier campaigns.



In addition, 25 multi-radionuclide sources at the Mt Walton facility contain the following combined total activity, with the same reference date as provided above:

Radionuclide	Total Activity (GBq)
Am-241	8.3E+00
C-14	7.0E-06
Co-60	1.1E+01
Cs-137	6.1E+01
H-3	6.3E+03
Ra-226	9.2E-02
Sr-90	2.2E-05
Tl-204	5.9E-06

Inventory of unsealed radioactive waste

Uranium Mining and Milling Sites

Jurisdiction	Site Name	Volume (m ³)	Mass (Mt)
Northern Territory	Ranger	28400000	
South Australia	Beverly	13640	
South Australia	Honeymoon	1735	
South Australia	Pt Pirie	120000	
South Australia	Radium Hill	250200	
South Australia	Olympic Dam	392,515,729	218.1

Disposal Sites

Jurisdiction	Site Name	Volume (m ³)
Commonwealth	ANSTO - Little Forest Legacy Site	1718
Commonwealth	South Alligator Disposal Facility	22000
South Australia	Maralinga	432000
Western Australia	Mt Walton East IWDF	124
Western Australia	Sandy Ridge Facility	2875*

* Inventory of actually disposed of up to 1/11/2024.



Storage Sites

Jurisdiction	Site Name	Suitable for near-surface disposal	Volume (m3)
Commonwealth	CSIRO - Woomera	*	2100
Commonwealth	CSIRO	yes	6
Commonwealth	CSIRO	no	3.3
Commonwealth	ARPANSA	yes	43.3
Commonwealth	ARPANSA	no	1.6
Commonwealth	ANSTO - Lucas Heights	yes	2261
Commonwealth	ANSTO - Lucas Heights	no	597
Australia Capital Territory	Store	no	0.01
New South Wales	Store	yes	5.46
New South Wales	Store	no	7.12
Queensland	QRWS	no	0.6
Queensland	QRWS	yes	2.4
Northern Territory	NTIWSF	yes	1
South Australia	EPA Store	yes	5
Victoria	VGISF	yes	11.9
Tasmania	Interim Store 14 Registered Stores	Yes no	0.6** Not assessed***

* Note: The waste stored at Woomera Prohibited Area (WPA) requires characterisation, treatment and pre-conditioning. Based on data obtained during the pilot trial for waste remediation, CSIRO now estimates that the amount of LLW was approximately 49.4% from the 911 drums tested (in the store of almost 10,000 drums). There is no current indication that there is any ILW at the CSIRO WPA storage site.

** All sources in the Tasmanian interim store are packaged to comply with the requirements for 'Type A packages'. Volumes stated reflect the total volume of the 20 litre dangerous goods drums in which the sources are packaged (30 drums approximately, each at 20 litres).

*** There are also 14 registered stores at industrial sites where sealed sources are held awaiting disposal. These stores are registered under the Radiation Protection Act 2005 and are assessed and certified by third party accredited person. Disposal is typically by return to supplier. Numbers of stores and sources vary from time to time depending on source age and return to supplier requirements.



Annex B – References to National Laws, Regulations, Standards, etc.²¹

Australian Government

- **Atomic Energy Act 1953;**
- **Australian Nuclear Science and Technology Organisation Act 1987;**
- **Australian Radiation Protection and Nuclear Safety Act 1998 (No. 133);**
- **Australian Radiation Protection and Nuclear Safety Regulations 2018;**
- Australian Radiation Protection and Nuclear Safety Agency. *Code of Practice and Safety Guide: Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing*. Radiation Protection Series No. 9 (RPS 9, 2005);
- Australian Radiation Protection and Nuclear Safety Agency. *Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM)*. Radiation Protection Series No. 15 (RPS 15, 2008);
- Australian Radiation Protection and Nuclear Safety Agency. *Safety Guide for the Predisposal Management of Radioactive Waste*. Radiation Protection Series No. 16 (RPS 16, 2008);
- Australian Radiation Protection and Nuclear Safety Agency. *Fundamentals for Protection against Ionising Radiation*. Radiation Protection Series F-1 (RPS F1, 2014);
- Australian Radiation Protection and Nuclear Safety Agency. *Regulatory Guide - Siting of Controlled Facilities v2 (ARPANSA-GDE-1756, 2014);*
- Australian Radiation Protection and Nuclear Safety Agency. *Guide for Radiation Protection in Existing Exposure Situations*. Radiation Protection Series G-2 (RPS G-2, 2017);
- Australian Radiation Protection and Nuclear Safety Agency. *Code for Disposal Facilities for Solid Radioactive Waste*. Radiation Protection Series C-3 (RPS C-3, 2018);
- Australian Radiation Protection and Nuclear Safety Agency. *Code for Disposal of Radioactive Waste by the User*. Radiation Protection Series C-6 (RPS C-6, 2018);
- Australian Radiation Protection and Nuclear Safety Agency. *Code for the Safe Transport of Radioactive Material*. Radiation Protection Series C-2 (Rev. 1) (RPS C-2, 2019);
- Australian Radiation Protection and Nuclear Safety Agency. *Guide for Radiation Protection in Emergency Exposure Situations*. Radiation Protection Series G-3 (RPS G-3, 2019);
- Australian Radiation Protection and Nuclear Safety Agency. *Regulatory Guide - Applying for a Licence for a Radioactive Waste Storage or Disposal Facility (ARPANSA-GDE-1736, 2019);*
- Australian Radiation Protection and Nuclear Safety Agency. *Code of Practice for the Security of Radioactive Sources*. Radiation Protection Series No. 11 (RPS 11, 2019);

²¹ Principal instruments appear in bold type.



- Australian Radiation Protection and Nuclear Safety Agency. *Code for Radiation Protection in Planned Exposure Situations*. Radiation Protection Series C-1 (Rev.1) (RPS C-1, 2020);
- Australian Radiation Protection and Nuclear Safety Agency. *Guide for Classification of Radioactive Waste*. Radiation Protection Series G-4 (RPS G-4, 2020);
- Australian Radiation Protection and Nuclear Safety Agency. Regulatory Guide - *Decommissioning of Controlled Facilities* (ARPANSA-GDE-1731, 2020);
- Australian Radiation Protection and Nuclear Safety Agency. Advisory Note: *Dose and risk criteria for protection of people following the closure of a disposal facility for radioactive waste* (2020);
- Australian Radiation Protection and Nuclear Safety Agency. *National Directory for Radiation Protection* (2nd Edition, 2021) (NDRP, 2021);
- Australian Radiation Protection and Nuclear Safety Agency. Advisory Note: *Consultation and engagement on public health: considerations for siting, construction and operation of a radioactive waste disposal facility* (2022);
- Australian Radiation Protection and Nuclear Safety Agency. Regulatory Guide - *Plans and Arrangements for Managing Safety* (ARPANSA-GDE-1735, 2023);
- **Customs (Prohibited Exports) Regulations 1958;**
- Department of Industry, Science, Energy and Resources. *Australian Radioactive Waste Management Framework* (2018);
- **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 near-surface disposal of radioactive waste in Australia*. Radiation Health Series No. 35, 1992 (RPS 35, 1992);
- **National Radioactive Waste Management Act 2012 (No. 29);**
- National Road Transport Commission and Federal Office of Road Safety. *Australian Dangerous Goods Code*. 6th ed., 1998;
- **Nuclear Non-Proliferation (Safeguards) Act 1987.**

Australian Capital Territory

- **Radiation Protection Act 2006;**
- **Radiation Protection Regulation 2007;**
- **Work Health and Safety Act 2011;**
- **Work Health and Safety Regulation 2011.**



New South Wales

- *Contaminated Land Management Act 1997;*
- *Environmental Planning and Assessment Regulation 2000;*
- *National Parks and Wildlife Regulation 2019;*
- *Work Health and Safety Act 2011;*
- *Work Health and Safety Regulation 2017;*
- *Protection of the Environment Operations Act 1997;*
- *Protection of the Environment Operations (Waste) Regulation 2014;*
- *Radiation Control Act 1990;*
- *Radiation Control Regulation 2013;*
- *Dangerous Goods (Road and Rail Transport) Act 2008;*
- *Dangerous Goods (Road and Rail Transport) Regulation 2014;*
- *Uranium Mining and Nuclear Facilities (Prohibitions) Act 1986;*
- *Waste Avoidance and Resource Recovery Act 2001.*

Northern Territory

- *Dangerous Goods Act 1998;*
- *Mining Management Act 2001;*
- *Radiation Protection Act 2004;*
- *Radiation Protection Regulations 2007;*
- *Nuclear Waste Transport, Storage and Disposal (Prohibition) Act 2004;*
- *Radioactive Ores and Concentrates (Packaging and Transport) Act 1980;*
- *Radioactive Ores and Concentrates (Packaging and Transport) Regulations 1980;*
- *Work Health and Safety (National Uniform Legislation) Act 2011;*
- *Work Health and Safety (National Uniform Legislation) Regulations 2011.*

Queensland

- *Radiation Safety Act 1999;*
- *Radiation Safety (Radiation Safety Standards) Notice 2010;*
- *Radiation Safety Regulation 2010;*
- *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;*



- *Nuclear Facilities Prohibition Act 2007;*
- *Environmental Protection Act 1994;*
- *Planning Act 2016;*
- *Public Safety Preservation Act 1986;*
- *Transport Operations (Road Use Management) Act 1995;*
- *Waste Reduction and Recycling Regulation 2023;*
- *Work Health and Safety Act 2011;*
- *Mining and Quarrying Safety and Health Act 1999;*
- Queensland Department of Natural Resources and Mines *QGL 1 Guideline for Management of Naturally Occurring Radioactive Material (NORM) in Metalliferous Mines (QGL 1, 2014).*

South Australia

- *Radiation Protection and Control Act 2021;*
- *Radiation Protection & Control Regulations 2022;*
- *Nuclear Waste Storage Facility (Prohibition) Act 2000;*
- *Mining Act 1971;*
- *Roxby Downs (Indenture Ratification) Act 1982;*
- *Maralinga Tjarutja Land Rights Act 1984;*
- *Mines and Works Inspection Act 1920;*
- *Environment Protection Act 1993;*
- South Australia Environment Protection Authority *Code of Compliance for Radiation Management Plans (COC-1, 2022);*
- South Australia Environment Protection Authority *Code of Compliance for Facility Design and Shielding (COC-2, 2022);*
- South Australia Environment Protection Authority *Code of Compliance for Medical, Veterinary and Chiropractic X-ray Apparatus (COC-3, 2022);*
- South Australia Environment Protection Authority *Code of Compliance for Dental X-ray Apparatus used for Plain, Panoramic and Cephalometric Radiography and Cone-Beam Computed Tomography (COC-4, 2022);*
- South Australia Environment Protection Authority *Code of Compliance for Radiation Therapy Apparatus (COC-5, 2022);*
- South Australia Environment Protection Authority *Code of Compliance for Apparatus used for Borehole Logging (COC-6, 2022);*



- South Australia Environment Protection Authority *Code of Compliance for Labelling and Signage of Ionising Radiation Sources* (COC-7, 2022).

Tasmania

- *Radiation Protection Act 2005*;
- *Radiation Protection Regulations 2016*;
- *Environmental Management and Pollution Control Act 1994*.

Victoria

- *Radiation Act 2005* (came into force 1 September 2007);
- *Radiation Regulations 2017*;
- *Nuclear Activities (Prohibitions) Act 1983*;
- *Environment Protection Act 2017*.

Western Australia

- *Radiation Safety Act 1975*;
- *Nuclear Waste Storage and Transportation (Prohibition) Act 1999*;
- *Radiation Safety (General) Regulations 1983*;
- *Radiation Safety (Qualifications) Regulations 1980*;
- *Radiation Safety (Transport of Radioactive Substances) Regulations 2002*;
- *Work Health and Safety Act 2020*;
- *Work Health and Safety (Mines) Regulations 2022*;
- *Environmental Protection Act 1986*.



Annex C – Overview Matrix of Current Policies and Practices in Australia

Type of Liability	Long-Term Management Policy	Funding of Liabilities	Current Practice / Facilities	Planned Facilities
Spent Fuel	Spent fuel to be transported to France for reprocessing. The resulting ILW is stored at ANSTO pending transfer to national facility.	Commonwealth funded.	On-site storage followed by overseas reprocessing and interim storage of returned waste.	Options for ILW disposal pathways for reprocessed waste are being considered.
Nuclear Fuel Cycle Wastes	On-site disposal for mining and processing tailings.	Responsibility of mine owner by means of bond. For legacy wastes, funding by the relevant jurisdiction.	On-site disposal.	N/A
Application Wastes	Commonwealth, state and territory management of LLW and ILW.	Funding by the Commonwealth for Commonwealth waste. For other jurisdictions, funding is by the owner of waste.	WA: disposal at state near surface disposal facility. Other jurisdictions: storage at site of generation or at central storage facilities within each jurisdiction. LLW disposal at commercial near surface disposal facility. Available for all suitable waste originating in Australia which meets the waste acceptance criteria (WAC) of the facility.	Options for LLW and ILW disposal pathways are being considered.



Type of Liability	Long-Term Management Policy	Funding of Liabilities	Current Practice / Facilities	Planned Facilities
Decommissioning	Planned decommissioning of HIFAR research reactor. OPAL research reactor has met preliminary decommissioning plan requirements.	Commonwealth funded.	HIFAR – licence granted to possess and control shut-down facility. An application for partial decommissioning was submitted to ARPANSA in 2023 and is currently under review.	Options for LLW and ILW disposal pathways are being considered.
Disused Sealed Sources	Repatriation to manufacturer where possible.	Owner	Repatriation to manufacturer where possible; otherwise storage awaiting disposal. LLW disposal at commercial near surface disposal facility. Available for all suitable waste originating in Australia, which meets the WAC of the facility.	Options for LLW and ILW disposal pathways are being considered.

