Australian National Report for the Tenth Meeting of the Convention on Nuclear Safety

In conformance with article 5 of the Convention on Nuclear Safety

2025

Acknowledgement of Country

The Australian Government respectfully acknowledges Australia's Aboriginal and Torres Strait Islander communities and their rich culture and pays respect to their Elders past and present. We acknowledge Aboriginal and Torres Strait Islander peoples as Australia's first peoples and as the Traditional Owners and custodians of the land and water on which we rely.

We recognise and value the ongoing contribution of Aboriginal and Torres Strait Islander peoples and communities to Australian life and how this enriches us. We embrace the spirit of reconciliation, working towards the equality of outcomes and ensuring an equal voice.

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Introduction

About this Report

i. This National Report (NR) is issued according to Article 5 of the Convention on Nuclear Safety (CNS, also referred to as the Convention'). Australia ratified the CNS in December 1996. Since then, Australia has submitted National Reports to, and actively participated in, every review meeting of the CNS. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) coordinates, on behalf of the Australian Government, the reporting on how Australia meets its obligations under the Convention. The Australian Nuclear Safety and Technology Organisation (ANSTO) also contributed to the NR.

ii. Australia is a Category 3 Contracting Party to the CNS. As such it has voluntarily reported under Articles 6 to 19 in the context of its research reactors. The report has been written as per the requirements of INFCIRC/572/Rev8 and the new CNS Report Template has been applied as appropriate.

Nuclear Installations Status of Australia

iii. Australia has no nuclear programme in the context of the CNS.

iv. Australia does not have, or plan to establish, any 'nuclear installations' as defined in the Convention but has one operating multipurpose research reactor, the Open-Pool Australian Light Water (OPAL) reactor. Another research reactor, the High Flux Australian Reactor (HIFAR), has been permanently shut down and all fuel elements have been removed. First stage decommissioning of HIFAR was approved in December 2024. Both reactors are managed by the Australian Nuclear Science and Technology Organisation (ANSTO), a Commonwealth entity, and are hence regulated by ARPANSA. Both reactors are located at the Lucas Heights Science and Technology Centre south of Sydney in the State of New South Wales. Note that a different regulatory body, the Australian Safeguards and Non-Proliferation Office (ASNO) also oversees the application of nuclear safeguards and physical protection of nuclear items in Australia.

v. For this report, Australia finds it useful to refer to its research reactors in describing how its obligations under the Convention are met. Other licensed activities at ANSTO include: the collection, treatment and storage of radioactive wastes, the handling and storage of new and irradiated nuclear fuel and nuclear materials and the production of commercial quantities of radiopharmaceuticals and radioisotopes for use in medicine and research within Australia and overseas, as well as irradiation services and other commercial services.

Background of the National Nuclear Policy

vi. The following information is provided as background information for Australia in line with INFCIRC/572 Rev8.

vii. Australia is a federation of 9 jurisdictions as shown in Figure 1. These comprise the Commonwealth of Australia (the Commonwealth), 6 states: New South Wales, Victoria, Queensland, Western Australia, South Australia, Tasmania, and 2 territories which are the Northern Territory and the Australian Capital Territory. Each state and territory have its own regulatory body for radiological safety.

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

viii. In 1998, the Australian Government created a regulatory body for Commonwealth entities, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) to regulate the radiation protection and nuclear safety activities of Commonwealth entities, regardless of the jurisdiction in which the operations are undertaken. Therefore, currently there are 9 different regulatory jurisdictions for radiological safety in Australia.

ix. Under Australian legislation, specifically the Australian Radiation Protection and Nuclear Safety Act 1998 (the Act), the CEO of ARPANSA is prohibited from authorising the construction or operation of nuclear power plants. The Environment Protection and Biodiversity Conservation Act 1999 and legislation in many Australian states and territories have similar prohibitions.

x. 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.

xi. As part of this initiative, a new naval nuclear power safety regulatory body, the Australian Naval Nuclear Power Safety Regulator (ANNPSR), will be established within the Defence portfolio enabled by the passing of the Australian Naval Nuclear Power Safety Act 2024. The Act requires that ANNPSR commences by 1 November 2025.

xii. The AUKUS partnership decision has already triggered legislative changes, including 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 supporting infrastructure and facilities associated with the nuclear-powered submarine program. The legislative changes do not disrupt Australia's moratorium on civil nuclear power, and further changes are expected in 2025 to establish ANNPSR including clarification of regulatory interfaces between ARPANSA and this new regulatory body.

xiii. Note that the nuclear-powered submarine program is out of scope of the CNS and has been included here for information only due to its impact on the Australian nuclear landscape.

Australia Radioactive Waste Management

xiv. As reported previously, the Nuclear Fuel Cycle Royal Commission (NFCRC) was established by the South Australian (SA) Government in March 2015 to undertake an independent and comprehensive

investigation into the potential for increasing South Australia's participation in the nuclear fuel cycle. It reported to the SA Government on 6 May 2016 with recommendations,[1] including that SA Government pursue removal of existing legislative prohibitions on nuclear power generation to allow nuclear power to contribute to a low-carbon electricity system in the future, if required.

xv. On 15 November 2016, the SA Government released its Response to the NFCRC Report recommendations.[2] The recommendation to pursue the removal of existing legislative prohibitions on nuclear power generation was not supported.

xvi. The reprocessing of spent nuclear fuel is not permitted under Australian law. As such, all spent fuel is sent abroad for reprocessing under inter-governmental agreements and Australia receives an amount of intermediate level solid waste (ILSW) back that is in equivalence in radiological terms to the spent fuel sent. All returned ILSW produced from the reprocessing of spent fuel - is currently held at an Interim Waste Storage (IWS) facility at ANSTO.

xvii. In March 2022, the last of the HIFAR reprocessed fuel was received back into Australia in a type B(U) TN-81 dual purpose storage/transport container from the Sellafield facility in the United Kingdom. This contained 4 canisters of vitrified CSD-V material. This represented the radiological equivalence of 114 spent HIFAR fuel elements which were previously sent to the Dounreay facility for reprocessing into 51 cement drums.[3] This container is stored at the ANSTO IWS facility with the previously reported B(U) TN-81 container and Type A ISO freight container which was received from the AREVA (now ORANO) La Hague facility in France in December 2015.[4]

xviii. OPAL reactor spent fuel continues to be stored within the facility in the Integral Service Pool until it is periodically transported to La Hague, France, for reprocessing. The first shipment of spent fuel to France occurred in mid-2018 and the equivalent ILSW is not expected to be received back into Australia until the early 2030s. 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 approximately every 7 years.

xix. The Australian Government remains committed to the establishment of a National Radioactive Waste Management Facility (NRWMF). This commitment is articulated in the Australian Radioactive Waste Management Framework,[5] that was updated in October 2023. The Commonwealth Department of Industry, Science, and Resources (DISR) which administers the National Radioactive Waste Management Act 2012, established the Australian Radioactive Waste Agency (ARWA) in July 2020. ARWA is tasked with, amongst other areas, establishing the NRWMF, coordinating Australia's radioactive waste inventory and progressing long-term work to site a separate, permanent location for disposal of ILSW, as well as other waste management functions outlined in the Australian Radioactive Waste Management Framework.

xx. A siting process based around community volunteerism for the NRWMF 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. However,

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1 See https://yoursay.sa.gov.au/pages/nuclear-fuel-cycle-royal-commission-report-release/

2 See http://assets.yoursay.sa.gov.au/production

3 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.

4 Note the B(U) TN-81 container holds 20 canisters of vitrified reprocessed HIFAR spent fuel waste (CSD-U) and the Type A ISO freight container contains six drums of CBF-C2 waste generated during reprocessing operations

5 See https://www.industry.gov.au/data-and-publications/australian-radioactive-waste-management-framework

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 and on 18 July 2023, a judge of the Federal Court set aside the declaration.

xxi. Subsequently, on 10 August 2023, the Minister for Resources stated that the Australian Government no longer intends to pursue Napandee as a potential site for the facility and is also not intending to pursue the previously shortlisted Lyndhurst and Wallerberdina sites. The Australian Government remains committed to safely storing and disposing of Australia's radioactive waste and has commenced work on alternative proposals for the disposal of low level (LLW) and intermediate level (ILW) radioactive waste.

xxii. ARWA has taken steps towards the development of a decommissioning strategy through the development of a detailed scoping paper on Decommissioning of nuclear facilities in Australia. 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 policies and strategies for decommissioning of nuclear facilities and management of radioactive waste.

xxiii. 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.
- ARPANSA issued a licence to ANSTO HIFAR to permit first stage of decommissioning for this reactor (December 2024).

xxiv. For more information on Australia's radioactive waste management, please refer to the Australian National Report Joint Convention on the safety of spent fuel management and on the safety of radioactive waste national report 2024.[6]

Statement of commitment to the CNS

xxv. Australia remains committed to the articles and spirit of the Convention on Nuclear Safety, despite not having nuclear installations, as defined under Article 2 of the CNS Convention, and views participation as an effective review and improvement process for nuclear safety.

Report structure and scope

xxvi. This report content is as per the INFCIRC/572/Rev.8 and the new CNS Report template has been applied to the structure as appropriate. As such the report is designed to be a stand-alone document. Therefore, information from previous CNS Review meeting Australian reports has been reproduced as appropriate. New information for the 10th CNS Review meeting has been presented in highlighted sections for ease of review.

[6] See https://www.arpansa.gov.au/about-us/what-we-do/international-collaboration/joint-convention/previous-reports

Summary

Summary

Australia is a Category 3 Contracting Party. As such it has voluntarily reported on relevant parts of Articles 6 to 19 of the CNS. Australia continues to fulfil all of these Articles as reported on in this NR.

i. Response to challenges to Australia from the Joint 8th and 9th CNS Review Meeting

At the last CNS review meeting, held in in March 2023, Australia was part of country group 2 which also included Belarus, Cuba, Czech Republic, France, Libya, Morocco, Niger, Portugal, Slovenia, Spain, Syrian Arab Republic and The Netherlands. Three challenges were issued to Australia. These have been addressed as follows:

Challenge 2023- 1: *Engagement with the wider Australian community over planned waste facilities.*

This was directed to ARPANSA regarding the ongoing community engagement that had taken place regarding the proposed site for the NRWMF that was declared by the former minister for Resources and Water in November 2021. Although not a statutory requirement, ARPANSA elected to conduct engagement prior to any licence application being submitted, to explain the role of the regulator within the potentially affected communities. However, the original declaration of the site for the NRWMF was challenged in Federal Court and set aside in July 2023. Once a new site is proposed, ARPANSA will conduct similar public engagement. This challenge is ongoing given that the Australian Government process for progressing radioactive waste disposal pathways was restarted following the conclusion of the most recent siting process in August 2023.

Challenge 2023-2: *Resource and skill recruitment and retention remains an ongoing challenge with an increased decommissioning programme of work and planned New Facilities.*

ARPANSA continues to face resource challenges as the nuclear sector in Australia continues to grow. With the establishment of new nuclear agencies such as the Australian Radioactive Waste Agency (ARWA), the Australian Submarine Agency (ASA) and the Nuclear-Powered Submarine Regulatory Design Team (NPSRD)[7], ARPANSA has implemented a workforce strategy for 2022-2025[8] which aims to achieve sustainable capability, keep ARPANSA as an employer of choice and maintain strategic alignment of resources to the agency's purpose. Measures include but are not limited to:

- optimising recruitment and staff onboarding
- recognising and embedding succession plans
- developing capability frameworks that support workforce and knowledge management
- refreshing the employee value proposition
- strengthening manager capability
- ensuring change management processes are consistently applied
- establishing and maintaining the ARPANSA Graduate Program.

ARPANSA has also received fixed term funding for key positions across the agency to support the additional workload associated with the nuclear-powered submarine program and the growth of the sector.

[7] NPSRD are the team working to establish the Australian Naval Nuclear Power Safety Regulator by 1 November 2025.

[8] Delivering for Tomorrow: APS Workforce Strategy 2025 (apsc.gov.au)

This challenge remains open due to its ongoing nature.

Challenge 2023-3: *Implementation of the 2018 Integrated Regulatory Review Service (IRRS) mission action to develop a National Radiation Protection Strategy to strengthen harmonisation and National Uniformity.*

ARPANSA has met its challenges and continues to have a statutory role to promote national uniformity of radiation protection and nuclear safety policy and practices across all 9 jurisdictions in Australia. This is done within the constraints of these differing legislative frameworks and will be further influenced by the introduction of the new naval nuclear regulator, ANNPSR in 2025. ARPANSA is assisted by statutory committees including the Radiation Health Committee (RHC) which comprises representatives from each of the other 9 regulatory jurisdictions and whose functions include developing national codes and standards for the national Australian Radiation Protection Series (RPS).[9]

Meeting the 2023-3 Challenge, Australia published a National Strategy for Radiation Safety (2024-2026)[10] in accordance with its commitment to implement the 2018 IRRS mission recommended actions. This strategy noted that Australia's development of nuclear-powered submarines and infrastructure to support the submarines would bring a greater focus to radiation safety, but that it was not the focus of the strategy. The establishment of the new defence regulator ANNPSR in 2025 will create a 10th jurisdiction, requiring new efforts to align regulatory approaches for national uniformity and a future revision and update of the National Strategy for Radiation Safety.

The 2023 IRRS follow-up mission also noted that ARPANSA had undertaken a series of other activities at both national and jurisdictional levels. Notably, the adoption of the second edition of the National Directory for Radiation Protection (NDRP2) laid the foundation for future nationally agreed radiation safety codes and standards. The implementation of NDRP2 remains the independent responsibility of each jurisdiction through varying mechanisms at different rates. ARPANSA's role to promote uniformity therefore remains ongoing due to the collaboration required to align regulatory approaches.

ARPANSA continues to work with regulatory stakeholders including ANNPSR to promote regulatory uniformity across jurisdictions of the Commonwealth, States and Territories. For example, in 2025 ARPANSA developed a strategic plan to maintain priority areas of the RPS. ARPANSA is also identifying areas for further formal collaboration which furthers the objectives of nationally uniform radiation protection outcomes and minimises unnecessary regulatory burdens on operators in all jurisdictions.

ii. Changes to National Nuclear Energy and Regulatory Program

Whilst there remain no plans to establish nuclear power program in Australia, the following changes have occurred since the last review meeting:

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. This is a three-stage approach with the first stage proposed to be operational from 2027. As part of the optimal pathway, a new naval nuclear power safety regulatory body, the Australian Naval Nuclear Power Safety Regulator (ANNPSR) will be established within the Defence portfolio.

[9] Radiation Protection Series | ARPANSA

[10] https://www.health.gov.au/resources/publications/national-strategy-for-radiation-safety

In July 2023 the Australian Submarine Agency was established to safely and securely acquire, construct, deliver, technically govern, sustain and dispose of Australia's submarine capability for Australia, via the AUKUS partnership.

The AUKUS partnership decision has already triggered legislative changes, including 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 2025 to establish ANNPSR.

Until the establishment of ANNPSR, ARPANSA is the regulatory authority for radiological and nuclear safety for naval nuclear propulsion related facilities. ARPANSA has already undertaken licence assessments for applications related to early-stage infrastructure required to support the optimal pathway. As these facilities are defence related, they will not be reported on. In addition, the design team for the new ANNPSR is growing its capability, and ARPANSA is assisting in that process.

The Australian government's long-standing role in the oversight of visiting nuclear-powered vessel is also expected to evolve given the proposed increase in nuclear powered submarine visits to support the training of Australian Defence Force personnel to become sovereign ready.

iii. Response to Common Challenges identified in the Joint 8th and 9th CNS President Report

Eight challenges were raised from the last CNS review meeting from the common themes identified across the country groups. Progress against these actions is as follows:

Contracting Parties are encouraged to develop and maintain strategies, approaches and contingency plans in managing extraordinary circumstances, such as Covid-19 pandemic, extreme natural disasters, armed conflicts, etc.

Both ANSTO and ARPANSA have strategies in place to enable safe continued operations during extraordinary circumstances such as a world pandemic. For example, ARPANSA manages and maintains a number of business-critical digital technology systems and infrastructure, including buildings, laboratories, instrumentation and mobile assets. The agency must ensure this environment is robust and resilient enough to sustain any disruption which may challenge business continuity and avoid degradation to property, facilities and digital technology systems.

ANSTO has in place a range of capabilities for responding to various disruption-related risk and disruptive incidents. The Business Resilience Framework provides an overall approach to the management of incidents and provides for the activation of an Incident Management Team and the Executive Crisis Management Team, if required. Both ARPANSA and ANSTO have adopted the Australian Inter-Service Incident Management System[11] for internal control and for coordination with external agencies (see Article 16 for more information on Australia's Emergency Preparedness and Response).

[11] In Australia, the Australasian Inter-Service Incident Management System (AIIMS) is the nationally recognised system of incident management for the nation's fire and emergency service agencies

Contracting Parties should establish durable capacity building programmes to align regulatory capabilities with future needs taking into account new and innovative technologies, including international cooperation between regulatory bodies.

Australia has no plans to establish nuclear power and therefore the emergence of new and innovative technologies related to this area is not applicable.

Contracting Parties are encouraged to foster international collaboration and as appropriate, to participate in different types of collaborative schemes for the review of SMR designs

Australia has no plans for nuclear power program. However, in order to continue to support nuclear safety of countries who already have nuclear power programs or who are intending on embarking on them ARPANSA and ANSTO are engaged in activities related to SMRs. For example:

- ARPANSA hosted an IAEA Educational Workshop on Regulatory Challenges in Small Modular Reactors (SMRs) in November 2022. This was attended by representatives of regulatory bodies from a number of regional countries. The aim of this workshop was to enhance the knowledge of member states regulatory bodies on challenges identified by the IAEA SMR Regulator's Forum.
- ARPANSA has also attended the 2nd plenary of the IAEA's Nuclear Harmonization and Standardization Initiative (NHSI) in June 2023 as an observer to understand the developing regulatory approaches to advanced reactors and SMRs.

Contracting Parties are encouraged to invite on a regular basis IAEA peer review missions, including follow-up missions to confirm the status and timely implementation of peer review findings.

Australia continues to invite peer review missions with the latest IRRS mission conducted in 2018 with a follow up mission completed in 2023 which concluded that actions were implemented in a timely manner. For full details refer to Section IV below.

Contracting Parties are encouraged to address possible impact of climate change on nuclear installations, in particular those related to the increased frequency and intensity of extreme weather conditions.

The impact of climate change is considered as part of the site characteristic assessment for new licence applications as and reviewed periodically as appropriate. For example, a recent application for a facility (not a nuclear installation) located on the Australian coast was assessed in line with Australian Standard AS 5334-2013 *Climate Change adaptation for settlements and infrastructure* and considered a range of potential climate change impacts including increased ambient temperatures, increased extreme weather events, rise in tidal levels and potential tsunami impacts.

A finding of the 2021 OPAL Periodic Safety and Security Review was that the qualification of system structures and components that are exposed to harsh external environmental conditions may need to take into consideration the impact of climate change, specifically in relation to the potential for higher ambient temperatures in the future. However, it was noted that this finding is not expected to impact the facility behaviour for assessed postulated initiating events. This finding is being actioned.

Contracting Parties are encouraged to share experience in securing supply chains and exchange information on practices in addressing non-conforming, counterfeit, fraudulent or suspect items (NCSFI).

In 2023, ANSTO achieved certification against ISO 19443:2018 *Quality Management Systems- Specific Requirements for the application of ISO 90001:2015 by organisations in the supply chain of the nuclear*

energy sector supplying products and services important to nuclear safety. This nuclear-specific quality management standard serves to optimise safety and quality throughout the nuclear supply chain. ANSTO is the first organisation in Australia and the Southern Hemisphere to be certified against this standard.

Contracting Parties are encouraged to exchange experiences on the implementation of their ageing management strategies and effectiveness of ageing management practices from design to decommissioning, with a special focus on newly identified ageing processes on specific Systems, Structures and Components (SSCs), when applicable.

Asset management remains a key strategy identified in the ANSTO Nuclear Operations Business Plans and the OPAL Reactor 2055 Long Term Plan that underpins the long-term safety and operational performance of the OPAL Reactor. The program incorporates ageing management, which relies on the systematic identification and assessment of ageing mechanisms of SSCs and is applied through tailored maintenance strategies. An example of the program is the 2019 commencement of an in-service inspection program, which has achieved remote systematic inspection of in-pool reactor components related to safety. ANSTO has also initiated a program of work to perform a life assessment of the OPAL Reactor, focussing on life limiting features of irreplaceable structures, systems and components through the performance of Time Limited Ageing Analysis (TLAA). The exchange of experiences supporting this program of work is through the IAEA Coordinated Research Programme on the Development of Time Limited Ageing Analysis to support Continued Safe Operation of Research Reactors (T34005).

Contracting Parties are encouraged to strengthen diligent cross border cooperation, including participation in joint emergency exercises, and to foster cooperation between experts in nuclear and radiation safety in relation to emergency response

ARPANSA and ANSTO (as well as the Australian Safeguards and Non-Proliferation Office (ASNO)) continue to play a key role in collaborating with national and regional partners to promote policies and practices that support development in radiological sciences and technology, as well as nuclear and radiological security in the Indo-Pacific Region. Examples of programs in place include:

- IAEA Integrated Nuclear Security Sustainability Plan (INSSP) – this enables Australia and Pacific partners to address nuclear security in a comprehensive way and to strengthen national nuclear security regimes
- IAEA Asia-Pacific Regulatory infrastructure Development Project (RIDP) – a technical assistance mechanism aimed at supporting Asia-Pacific countries to establish or enhance their national regulatory infrastructure for radiation safety and for security of radioactive materials
- IAEA Sub-regional Approach to the Pacific Islands – this provides a platform to increase sub-regional collaboration and address challenges faced by the Pacific Islands, including those related to nutrition, agricultural productivity, non-communicable diseases (specifically cancer), marine and coastal environments, water resource management, and radiation safety
- cooperative arrangements (Memorandums of Understanding) – ARPANSA has in place agreements with key regional partners. These focus on supporting development of regulatory infrastructure for the safety of radiation facilities and nuclear installations, and the security of radioactive sources.

ARPANSA also regularly participates in internationally facilitated emergency training exercises such as IAEA Conventional Exercises (ConvEx). In 2024 ARPANSA in partnership with the Australian state of Tasmania coordinated Australia's participation in the Nuclear Energy Agency (NEA) Sixth International Nuclear Emergency Exercise (INEX-6) on the long-term recovery phase following the termination of a nuclear

emergency, with participants including ANSTO, ARWA, the National Emergency Management Agency (NEMA) and state government authorities.

iv. International peer review missions

An Integrated Regulatory Review Service (IRRS) team undertook a full scope mission in Australia in 2007. This IAEA effort was an in-depth review of ARPANSA's Regulatory Services Branch. A follow-up mission was then conducted in 2011, when a module on medical exposure and patient protection was introduced. All actions from this mission have been implemented.

A further full scope IRRS mission to Australia occurred in 2018, which reviewed Australia's national, legal and governmental framework for nuclear and radiation safety against the IAEA's Safety Standards. This mission included participation from all Australian jurisdictions. The IRRS team consisted of 15 senior regulatory experts from 13 IAEA Member States, 3 IAEA staff members and 2 observers.

The scope of the IRRS mission to Australia included all modules offered by the IRRS. It included all facilities and activities regulated in Australia, with the exception of the uranium mining industry and the management of waste containing naturally occurring radioactive material (NORM). The mission scope included ARPANSA's role and responsibilities as the Commonwealth regulator for radiation protection and nuclear safety in all modules. In addition, for specific areas (radiation sources control, transport, occupational radiation protection, control of public exposure, environmental monitoring and medical exposure control) the mission scope included all jurisdiction regulatory bodies.

The IRRS mission included a policy issue discussion on national uniformity of radiation protection and nuclear safety policy and practices across the Commonwealth, states and territories.

This was the first IRRS mission to undertake a comprehensive multi-jurisdictional review of a federated constitution in which all of the jurisdictions are self-governing. This was identified as a good practice by the team and a model that other federal countries may want to consider when planning for future IRRS missions.

The mission found 4 good practices and made 23 recommendations and 12 suggestions for improvement. These were addressed to the various Australian governments and regulatory bodies.

An IRRS follow up mission was conducted in 2023 and the report[12] noted that substantial progress had been made in response to the 2018 IRRS mission findings across all Australian Government and State and Territory participants.

The follow up mission noted that one of the most prominent challenges identified by the 2018 IRRS mission was the establishment of a national framework for radiation safety that ensures a consistent level of safety and protection for individuals and the environment across all jurisdictions, both in principle and regulatory practice. In response, a series of activities have been undertaken at both national and jurisdictional levels. Notably, the adoption of the second edition of the NDRP2 has laid the foundation for nationally agreed radiation safety codes and standards. However, the IRRS team noted that the implementation of NDRP2 has not proceeded uniformly and promptly across all jurisdictions. This remains a challenge for Australia.

The follow up mission also found 2 new areas of good performance relating to publishing of the ARPANSA Safety Culture Assessment on the internet and also the establishment of an incident management system

[12] See IRRS 2023 Australian follow up report.pdf (arpansa.gov.au)

across ARPANSA for routine recording of health and safety incidents which will ensure that staff are familiar with the system and will use it effectively to manage the response to a nuclear or radiological emergency.

All IRRS mission reports and corresponding action plans are published on the ARPANSA website.[13]

v. Notable Achievements

The following are suggested as potential areas of good performance for Australia:

- **Commitment to Nuclear Supply Chain Safety and Quality** – For the achievement of certification of ANSTO in 2024 to ISO 19443:2018 *Quality Management Systems- Specific Requirements for the application of ISO 90001:2015 by organisations in the supply chain of the nuclear energy sector supplying products and services important to nuclear safety*. This nuclear-specific quality management standard serves to optimise safety and quality throughout the nuclear supply chain. ANSTO are the first organisation in Australia and the Southern Hemisphere to be certified against this standard.
- **Safe Completion of a Unique Maintenance Activity** – For the successful replacement of the OPAL research reactor in-pile cold neutron source. This activity was achieved safely during a planned outage in 2024 using a mix of in-person and remote techniques with extensive training undertaken on a partial full-scale mockup of the reactor pool (see Figure 2). The project is considered unique as no international research reactors reported to have conducted this sort of in-pool replacement (for more information see Article 6).
- **Commitment to Openness and Transparency** – For the decision by ARPANSA to undertake public consultation on a number of licence applications for new facilities in communities that have not previously had similar radiological or nuclear facilities due to perceived public interest, despite there being no legislative requirement to undertake this consultation. In addition, the adoption of a new platform (Citizen Space) that supports online public engagement and has resulted in more effective engagement and more detailed analysis of public submissions (for more information see Article 8).
- **Development of Community Values for Environmental Monitoring and Assessment** – In 2024, ARPANSA sought input from members of the public to ensure that existing monitoring, measurement and assessment activities take into account the needs and values of the wider community. The feedback was used to finalise these values in a new environmental monitoring and assessment framework and include ecosystem health, cultural and spiritual heritage, clean air, food and drinking water safety, economic activity, recreation and environment and public advice. (for more information see Article 15).

vi. Challenges for Australia

The following are identified as challenges for Australia:

The recruitment and retention of suitably qualified and experienced personnel (SQEP) – within existing organisations (ARPANSA, ANSTO and ASNO), particularly as a result of the recent nuclear-powered submarine program and the establishment of the Australian Radioactive Waste Agency that has created increased competition with the very limited nuclear industry within Australia.

[13] See Integrated Regulatory Review Service | ARPANSA

The ongoing establishment of a national framework for radiation safety – remains a challenge for Australia, to ensure a consistent level of safety and protection for individuals and the environment and is implemented across all jurisdictions. The establishment of ANNPSR (the new defence regulator to regulate the nuclear-powered submarine program) will compound this challenge further (remains open from the 8th and 9th Joint Review Meeting).

vii. Operating Experience

There were no events reported in the last review period which were significant for the safety of OPAL research reactor or related to the shutdown HIFAR reactor. For more information on analysis of events, implementation of lessons learned from operating experience and emergency drills and exercises see Article 14 and 16.

viii. Commitment to Openness and Transparency

Australia remains committed to the values of openness and transparency. These are discussed in Article 8 and Article 9.

ix. Vienna Declaration Principles

There has been no change to how Australia continues to meet the three Principles in the Vienna Declaration on Nuclear Safety (VDNS) since the last CNS review meeting. Australia does not expect to face difficulties in continuing to apply the VDNS principles and safety objectives. Australia's alignment with the VDNS principles is documented in Appendix 1.

x. Lessons Learned from the Fukushima Daiichi Nuclear Power Plant Accident

There has been no change from what was previously reported. In summary, ANSTO completed an assessment in accordance with IAEA Safety Report Series No. 8 *Reassessment for Research Reactors in Light of the Accident at the Fukushima Daiichi Nuclear Power Plant*. This assessment resulted in a number of areas for improvement but nothing that required urgent corrective action. All improvements have since been implemented.

Open Pool Australian Lightwater (OPAL) reactor

Articles

INFCIRC/572 Rev 8 Article 6

For subsequent reporting, a practice has been developed by Contracting Parties to regard Article 6 of the Convention as a continuous obligation to regularly assess and, when necessary, to improve the safety of existing installations and at the time of reporting to justify and report on related decisions taken in accordance with the provisions in Article 6 of the Convention. Typically, subsequent National Reports include:

- *an updated list of existing nuclear installations as defined in Article 2 of the Convention*
- *an overview of significant safety related issues, including events that occurred in the nuclear installations over the last three years, and measures taken in response to these issues*
- *an overview of planned programmes and measures for the continued safety upgrading, where appropriate, of each type or generation of nuclear installation*
- *identification of installations for which decisions on shutdown have been made*
- *a statement on the position of the Contracting Party concerning the continued operation of the nuclear installations.*

Nuclear research reactor that existed at the time the Convention entered into force for Australia

6.1. The only research reactor at the time the CNS came into force was the High Flux Australian Reactor (HIFAR) - a 10 MW(t) heavy water, tank type, materials testing reactor.

6.2. ARPANSA authorised ANSTO to Possess or Control (PoC) the HIFAR facility following its permanent shutdown on 30 January 2007 and removal of fuel. PoC is considered to mean the set of activities whereby a state of safe enclosure of the facility is achieved and maintained with the characterisation of the radiological inventory being conducted in preparation for ultimate dismantling and decommissioning. Further, safe enclosure is considered to mean that the parts of the facility that contain radioactivity are either processed or placed in such a condition that they can be safely stored and maintained until they can be decontaminated and/or dismantled to levels that permit release from regulatory control. This authorisation for PoC was granted to ANSTO on 15 September 2008. In December 2024, ANSTO was granted a first stage decommissioning licence (see text below) which superseded this PoC licence.

New information for 10th Review Meeting – HIFAR Reactor issued a Decommissioning Licence

6.3. On 10 December 2024, ARPANSA issued a licence which authorised the HIFAR reactor facility to commence decommissioning. ANSTO has opted for a phased approach to decommissioning with each phase having separate stages that ANSTO will apply for individually, prior to work commencing. The current licence permits decommissioning relating to utilisation equipment, neutron beam instruments and irradiation rig support equipment.

List of current research reactors

6.4. Australia has one operating research reactor, the Open Pool Australian Light-water (OPAL) reactor.[14] OPAL is a high flux, thermal, multi-purpose pool type reactor. OPAL achieved full power of 20 Megawatts in 2006. The reactor is fuelled with low enriched uranium (LEU). The fuel elements are

[14] See http://www.ansto.gov.au/AboutANSTO/OPAL/index.htm

aluminium-clad uranium silicide plates. It is cooled by light water and has a heavy water reflector surrounding the core.

6.5. OPAL is housed in a containment building which also houses the primary cooling circuit and most of the auxiliary plant. The stainless-steel reactor pool has a water depth of 12.6 metres and is surrounded by a thick-walled, reinforced high density concrete construction (the Reactor Block). The reactor core sits at the bottom of the pool and is surrounded by a Zircaloy reflector vessel which also houses all the irradiation rigs and beam tube assemblies. A service pool, contiguous with the reactor pool, stores the irradiated materials and provides for the interim storage of irradiated fuel. A reactor beam hall within the reactor building and a neutron guide hall adjacent to the reactor building contain experimental stations and instrumentation for neutron beam research purposes.

6.6. Other activities related to the operation of OPAL include the handling and storage of new and irradiated nuclear fuel and nuclear materials and the production of commercial quantities of radiopharmaceuticals and radioisotopes for use in medicine, industry and research within Australia and overseas.

Overview of significant safety related issues

6.7. There were no significant safety related issues reported related to Australian nuclear installations OPAL and HIFAR.

Notable Upgrades/Modifications

New information for 10th Review Meeting – Maintenance of the OPAL Reactor

6.8. There was a significant upgrade required for the OPAL Reactor in relation to the upgrade of the First Reactor Protection System (FRPS). It involved extensive software and hardware upgrades to the FRPS and was implemented during the 2024 shutdown in parallel to the replacement of the Cold Neutron Source as discussed below.

6.9. Whilst not considered a safety upgrade under the CNS, the following is reported for the purpose of information sharing:

6.10. In the past reporting period, ANSTO successfully replaced the cold neutron source in pile assembly at the OPAL reactor which was reaching the recommended end of life period of 15 years. The cold neutron source is the component that reduces the energy and speed of the neutrons from OPAL for use in scientific instruments and allow scientists to investigate the unique properties of larger molecules such as proteins and polymers.

6.11. To prepare for the operation, a full-scale mock-up of the cold neutron source and reactor environment was constructed (see figure 2) to assist in the planning and training of workers. This allowed team members to undertake comprehensive training in conditions which mimicked the real environment.

6.12. During the engineering design process, every component in the installation was modelled in a 3D computer simulation. This was used to fabricate prototype components to initially build the full-scale mock-up then used to optimise the design of the cold neutron source itself.

6.13. Prior to the commencement of the installation sequence, the reactor was defueled, the level of water in the reactor pool was reduced and a number of reactor components and pipework had to be removed to allow access to the old cold neutron source.

6.14. The cold neutron source together with associated pipework were lifted out of the reactor and placed in a manufactured shielded device. This was done remotely using cameras and no direct interaction with technicians.

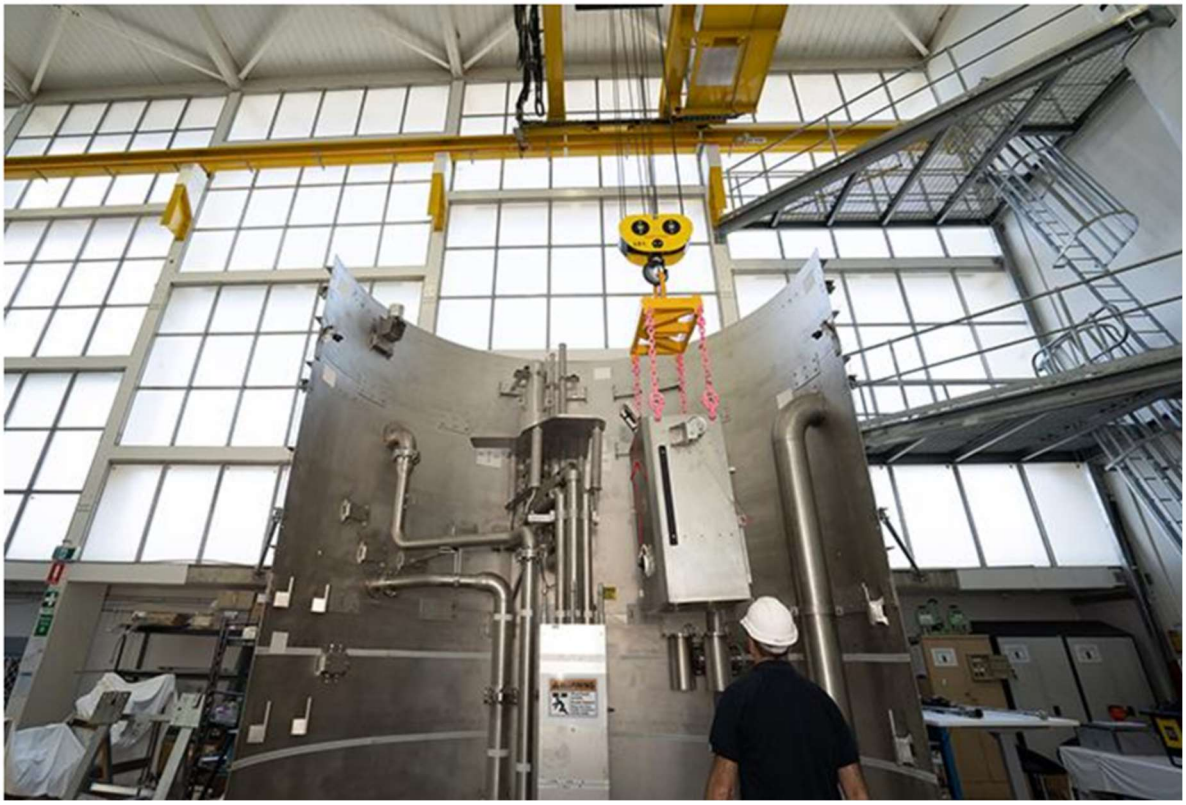
6.15. The replacement cold neutron source structure was eight metres tall and had to be installed precisely vertical. Again, this was conducted remotely using cameras and required positioning accuracy to within a few millimetres. Once in place, the various pipes suppling either helium, deuterium or vacuum services were connected and tested.

6.16. This was successfully achieved over a 7-month outage between March and September in 2024. The replacement was an activity unique to OPAL since other international research reactor organisations which were contacted for operational experience reported that they have not completed such maintenance activities. Therefore, the successful and safe completion of the unique maintenance activity to replace the OPAL research reactor cold neutron source is suggested to be an area of good performance.

Statement on the Position on the Continued Operation of the OPAL Research Reactor

6.17. OPAL completed its second periodic safety and security review in 2021. No significant issues were identified which would challenge the continued operation of this facility. The PSSR and associated action plan have been accepted by ARPANSA and ASNO and a new licence condition prescribed which requires the next OPAL PSSR to be submitted by 2031.

Figure 2 – Mock Up of the OPAL Reactor and Workbox Used to Replace the Cold Neutron Source In-Pile Assembly



Article 7 – Legislative and regulatory framework

INFCIRC/572/Rev 8 Article 7(1) Establishing and maintaining a legislative and regulatory framework

- *Overview of the primary legislative framework for nuclear safety, including interfacing national legislation*
- *Ratification of international conventions and legal instruments related to nuclear safety*

Article 7(2) (i) National safety requirements and regulations

- *Overview of the secondary legislation for nuclear safety*
- *Overview of regulations and guides issued by the regulatory body*
- *Overview of the process of establishing and revising regulatory requirements, including the involvement of interested parties*

Article 7 (2) (ii) System of licensing

- *Overview of the licensing system and processes including types of licensed activity and, where appropriate, the procedure for relicensing*
- *Involvement of the public and interested parties within the Contracting Party*
- *Legal provisions to prevent the operation of a nuclear installation without a valid licence*

Article 7 (2) (iii) System of regulatory inspection and assessment

- *Regulatory strategies*

- *Overview of the regulatory inspection and assessment process with regard to the safety of nuclear installations*
- *Basic features of inspection programmes*

Article 7 (2) (iv) Enforcement of applicable regulations and terms of licences

- *Power for legal actions*
- *Overview of enforcement measures available to the regulatory body*
- *Experience with legal actions and enforcement measures*

The ARPANS Act

7.1. The Act applies only to Australian Commonwealth government entities and their contractors. It enables the regulatory framework to govern the safety of, among others, OPAL and HIFAR. The Act was amended in 2015 to provide the CEO with additional powers to direct a licence holder, issue improvement notices, and compel the provision of information.

Ratification of International Conventions and legal instruments related to nuclear safety

7.2. ARPANSA administers Australia's rights and obligations/is the designated Competent Authority for the following:

- Convention on Nuclear Safety, ratified by Australia in March 1997
- Joint Convention on the Safety of Spent Fuel Management and on the Safey of Radioactive Waste Management, ratified by Australia in August 2003.
- Comprehensive Nuclear-Test-Ban Treaty, ratified by Australia in July 1998
- Convention on Early Notification of a Nuclear Accident ratified by Australia on 23 October 1987
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, ratified by Australia on 23 October 1987.

National Safety Requirements and Regulations

7.3. The Australian Radiation Protection and Nuclear Safety Regulations 2018 (the Regulations) replaced the Australian Radiation Protection and Nuclear Safety Regulations 1999 on 9 December 2018. There was no change to the effect of the regulations, but the numbering and formatting has changed and in some parts the wording has changed to simplify the regulations in accordance with modern drafting practices.

7.4. The Regulations set up the framework for licensing, inspection and enforcement. The Regulations also contain licence conditions and specify dose limits. In assessing licence applications, ARPANSA must, under the Act, take into account international best practice in radiation protection and nuclear safety.

7.5. ARPANSA publishes a range of publications (codes, fundamentals, guides and recommendations) under the Radiation Protection Series[15], as well as regulatory guides to assist licence applicants and

[15] See https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-protection-series

licence holders. These publications are based on best international practice. Stakeholders are invited to make comment on new publications and significant amendments to existing ones as appropriate.

7.6. Updates to regulatory requirements are implemented through amendments to the regulations, introduction of new or amended Codes or implementation or changes to licence conditions. Significant changes are subject to regulatory impact assessments.

New information for 10th Review Meeting

7.7. ARPANSA has drafted a set of Regulatory Assessment Principles which are designed to offer guidance to regulators on the assessment of new licence applications and submissions. This document applies international best practice in safety assessment but is tailored to the Australian environment.

Licensing

7.8. The ARPANS Act covers source licences, prescribed radiation facilities, prescribed legacy facilities and nuclear installations. The Act prohibits the siting, construction, operation, possession and control, or decommissioning of nuclear installations 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.

7.9. The ARPANS Regulations require the CEO to take into account the results of public consultation when making a decision to issue a licence for a nuclear installation.

Inspections

7.10. ARPANSA's Regulatory Activities Policy[16] provides the over-arching framework for efficient and effective regulatory activities to achieve the object of the Australian Radiation Protection and Nuclear Safety Act 1998 (the Act) to protect the health and safety of people, and to protect the environment, from the harmful effects of radiation.

7.11. The Act provides powers of entry for inspectors to enter OPAL (and any other licensed facility) and inspect it at reasonable times. Inspectors are authorised to undertake searches and exercise a range of powers. An inspection manual[17] is available to guide inspectors on the exercise of their powers. ARPANSA has developed a risk-informed approach to the planning of its inspection program, which is designed to emphasise its safety assurance role.

7.12. The inspection program is designed to:

- identify activities prohibited under the ARPANS Act that are being undertaken without appropriate authorisation or exemption
- assess and verify licence holder compliance with the Act, the Regulations and licence conditions

[16] See Regulatory Activities Policy | ARPANSA

[17] See arpansa-gde-1119web_inspection_manual.pdf

- appropriately respond to non-compliance, areas for improvement, abnormal occurrences, incidents and accidents.

7.13. The outcomes of these activities provide reasonable assurance to the Government and the public that people and the environment are being protected from the harmful effects of radiation. ARPANSA adopts a graded and risk-based approach to compliance and 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 should be used to achieve the desired result which in most cases will be a return to compliance.

7.14. The response is detailed in the ARPANSA Compliance and Enforcement Manual.[18] The options in place are identified in Table 1 below.

Table 1 –ARPANSA Enforcement Options

Option	Description
Encourage and assist compliance	ARPANSA may provide information to encourage and support a licence holder return to compliance, while being mindful that the ultimate responsibility for safety rests with the operator. ARPANSA may accept a written commitment from the licence holder that action will be taken to rectify non-compliance within a defined timeframe. If resolution efforts prove unsuccessful in achieving a return to compliance, the regulatory response may be escalated.
Improvement notice (s80A)	Under section 80A of the Act, an inspector may issue an improvement notice in response to non-compliance or where non-compliance is likely to occur.
Direction by the CEO of ARPANSA (s41)	Under section 41(1A), the CEO has the power to issue a direction if the CEO believes on reasonable grounds that there is a risk of death, serious illness, serious injury or serious damage to the environment, arising from radiation, in connection with a controlled facility, controlled material or controlled apparatus and there is an urgent need to minimise the risk. A copy of any direction issued by the CEO must be provided to the Minister, who must table it in each House of Parliament. In 2018, ARPANSA issued a direction under section 41(1A)) to ANSTO.[19.]
Amendment of licence (s36)	Under section 36 of the Act, the CEO may impose additional licence conditions, remove or vary licence conditions that were imposed by the CEO or extend or reduce the authority granted by the licence. Depending on the nature of the non-compliance, it may be considered appropriate to amend the licence to facilitate compliance or address any new risks that have been identified.
Suspension or cancellation of licence (s38)	Under section 38 of the Act, the CEO may decide to suspend or cancel a licence in circumstances where a condition of the licence has been breached by the licence holder or by a person covered by the licence where there are reasonable grounds to believe that an offence has been committed against the Act or regulations by

[18] See arpansa-reg-com-man-270w_compliance_enforcement_manual.pdf

[19] See https://www.arpansa.gov.au/news/arpansa-issues-direction-ansto

Option	Description
	the licence holder or by a person covered by the licence, or where the licence was obtained improperly.
Referring matters to the Director of Public Prosecutions	The laws administered by ARPANSA create a number of offences. The Office of the Commonwealth Director of Public Prosecutions (CDPP) is an independent prosecution service responsible for prosecuting alleged offences against Commonwealth Law. The decision to refer a matter to the CDPP for prosecution will be made by ARPANSA in light of the facts and the Prosecution Policy of the Commonwealth. The CDPP will then make the ultimate decision whether or not to commence a prosecution in accordance with the Prosecution Policy of the Commonwealth.
Injunction	Under section 43 of the Act, the CEO can make an application to the Federal Court of Australia for an injunction in circumstances where a controlled person has engaged, is engaging, or proposing to engage in any conduct that would be an offence against the Act, or where there has been or is proposed to be a refusal or failure to do a thing, which refusal or failure would be an offence against the Act.

Experience with legal actions and enforcement measures

7.15. ARPANSA publishes breaches and enforcement actions on its website for transparency.[20] Since the last reporting period there have been no significant legal actions or enforcement actions required.

Article 8 – Regulatory body

INFCIRC/572/Rev 8 Article 8 (1) Establishment of the regulatory body

- *Legal foundations and statute of the regulatory body*
- *Mandate, mission and tasks*
- *Authorities and responsibilities*
- *Organizational structure of the regulatory body*
- *Development and maintenance of human resources over the past three years*
- *Measures to develop and maintain competence*
- *Developments with respect to financial resources over the past three years*
- *Statement of adequacy of resources*
- *(Quality) management system of the regulatory body*
- *Openness and transparency of regulatory activities including actions taken to improve transparency and communication with the public*
- *External technical support, if appropriate*
- *Advisory committees, if appropriate.*

[20] See Licence holder performance | ARPANSA

Article 8 (2) Status of the regulatory body

- *Place of the regulatory body in the governmental structure*
- *Reporting obligations (to the parliament, government, specific ministries)*
- *Means by which effective separation is ensured between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy and means by which independence of the regulatory body in making its safety-related decisions is assured.*

8.1. The ARPANS Act establishes the Office of the CEO of ARPANSA. The CEO has both regulatory and non-regulatory functions. The non-regulatory functions include promoting national uniformity in radiation protection policy and processes among states and territories, providing scientific advice, providing radiation monitoring and calibration services, and undertaking research.

8.2. ARPANSA comprises a Regulatory Services Branch (RSB), a Radiation Health Services Branch, a Medical Radiation Services Branch, the Office of the CEO, the Office for Business Support and the Office of the General Counsel.

8.3. The Regulatory Services Branch (RSB) assists the CEO to perform their regulatory functions. The RSB has primary responsibility for the day-to-day regulatory oversight of the safety and security of OPAL and HIFAR. In addition to licensing, compliance monitoring and enforcement, the RSB also investigates accidents and incidents and prepares regulatory guidance material. The RSB's functions also include regulatory oversight of other facilities such as radioisotope production facilities, radioactive waste management facilities, accelerators, and irradiators. The delivery of regulatory outcomes is governed by the Regulatory Activities Policy[21].

8.4. Actions taken to develop and maintain Human Resources over the past 3 years are discussed in Article 12.

8.5. RSB personnel have competency in a wide variety of technical fields related to radiation protection and nuclear safety. The CEO of ARPANSA also draws on expertise from other branches of ARPANSA (e.g. dosimetry, emergency management, communication, environmental monitoring) and is also supported by the Office of General Counsel, Office for Business Support and by the Office of the CEO. ARPANSA's corporate policies and procedures apply across the whole Agency, including RSB. If ARPANSA requires specialist technical advice to support regulatory activities and this is not available within the agency or in other partner organisations, financial resources and contracts are available to source such expertise externally.

8.6. The IAEA Methodology for the Systematic Assessment of the Regulatory Competence Needs (SARCoN) for Regulatory Bodies of Nuclear Installations was used to perform a review of RSB staff competencies in 2023. In addition, ARPANSA has completed a comprehensive review of all positions in the organisation as part of ongoing succession planning. This included identification of vulnerable areas and priority areas for strengthening resilience of some key competencies.

8.7. RSB staff competence has been maintained through targeted training. This is done through 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.

[21] see https://www.arpansa.gov.au/regulation-and-licensing

8.8. 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 Act.

8.9. The establishment of ANNPSR on 1 November 2025 has provided impetus to ARPANSA to align competencies with other peer regulators. This alignment is still in development but includes both nuclear safety regulators as well as ASNO.

8.10. The cost for ARPANSA's regulatory activities is recovered from the licence holders through licence charges and through direct cost recovery for licence application assessment as relevant. ARPANSA tracks expenditure of resources on regulatory activities, and the annual charges are adjusted accordingly. Proposed changes that are not simply machinery in nature (an example of a machinery change is indexation), are communicated to licence holders and their responses taken into account.

8.11. ARPANSA has adequate RSB resources and finance to continue to effectively perform its regulatory duties.

8.12. ARPANSA has the means to continue to employ external consultants in specialised areas if required. For example, additional external expertise was employed to assist with the review of the OPAL PSSR (submitted to ARPANSA in November 2021) and to assist with the review of aspects of the OPAL First Reactor Protection System (submitted to ARPANSA in October 2023).

Quality management

8.13. ARPANSA has an Integrated Management System (IMS) to develop and maintain policies, procedures, forms and guides of a regulatory nature. The IMS 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 IMS is in line with the requirements of AS/NZS ISO 9001 standard.

Advisory committees

8.14. The CEO of ARPANSA receives advice on radiation protection and nuclear regulatory matters from three committees. These are the Radiation Health and Safety Advisory Council, the Nuclear Safety Committee and the Radiation Health Committee. Each committee's functions are established under the Act. The minutes of these committee meetings are published on the ARPANSA website along with the terms of reference.[22]

8.15. The Radiation Health and Safety Advisory Council has the following functions:

- to identify emerging issues relating to radiation protection and nuclear safety and to advise the CEO on them
- to examine matters of major concern to the community in relation to radiation protection and nuclear safety and to advise the CEO on them
- to advise the CEO on the adoption of recommendations, policies, codes and standards in relation to radiation protection and nuclear safety
- to advise the CEO, at the CEO's request, on other matters relating to radiation protection and nuclear safety
- to advise the CEO on such other matters relating to radiation protection and nuclear safety as the Council considers appropriate
- to report to the CEO on matters relating to radiation protection and nuclear safety.

[22] See Advisory Council and Committees | ARPANSA

8.16. The Nuclear Safety Committee has the following functions:

- to advise the CEO and the Council on matters relating to nuclear safety and the safety of controlled facilities
- to review and assess the effectiveness of standards, codes, practices and procedures in relation to the safety of controlled facilities
- to develop detailed policies and to prepare draft publications for the promotion of uniform national standards in relation to the safety of controlled facilities
- to report to the CEO on matters relating to nuclear safety and the safety of controlled facilities.

8.17. The Radiation Health Committee has the following functions:

- to advise the CEO and the Council on matters relating to radiation protection
- to develop policies and to prepare draft publications for the promotion of uniform national standards of radiation protection
- to formulate draft national policies, codes and standards in relation to radiation protection for consideration by the Commonwealth, the States and the Territories
- to review national policies, codes and standards in relation to radiation protection to ensure that they continue to reflect world best practice
- to consult publicly in the development and review of policies, codes and standards in relation to radiation protection.

Independence and management of conflict of interest

8.18. Although ARPANSA and ANSTO are government entities, they are separated by portfolios managed by separate ministers. ARPANSA is within the Health Portfolio, while ANSTO is a Corporate Commonwealth Entity within the Industry, Science and Resources Portfolio. Besides this structural separation, ARPANSA's independence is further assured through requirements in the 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 the OPAL and HIFAR reactors
- 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 to, at any time, cause a report about matters relating to the CEO's functions to be tabled in Parliament.

8.19. The integrity of ARPANSA's regulatory decision-making is governed by the aforementioned ARPANSA Regulatory Activities Policy which applies to all ARPANSA staff and regulatory activities. It provides the principles according to which the regulatory activities are carried out. The CEO of ARPANSA is responsible for the regulatory decisions. The CEO, or delegate, makes regulatory decisions to fulfil the object of the Act, being 'to protect the health and safety of people, and to protect the environment, from the harmful effects of radiation, without regard to any external pressures but being mindful of consequences of the regulatory decisions for third parties. The Minister can issue directions to the CEO. However, a direction must be tabled in Parliament and the Minister can only direct the CEO if it is in the public interest to do so.

8.20. 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 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. The General Counsel makes the final determination of whether a conflict (perceived or real) exists and what mitigation strategy to put in place.

8.21. In addition, the CEO ensures that any regulatory function exercised over other parts of ARPANSA is independently overseen by external personnel. For example, ARPANSA has adopted a practice of securing external oversight of its self-regulation by inviting an inspector from another jurisdiction to provide oversight of ARPANSA's self-inspections and self-licensing decisions. Further information on the management of conflict of interest can be found on the ARPANSA website.[23]

Openness and transparency

8.22. The ARPANS Regulations provide that if a facility licence application relates to a nuclear installation, the CEO of ARPANSA must invite people and bodies to make submissions about the application. This includes advertising publicly, providing a period for making submissions, and providing instructions for making submissions. This was done for the OPAL Reactor and the HIFAR Decommissioning Licence Applications.

8.23. ARPANSA's regulatory processes are fully transparent. The statement of reasons that form the basis for licensing decisions for nuclear installations are published on ARPANSA's website and are available for public scrutiny.

8.24. The Act makes it mandatory for the CEO to report to Parliament quarterly and annually on operations of the CEO, ARPANSA and the advisory bodies. Such reports include findings of breaches. The CEO can also table a report in Parliament on any matter that relates to the CEO's functions at any time.

8.25. .

8.26. ARPANSA publishes annual performance statements, as part of annual reporting[24] which provide a detailed perspective of performance results against the following key activities:

- Initiate, maintain, and promote frameworks for protection and safety.
- Undertake research and provide expert evaluations, advice, and services.
- Ensure effective and risk-informed regulation.
- Enhance organisational innovation and capability.

New information for the 10th CNS Review Meeting – Actions taken to improve transparency

8.27. ARPANSA continues to be committed to openness and transparency. Since the last review meeting, ARPANSA has taken the following steps to improve transparency and public communication:

Under the Australian Radiation Protection and Nuclear Safety (ARPANS) Regulations, only licence applications for nuclear installations have a legislated requirement for public consultation. In 2024 and 2025 the CEO of ARPANSA elected to go to public consultation on two licence applications for new non-nuclear installations associated with the nuclear-submarine program because of the

[23] See https://www.arpansa.gov.au/regulation-and-licensing

[24] See Annual Report series | ARPANSA

perceived level of public interest in the host communities. These communities have not previously hosted similar radiological or nuclear facilities.

8.28. In 2023 ARPANSA implemented a platform (Citizen Space) that supports community engagement activity online. The features include geospatial mapping, advanced survey tools, and the ability to perform real time analysis. Previously submissions were received via email and/or post. This platform has resulted in more accessible and effective engagement and more detailed analysis of results.

8.29. The commitment to public consultation when not legislated and the adoption of a new platform to support community engagement is suggested to be an area of good performance.

Article 9 – Responsibility of the licence holder

INFCIRC/572 Rev 8 Article 9

- *Formulation in the legislation (quotation) assigning the prime responsibility for safety to the licence holder*
- *Description of the main means by which the licence holder discharges the prime responsibility for safety.*
- *Description of the mechanism by which the regulatory body ensures that the licence holder discharges its prime responsibility for safety.*
- *Description of the mechanisms whereby the licence holder maintains open and transparent communication with the public.*
- *Description of the mechanism by which the Contracting Party ensures that the licence holder of the nuclear installation has appropriate resources (technical, human, financial) and powers for the effective on-site management of an accident and mitigation of its consequences.*

9.1. The Regulations place prime responsibility for safety on the licence holder. This is primarily done through Section 60, which provides that the licence holder must take all take all reasonably practicable steps to manage the safety of the facility described in the licence, including having in place plans and arrangements for managing safety described in paragraph and ensuring that such plans and arrangements are implemented to the extent reasonably practicable.

9.2. Other provisions in the 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.

9.3. ANSTO's responsibility for safety is defined in its Health, Safety, Community and Environment Policy[25] and the supporting safety management system, which is certified to ISO 9001, 14001 and 45001 standards. To support the safety management system, ANSTO has safety assessment and audit systems that are independent of line management responsible for OPAL operation. The overarching safety process, the Safety Reliability and Assurance (SRA) process provides assurance to the CEO of ANSTO

[25] See https://www.ansto.gov.au/media/1615/download?inline

that ANSTO is meeting its obligations under the Work Health and Safety Act and Regulations and the ARPANSA Act and Regulations.

9.4. As part of the application for a facility licence to authorise the operation of OPAL, ANSTO submitted a suite of safety related documentation including how appropriate effective control is maintained (resourcing and technical expertise etc.) and emergency response is handled. This suite of safety documents is reviewed as part of the ongoing inspection program. Any proposal to change ANSTO's arrangements for managing safety that has significant implications for safety requires ARPANSA's prior approval.

9.5. ARPANSA inspectors regularly monitor and review the operations of ANSTO's nuclear operations. The inspectors undertake planned inspections of the nuclear facilities and frequent site visits and/or virtual meetings. Inspectors use these opportunities to emphasise and stress the licence holder's primary responsibility for safety and to review that there are adequate resources to handle any potential accidents.

9.6. The OPAL Licence applications were published for public consultation as was the HIFAR decommissioning licence.

New information for the 10th CNS Review Meeting – Actions taken to improve transparency

9.7. ANSTO continues to maintain open and transparent communication through a number of mechanisms including the ANSTO Education and Outreach program. The primary goal of this program is to educate teachers, students, and the general public about the advantages of nuclear science and technology, while also providing insights into potential careers in STEM and nuclear fields.

9.8. For example, in 2023-2024, a total of 692 site tours were conducted for 16,026 visitors at the Lucas Heights campus, with an additional 140 site tours for 2,864 visitors to the Australian Synchrotron. ANSTO also offers a variety of educational experiences and resources, many of which are available online or in the classroom for nationwide access. Key programs include online learning, the development of educational resources, teacher professional development, work experience opportunities and national competitions.

Article 10 – Priority to safety

INFCIRC/572 Rev 8 – Overview of the Contracting Party's arrangements and regulatory requirements regarding policies and programmes to be used by the licence holder to prioritize safety in activities

for design, construction and operation of nuclear installations, including:

- *safety policies*
- *safety culture programmes and development*
- *arrangements for safety management*
- *arrangements for safety monitoring and self-assessment*
- *independent safety assessments*
- *discussion on measures to improve safety culture*
- *a process oriented (quality) management system.*

Measures taken by licence holders to implement arrangements for the priority of safety, such as those above and any other voluntary activities, examples of Good Practices and safety culture achievements.

Regulatory processes for monitoring and oversight of arrangements used by the licence holders to prioritize safety.

Means used by the regulatory body to prioritize safety in its own activities.

10.1. ARPANSA has a Work Health and Safety Policy which outlines how the agency complies with legislative requirements, namely the *Work Health and Safety Act 2011*.

10.2. ARPANSA requires applicants for a licence and licence holders to demonstrate a commitment to a strong safety culture. The *Regulatory Guide: Plans and Arrangements for Managing Safety* against which licence applications are assessed, states that "*the Licence Holder or Applicant is responsible for establishing safety as the organisation's highest priority, consistent with international best practice in radiation protection and nuclear safety and overriding, if necessary, the demands of production or project schedules."*

10.3. The plans and arrangements are required to provide sufficient details on how the applicant will exercise effective control and manage safety, including measures to foster and improve safety culture. Specific plans are required to be submitted on how the applicant will monitor and assess safety, including undertaking independent safety assessments for radiation protection, radioactive waste management, security, emergency preparedness and decommissioning.

10.4. Once a licence is issued, the Regulations require the licence holder to take all reasonably practicable measures to manage safety. Specifically, the licence holder must continue to have in place plans and arrangements that are reviewed and updated at least once every three years. The licence holder must also take all reasonably practicable measures to implement the plans and arrangements. Non-compliance with these requirements may be a breach of licence condition.

10.5. Safety culture has consistently formed a key part of the performance objectives and criteria (POCs) that ARPANSA inspectors' use in licence holder inspections. In ARPANSA's previous POCs safety culture was also one of three 'cross-cutting' areas. Subsequent updates to the POCs have increasingly integrated safety culture and other technical, human and organisational factors.

10.6. In 2019, in response to a recommendation from the 2018 IRRS mission, ARPANSA, in conjunction with an external consultancy group in safety culture and organisational psychology, conducted a safety culture assessment of the whole of agency. The process involved developing a custom-built safety culture maturity model and applying it in a safety culture assessment.

10.7. The model ranks performance in five elements each with four sub-elements. Maturity is ranked on a five-point scale from 'pathological' to 'holistic.'

10.8. The model was based on the OECD Nuclear Energy Agency (NEA) publication *the Safety Culture of an Effective Nuclear Regulatory Body*. The model was adapted from the 'Safety Culture Maturity Matrix' and framework developed by Bel V (2018). Bel V is a subsidiary of the Belgian Federal Agency for Nuclear Control (FANC), which acts as an expert for the safety assessments of nuclear projects and carries out inspections of nuclear installations in Belgium. Bel V reviewed and commented on the ARPANSA model.

10.9. The assessment was carried out in the spirit of International Atomic Energy Agency (IAEA) General Safety Requirements No. GSR Part 2 *Leadership and Management for Safety*. The model is consistent with the guidance for safety culture assessment of IAEA Safety Standard GS-G-3.5 *The Management System for Nuclear Installations* and IAEA Safety Report Series No. 83 *Performing Safety Culture Assessment*. However, it has been modified to be more targeted at the role of the regulator rather than the operator.

10.10. In 2023, ARPANSA conducted its second Safety Culture Assessment, upholding ARPANSA's commitment to conducting a Safety Culture Assessment every 3-4 years, in line with requirement 14 of International Atomic Energy Agency (IAEA) General Safety Requirements No. GSR Part 2 *Leadership and Management for Safety* and recommendation 10 of the 2018 IRRS mission. In the 2023 Safety Culture Assessment, ARPANSA adapted its methodology to better represent collected data. In previous assessments while data from multiple sources was gathered, safety maturity ratings were determined only by perception survey results. In the 2023 assessment these ratings were informed by data from perception surveys, interviews and focus groups, document review and workplace behavioural observations.

This update enabled a more robust appraisal of the agency's safety culture but made it difficult to compare the 2023 and the 2019 Safety Culture Assessment. The more holistic approach will be used for future assessments.

10.11. ARPANSA has published a summary of the 2023 Safety Culture Assessment results and updated methodology to the ARPANSA Website.[26]

New information for 10th Review Meeting Measures to Improve Safety Culture

10.12. In 2023, ARPANSA implemented a second self-assessment of safety culture. This was conducted using a custom-built safety culture maturity body.

10.13. The assessment found - one area of good practice related to external communication and collaboration. This related to where staff reported the positive impact of their work and the agency in general on external stakeholders. Staff were found to value and manage external relationships well.

10.14. Five areas for improvement were identified related to leadership for safety, workload management, individual accountability and responsibility, safety oversight and systemic approach and knowledge sharing. An action plan is being developed to address these.

10.15. A summary of the study and results has been published on the ARPANSA internet.

[26] See Safety culture assessments | ARPANSA

10.16. ANSTO has a Health, Safety, Community and Environment Policy[27] under which it operates in a manner that places the protection of human health and safety and the environment as its highest priority, promotes a positive safety culture and environmental awareness. and strives for continual improvement in safe work practices using a blame-free learning approach. In addition, ANSTO also supports a positive safety culture through risk management and quality management policies and systems.

10.17. ANSTO implements its safety policy and strategies through an ISO 45001 certified work health and safety management system that covers radiological, nuclear and occupational health and safety. The system makes every member of ANSTO's staff responsible for ensuring compliance with the organisation's work health, safety and environment policy and strategies, and line management accountable for safety.

10.18. Safety assurance at ANSTO is achieved by several mechanisms. Changes and activities at the OPAL reactor that have any impact on nuclear safety are reviewed by the OPAL Reactor Assessment Committee (RAC) - that is independent of the OPAL reactor line management. Additional assurance of safety is achieved through routine audits and inspections by staff, who are independent of the function being assessed, and the review of safety performance by senior management and the ANSTO Board. In undertaking its assessments, the OPAL RAC has regard to applicable IAEA Safety Standards.

10.19. Safety culture within OPAL was also assessed under Safety Factor 10 of the Periodic Safety and Security Review (PSSR) of OPAL. This assessment including the use of an independent external consultant specialising in reviewing the safety management and safety culture within organisation.

New information for the 10th CNS Review Meeting -ANSTO OPAL Safety Culture

- In the past 10 years, Reactor Operations management have strategically prioritised cultural performance and strength, particularly related to specific recommendations arising from the OPAL PSR 2011 and the requirements of the 2021 PSSR. This is evidenced by various activities and initiatives focussed on supporting and monitoring safety and security culture, and other cultural aspects of engagement and wellbeing. These initiatives have aligned with ANSTO's core values of "Safe, secure, sustainable, working together, curiosity, excellence, leadership, and trust and respect."
- This has included reinforcement of the Stop, Think, Act, Review (STAR) principle and the "If you see something, say something" mindset. Initiatives have included a Safety Conversations model, reward and recognition programs aligned with safety objectives, introduction of a "Wellbeing Room" and safety culture awareness training based on the ARPANSA Holistic Safety Guidelines. More recently, roundtable discussions have been introduced to foster safety culture via peer-to-peer discussion.
- Ongoing appraisal of safety culture is implicit in the evaluation of safety performance and feedback of operating experience, particularly through human factors related safety performance indicators. Organisationally, engagement surveys have been used to gauge outlook on issues of trust, working together, social cohesion and safety.
- In association with the 2021 PSSR, an assessment of safety culture was undertaken consistent with ARPANSA and international guidance, with application of recommended methods including questionnaires, interviews and focus groups. In 2019 Reactor Operations took part in a Safety Culture Perception Survey which utilised the questions from the IAEA Safety Culture Perception Questionnaire. Overall, the respondents grading of Reactor Operations approach to nuclear

[27] See https://www.ansto.gov.au/media/1615/download?inline

safety spanned the very good to excellent range. Several themes that emerged from the survey were further explored through externally facilitated focus groups and interviews to understand key levers impacting safety culture within Reactor Operations.

- The independent safety culture assessment (conducted by external consultant) noted consistent examples during all Reactor Operations focus groups and interviews of commitment to safety and wellbeing and the strength of the existing safety culture maturity. In relation to the priority of safety over production, the assessment found that on balance people recognise safety comes first. This provides evidence of conservative decision making and a questioning attitude which support safety and security culture.
- The likely culture maturity of reactor operations was assessed as "proactive," where there is evidence that safety leadership and values aim to drive continuous improvement. This is considered a relatively high level of maturity on safety culture maturity scales.

10.20. ANSTO has, in consultation with ARPANSA established Safety Performance Indicators (SPIs) for OPAL. These SPIs measure and set objective targets for safety related functions of plant operation. Performance against the SPIs is reported monthly within ANSTO and reported quarterly to ARPANSA. These SPIs are themselves also subject to regular review to verify their continued suitability and applicability.

10.21. ARPANSA's regulatory approach is risk-informed, driven by data and evidence, provides for optimisation, is effective, and will seek to eliminate unnecessary regulatory action.

10.22. ARPANSA's regulatory approach is based on a firm understanding of radiation risks and provides for optimisation of protection in dealings that are deemed justified. The review, assessment and verification of safety is supported by ARPANSA's framework for risk management and by appropriate understanding of the specific circumstances under which licence holders operate. Safety assessments will be requested in a format appropriate to the nature and magnitude of the radiation risk to be managed.

10.23. The nature and frequency of monitoring of licence holder performance, including inspections, is informed by the licence holders' risk profiles including performance history and safety culture. The inspection program includes planned and reactive inspections. inspections can also be unannounced.

10.24. In reviewing and assessing licence applications, activities or facilities, or modifications which might affect safety, ARPANSA develops the required understanding of the relevant designs and operating principles to inform its decisions. ARPANSA has statutory powers to require information to be provided by licence holders.

10.25. ARPANSA recognises that regulatory control is only one means of managing radiation risks and may be on occasions inappropriately burdensome to regulated entities if the radiation risk of justified practices is of minor regulatory concern. In such circumstances, using a risk-informed approach, relevant weight is given to other measures to manage radiations risks, such as information, communication, education and engagement. Further information on the graded approach to compliance is discussed in Article 7.

Article 11 – Financial and human resources

INFCIRC/572/Rev.8 Article 11 (1) financial resources

- *Mechanism for the provision of financial resources to the licence holder or applicant in order to ensure the safety of the nuclear installation throughout its lifetime, including:*
  - *principles for the financing of safety improvements to the nuclear installation over its operational lifetime*
  - *principles for financial provisions during the period of commercial operation for decommissioning and management of spent fuel and radioactive waste from nuclear installations*
  - *Statement with regard to the adequacy of financial provisions*
  - *Contracting Party's processes to assess the financial provisions*
  - *Description of the Contracting Party's arrangements for ensuring that the necessary financial resources are available in the event of a radiological emergency.*

Article 11 (2) Human resources

- *Overview of the Contracting Party's arrangements and regulatory requirements concerning staffing, qualification, training and retraining of staff for nuclear installations*
- *Methods used for the analysis of competence requirements and training needs for all safety related activities in nuclear installations*
- *Arrangements for initial training and retraining of operations staff, including simulator training*
- *Capabilities of plant simulators used for training with regard to fidelity to the plant and scope of simulation*
- *Arrangements for training of maintenance and technical support staff*
- *Improvements to training programmes as a result of new insights from safety analyses*
- *Operational experience, development of training methods and practices, etc.*
- *Methods used to assess the sufficiency of staff at nuclear installations*
- *Policy or principles governing the use of contracted personnel to support or supplement the licensee's own staff*
- *Methods used to assess the qualification and training of contractor's personnel*
- *Description of the national supply of, and demand for, experts in nuclear science and technology*
- *Methods used for the analysis of competence*
- *Availability and sufficiency of additional staff required for severe accident management, including contracted personnel or personnel from other nuclear installations*
- *Regulatory review and control activities.*

ARPANSA Finance and Human Resources

11.1. 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, during normal and abnormal operations, before it is issued with an operating licence as per *Regulatory Guide: Applying for a licence for a nuclear installation*[28]. Since ANSTO is a government agency, its funding for nuclear safety and reliability of its installations, including decommissioning, will be underwritten by the Commonwealth Government throughout its life.

[28] See https://www.arpansa.gov.au/sites/default/files/legacy/pubs/regulatory/guides/REG-LA-SUP-240G.pdf

11.2. The bulk of ANSTO's operating revenue is provided by the Australian Government. ANSTO also generates revenue from the sale of goods and services, particularly radiopharmaceuticals and irradiated materials. ANSTO has demonstrated to ARPANSA's satisfaction that it has adequate financial capability to support the safety of OPAL and HIFAR, including in the event of an emergency.

11.3. The ARPANSA RSB is primarily responsible for the compliance and inspection program for safety related aspects of the operation of OPAL. A dedicated lead inspector for OPAL is supported by several other staff who assist the lead inspector. Inspector rotation is applied periodically to reduce the risk of regulatory capture.

11.4. Regulatory staff must complete on the job training in relevant technical areas before being eligible to be appointed as an inspector. In addition, inspectors must have either obtained or be working towards a nationally recognised accreditation, namely, Certificate IV in Government Investigations (or equivalent). Inspectors are appointed by the CEO of ARPANSA following the completion of the training programme.

11.5. Competencies that this program offers are the ability to exercise regulatory powers, promote and assess compliance with legislation, investigate non-compliance, conduct and record interviews, conduct a search and seizure and prepare evidence. Additional training is conducted periodically for all regulatory staff in inspection reporting, conflict of interest, security, and legal awareness.

11.6. ARPANSA previously benchmarked the regulatory framework against IAEA General Safety Guides 12 and 13 in 2020 which resulted in an extensive action plan that was partially implemented.

11.7. ARPANSA follows the Commonwealth Government procurement rules when procuring services/contractors.

ANSTO Finance and Human Resources

11.8. ARPANSA requires ANSTO 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. Resources must also demonstrate adequate personnel and capability to manage emergency preparedness and response.

11.9. OPAL is operated with a rotating 12-hour shift roster of at least two reactor operators and a Shift Manager when the reactor is at power. Shift Managers have, as a minimum, an appropriate university degree, often in engineering or physics. Reactor operators and Shift Managers undergo a period of intensive training at the start of their employment and are required to demonstrate competence in reactor operation and safety through an accreditation process. Reactor - Operators and Shift Managers are subject to refresher training and re-accredited every three years.

11.10. In addition to reactor operators and Shift Managers, OPAL has significant human resources in utilisation, engineering, maintenance, nuclear analysis and technical support under the management of the General Manager, OPAL Reactor (equivalent to a Reactor Manager) and the Group Executive, Nuclear Operations, Safety and Security.

11.11. The arrangements for qualification training, accreditation and retraining of OPAL staff are summarised in the OPAL Safety Analysis Report and detailed in a Training Manual. OPAL reactor specific training is designed to provide personnel with the knowledge and skills needed to perform their roles, a healthy respect for nuclear safety and radiation protection issues, and an awareness of the impact that actions have on safety and performance. The three components of training at the OPAL reactor are induction, role-specific, and ongoing training. It is provided or coordinated by a dedicated OPAL Training Group

11.12. OPAL operations are supported by staff from other parts of ANSTO who provide services in radiation protection, waste management, emergency response and engineering as well as finance and procurement, site services, human resources and general administration as required. These services are defined by the ANSTO Business Management System (ABMS) in relation to the scope, nature, frequency and standard of the services provided, including a range of performance metrics to assess and verify the quality of the services provided.

11.13. For complex plant modifications, OPAL builds mock ups/simulations of plant to train staff on (see Article 6 for example).

11.14. ARPANSA's inspections of OPAL include training. ARPANSA inspectors are invited to observe Reactor Operator and Shift Manager accreditation panels to ensure that the process is robust.

11.15. ANSTO has contractor management and supplier assurance processes in place which amongst other areas, require evidence of competencies/training of contractors as appropriate. OPAL requires all contractors to undertake OPAL induction training and then further training depending on their activities. These arrangements are described in the plans and arrangement for safety which are approved by ARPANSA.

New information for 10th Review Meeting- ARPANSA Workforce Strategy and Program Plan 2022-2025

11.16. ARPANSA continues to face resource challenges with the emergence of the Australian nuclear submarine program, a national approach to radiation waste disposal and an increasing number of existing facilities reaching end of life.

11.17. The ARPANSA Corporate Plan continues to identify reduced workforce capability or capacity as a risk and commits to workforce planning as a prevention strategy.

11.18. In line with the Australian government workforce strategy[29]. ARPANSA is currently implementing a workforce strategy which aims to achieve sustainable capability, keep ARPANSA as an employer of choice and maintain strategic alignment of resources to the agency's purpose.

11.19. This Workforce Strategy supports the key activities and priorities of the ARPANSA Corporate Plan and Business Plan. Funding, government priorities and a strategic environmental scan are key inputs to prioritisation of these initiatives that enable results. Measures include but are not limited to:

- optimising recruitment and staff onboarding
- recognising and embedding succession plans
- developing capability frameworks that support workforce and knowledge management
- refreshing the employee value proposition
- ensuring change management processes are consistently applied
- establishing and maintaining an ARPANSA Graduate program
- Strengthening manager capability

[29] Delivering for Tomorrow: APS Workforce Strategy 2025 (apsc.gov.au)

Article 12 – Human factors

INFCIRC/572 Rev 8 Human Factors

- *Overview of the Contracting Party's arrangements and regulatory requirements to take human factors and organizational issues into account for the safety of nuclear installations*
- *Consideration of human factors in the design of nuclear installations and subsequent modifications*
- *Methods and programmes of the licence holder for analysing, preventing, detecting and correcting human errors in the operation and maintenance of nuclear installations*
- *Self-assessment of managerial and organizational issues by the operator*
- *Arrangements for the feedback of experience in relation to human factors and organisational issues*
- *Regulatory review and control activities.*

12.1. The Safety Systems section within ARPANSA's Regulatory Services Branch includes staff who serve a specialised function in human factors and organisational psychology. This team oversaw the technical, human and organisational factors (THOF) integration program. This program concluded with all goals met, including the implementation of internal training programs, the integration of THOF into ARPANSA systems, and the inclusion of THOF in Australian regulations.

12.2. THOF integration continues with the implementation of ARPANSA's upcoming Regulatory Administration Database (RAD) and development of THOF-focused inspections.

12.3. Current and developing arrangements will support ARPANSA in collecting and analysing quality THOF-related data pertaining to licence holders. This analysis will help in identifying THOF issues and determining scope for future inspections. These activities will further ARPANSA's ability to forecast trends, detect risks, and take proactive action in ensuring licence holder safety and compliance. ARPANSA will also support licence holders to integrate THOF best-practice to ensure safety and to meet organisational objectives.

12.4. ARPANSA published an update of the Regulatory Guide –Holistic Safety Guidelines in August 2025.[30] This guide was developed to provide guidance on key technical, human, and organisational aspects necessary to create and maintain optimal safety. The update to this guide continues in the same spirit but intends to be more comprehensive, practical, and reflective of advancements in safety science.

New information for 10th Review Meeting ARPANSA THOF

12.5. ARPANSA amended the ARPANS regulation effective from 10 August 2022 to include:

- A new obligation to show that the applicant has considered interactions between technical, human and organisational factors in the management of safety
- A new obligation for licence holders to prevent and minimise human errors and organisational failures
- Introduction of human and organisational factors when updating safety analysis reports, plans and arrangements and preparing new applications for licence.

12.6. ARPANSA has completed its THOF integration program and intends to continue THOF work through:

[30] See Regulatory Guide - Holistic Safety (ARPANSA-GDE-1753) | ARPANSA

- An update to ARPANSA's Regulatory Guide – Holistic Safety, published in August 2025
- The development of THOF-focused inspections
- THOF integration into ARPANSA's upcoming Regulatory Administration Database (RAD) for improved THOF data collection and analysis.

ANSTO Human Factors

12.7. OPAL has had a human factors program from its inception that will continue to evolve until the reactor is decommissioned. The program aims to optimise the human-machine interface to avoid operational/maintenance errors and violations. The HF design plans for OPAL were proposed by ANSTO and reviewed by ARPANSA. The HF commitments are defined in various sections of the OPAL Safety Analysis Report (SAR). All safety related events/incidents are reported and investigated following the *Incident Management and Incident Response Process*. This process also captures incidents and abnormal occurrences, suggestions for improvement, and includes human factor and organisational related issues.

12.8. ANSTO is required by the Regulations to analyse the causes of incidents (abnormal safety occurrences) and lessons learned.

12.9. Since the last CNS report, there have been a number of nuclear safety related events reported for OPAL, but none have been identified as significant by ARPANSA. In its Quarterly Reports to ARPANSA, ANSTO provides a list of incidents that have occurred within OPAL in the previous quarter. These incidents are reviewed and discussed by both organisations at a quarterly meeting.

12.10. Human factors were also assessed under Safety Factor 12 of the Periodic Safety and Security Review (PSSR) of OPAL in conjunction with independent specialist human factors review conducted by an external expert.

New information for 10th Review Meeting Findings of the OPAL PSSR Human Factors

12.11. Organisational requirements for the OPAL Reactor continue to be effectively managed to maintain reactor safety and reliability in accordance with the Safety Analysis Report (SAR).

12.12. Minimum staffing levels of accredited and experienced personnel have been continually met to ensure a safe envelope of operation of the OPAL Reactor in line with Operational Limits and Conditions (OLC) requirements.

12.13. Adequate arrangements are in place for maintaining appropriately qualified and competent operating, utilisation, maintenance, engineering, technical and managerial staff. The basis for licensing the OPAL Reactor related to organisational structure, staffing and competencies is provided in the SAR, OLCs and BMS plans and arrangements, and is reviewed and if necessary modified by management as part of normal operational practice. An increase in staffing and effective training over the past 10 years has contributed to the ongoing safe, secure and reliable operation of the OPAL Reactor.

12.14. Daily work planning, including operations, production and maintenance planning, account for human factors, particularly the need to perform work without undue time pressure and other physical constraints.

12.15. Longer term workforce and succession plans are maintained and reviewed in view of changing needs and requirements. Within Reactor Operations, knowledge transfer and succession planning for specialist staff are priorities for a holistic understanding of the OPAL Reactor safety case, nuclear analysis and engineering capability. The support and specialised research capabilities of

other ANSTO groups is also essential for the safe operation of the OPAL Reactor and is an important consideration for ongoing organisational planning.

12.16. Accreditation and authorisation processes are supported by a comprehensive training curriculum and experience, providing assurance of the required competency for operations personnel in nuclear safety. Training programs for role-specific and other OPAL Reactor specific training have increased in quality and scope, such as human factors awareness, and other opportunities have been provided to support personal development.

12.17. Human factors are considered in the safety analysis relating to Operator actions for nuclear safety. The assumptions and claims are highly conservative in relation to Operator actions for nuclear safety and these remain valid as there have been no identified changes impacting the analysis relating to Operator actions during the operation of the OPAL Reactor.

12.18. An independent specialist human factors review of the OPAL Reactor Facility conducted for the 2021 PSSR assessed that the condition of human-machine interfaces (HMIs) and the operating environment was adequate, and areas were well organised. The HMI design remains consistent with current international standards referenced in IAEA Safety Standards Series No. SSG-51 and modifications are managed with consideration of human factors related to HMI and WHS.

Article 13 – Quality assurance

Overview of the Contracting Party's arrangements and regulatory requirements for:

- Quality assurance programmes, quality management systems, or management systems of the licence holders
- Status with regard to the implementation of integrated management systems at nuclear installations
- Main elements of a typical quality assurance, quality management or management system
- programme covering all aspects of safety throughout the lifetime of the nuclear installation, including delivery of safety related work by contractors.
- Audit programmes of the licence holders
- Audits of vendors and suppliers by the licence holders
- Regulatory review and control activities.

ARPANSA Quality Management System

13.1. 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 IMS to all agency activities.

13.2. ARPANSA uses the 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 IMS meets the requirements of AS/NZS ISO 9001 standard.

13.3. As per *Regulatory Guide: Plans and Arrangements for Managing Safety,* a licence applicant must 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.

OPAL Quality Management System

13.4. The administrative control of OPAL is undertaken in accordance with the -Reactor Operations Business Management System (BMS). This system sits within the ANSTO Business Management System (ABMS) framework, which is an integrated system (e.g. safety, environment etc). The ABMS covers ANSTO policies, overarching processes and supporting guidance. The ABMS (and hence, the Nuclear Operations BMS) is AS/NZ ISO 9001 certified.

13.5. The lead document of the Nuclear Operations BMS is the -Reactor *Operations and Waste Management Services Integrated Business Management System Manual* and below this lies a range of manuals, procedures, instructions, and forms for operational and maintenance activities, including management of contractors. The documents include response to alarms and emergency operating instructions. ARPANSA reviewed these documents as part of the licence application assessment process and regularly undertakes inspections to determine if OPAL operation is consistent with the documentation contained in the - Reactor Operations BMS.

13.6. ANSTO undertakes regular internal management system audits in accordance with its ISO 9001 quality system, ISO 14001 environmental system and ISO 45001 occupational health and safety

system certifications that verify activities are compliant with the - Reactor Operations BMS and to identify process improvements. ANSTO is also subject to regular surveillance and re-certification audits by an accredited external organisation in order to maintain its ISO 9001 quality system, ISO 14001 environmental management system and ISO 45001 occupational health and safety system certifications.

13.7. OPAL has a supplier assurance procedure in place which provides for audits of vendors and suppliers.

New information for 10th Review Meeting – ANSTO Quality Management System

13.8. In 2023, ANSTO received certification in ISO 19443, a nuclear-specific quality management standard to optimise safety and quality throughout the nuclear supply chain. This certification is an important step in improving the supply chain of products and services important to nuclear safety. ANSTO is the first organisation in Australia and the Southern Hemisphere to be certified against this standard. This is suggested to be an area of good performance.

Article 14 – Assessment and verification of safety

Article 14 (1) Assessment of safety – Overview of the Contracting Party's arrangements and regulatory requirements to perform comprehensive and systematic safety assessments

- *Safety assessments within the licensing process and safety analysis reports for different stages in the lifetime of nuclear installations (e.g., siting, design, construction, operation)*
- *Re-evaluations of hazard assumptions (e.g., according to international best practice, using deterministic and probabilistic methods of analysis)*
- *Overview of periodic safety assessments of nuclear installations during operation, including references to appropriate standards and practices and illustrations on how new evidence is taken into account (e.g., in the light of operating experience, and of other significant new safety information)*
- *Overview of safety assessments performed and the main results of those assessments for existing nuclear installations including the summary of significant results for individual nuclear installations and not only according to their type and generation*
- *Regulatory review and control activities.*

Article 14 (2) Verification of safety

- *Overview of the Contracting Party's arrangements and regulatory requirements for the verification of safety*
- *Main elements of programmes for continued verification of safety (in-service inspection, surveillance, functional testing of systems, etc.)*
- *Elements of ageing management programme(s)*
- *Arrangements for internal review by the licence holder of safety cases to be submitted to the regulatory body*
- *Regulatory review and control activities.*

14.1. ARPANSA's licensing process is staged. A separate licence is required for each stage of a nuclear installation lifecycle from the preparation of a site to decommissioning. ARPANSA requires a Safety Analysis Report to submitted as part of each staged licence application. The SAR is treated as a living document and is required to be updated throughout the life of the nuclear installation.

14.2. The SAR must include deterministic safety analyses to determine if the safety limits and objectives will be met for design-basis accidents. A probabilistic safety assessment may supplement the deterministic safety assessment of design-basis and design extension condition accidents. The operational limits and conditions (OLC) are determined from the safety analyses.

14.3. ARPANSA's requirements for each phase of a nuclear reactor's lifecycle can be summarised as follows:

 **Siting**	Detailed site evaluation, including a consideration of the extent to which the site may be affected by natural and man-made events, and environmental impact assessments.
 **Construction and Operation**	Design information, including the OLC within which the reactor must operate, the safety analysis, and detailed plans and arrangements for safety.
 **Possession or control**	Arrangements for safe storage of radioactive material and maintaining the nuclear reactor in a safe state.
 **Decommissioning**	Decommissioning plans and results (respectively) and the details of any proposed environmental monitoring program for the site.

14.4. ARPANSA issued the operating licence to OPAL in 2006 following a detailed assessment of the SAR and the plans and arrangements for managing safety submitted by ANSTO.[31] Any change to the SAR or the plans and arrangements with significant implications for safety requires approval by ARPANSA under Section 63 of the Regulations, before implementation.

14.5. ANSTO has a well-developed and sophisticated system for safety assessment and verification, including the requirement for prior review and approvals of modifications to all licensed facilities that have the potential for significant implications for safety. Changes at the OPAL reactor that have any impact on nuclear safety must be reviewed by the OPAL Reactor Assessment Committee (RAC) that is independent of OPAL reactor line management.

14.6. The OPAL operating licence requires a Periodic Safety and Security Review (PSSR) to be undertaken every ten years. The latest PSSR was submitted to ARPANSA and ASNO in 2021. The reviews identified a high degree of conformity by ANSTO with the current international safety and security standards and practices. The licensing basis was found to remain valid.

14.7. The Regulations require a licence holder to take all reasonably practicable measures to implement its plans and arrangements for managing safety. The licence holder is also required to review those plans and arrangements at least once every three years. Any change to plans and arrangements that may have significant implications for safety must be approved prior to implementation.

14.8. ARPANSA conducts planned inspections to verify the safety of OPAL and HIFAR and other facilities. The inspections aim to assess the safety performance of ANSTO and provide reasonable assurance

[31] See https://www.arpansa.gov.au/regulation-and-licensing/regulation/about-regulatory-services/who-we-regulate/major-facilities/open-pool-light-water-reactor/operating-licence-application

to the Australian Government and the public that activities involving radiation facilities and sources do not pose a threat to human health or the environment. The inspections focus on compliance with the Act and Regulations. A set of performance objectives and criteria (PO&C)[32] are used by inspectors for a transparent and graded approach to assess licence holders' practices and is consistent with the risk of the facility.

14.9. The PO&Cs reflect international best practices and are organised under eight 'baseline modules' and three cross cutting areas. One or more of these modules is used for the inspection of facilities. The eight baseline modules cover:

- Effective Control
- Safety Management
- Radiation Protection
- Environmental Protection
- Waste Management
- Decommissioning
- Emergency Preparedness and Response
- Security

14.10. The cross-cutting areas are safety culture, human performance and performance improvement.

14.11. ARPANSA also undertakes routine site visits/holds virtual meetings with OPAL, HIFAR and other facilities. Site visits supplement the inspection program and are regular, frequent and informal visits to the premises of a licence holder for regulatory oversight and discussions.

14.12. Requirements for the assessment and reporting of design extension conditions (DECs) for the OPAL reactor were stipulated in the revised OPAL licence issued in May 2019 following submission of detailed plans by ANSTO. This was following a suggestion from the 2018 IRRS mission. The DECs were submitted by ANSTO in June 2021 and approved by ARPANSA. No mitigations were considered to be required at OPAL as a result of the analysis of the DECs, but the analyses have been incorporated into the OPAL SAR.

14.13. The OPAL In-Service Inspection (ISI) program, which was implemented in 2019 to achieve systematic inspection of in-pool reactor components related to safety, noted defects/cracks in the reactor upper chimney (or riser) in November 2020. The chimney function is to collect and bound primary cooling system water flowing through the reactor core. The chimney comprises of the lower chimney that is part of the reflector vessel and the upper chimney, also called the riser. The lower chimney is made of zircaloy-4, and the riser is made of stainless steel.

14.14. Investigation into the defects determined the root cause to be a pressure pulse caused by the rapid closure of the primary coolant system (PCS) flap valves. The PCS flap valves open and establish a path for natural circulation cooling when forced circulation is stopped (amongst other safety functions). The rapid closure occurs upon start-up of the PCS pumps when forced cooling circulation is established for reactor operation in the power state. This rapid closure was determined to cause a pressure pulse which resulted in the damage to the riser.

[32] See https://www.arpansa.gov.au/regulation-and-licensing/licensing/information-for-licence-holders/inspections/performance-objectives-and-criteria

14.15. Justification for continued operation of OPAL was granted by the CEO of ARPANSA following submission of an investigation report, consequence analyses and fracture mechanics assessment, as well as a rectification and mitigation action plan. Other actions include plans to repair, remediate or replace the riser if determined as necessary and to redesign the PCS flap valves to reduce the pressure pulse. ARPANSA imposed a licence condition that requires periodic visual inspections of the riser internal and external surfaces to be provided to the CEO, as part of ongoing monitoring of the situation. To date the action plan is on target and no further discontinuities have been observed.

Article 15 – Radiation protection

INFCIRC/572 Rev.8 Article 15

- *Overview of the Contracting Party's arrangements and regulatory requirements concerning radiation protection at nuclear installations, including applicable laws not mentioned under Article 7*
- *Regulatory expectations for the licence holder's processes to optimize radiation doses and to implement the 'as low as reasonably achievable' (ALARA) principle.*
- *Implementation of radiation protection programmes by the licence holders, including*
  - *observation of dose limits, main results for doses to exposed workers*
  - *conditions for the release of radioactive material to the environment, operational control measures and main results*
  - *processes implemented and steps taken to ensure that radiation exposures are kept as low as reasonably achievable for all operational and maintenance activities*
  - *environmental monitoring and main results.*
- *Regulatory review and control activities.*

15.1. The Regulations require ARPANSA to be satisfied that licence holders optimise radiation protection and apply the ALARA principle. 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 implement the most recent recommendations from the International Commission on Radiological Protection. ARPANSA monitors whether ANSTO ensures 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.

15.2. ANSTO's plans and arrangements for OPAL include a radiation protection plan and an Environmental Protection Plan, as required by the Regulations and further elaborated in ARPANSA's Regulatory Guide: *Plans and Arrangements for Safety* which covers the following:

- roles and responsibilities for radiation protection
- an evaluation and safety assessment of the main radiological hazards in OPAL
- access control to areas with radiological hazards
- administrative controls for management of radiological hazards
- radiological monitoring programs for plant, individuals and the environment
- transportation of radioactive materials
- training requirements for radiation protection

- arrangements for reviewing the radiation protection plan.

15.3. Radiation protection in OPAL is managed with advice from a dedicated Radiation Protection Adviser (RPA). The RPA is supported by a group of radiation protection personnel working in OPAL, including health physics surveyors. The RPA advises OPAL reactor line management and staff on the continuing effectiveness of controls against identified radiological hazards within OPAL and co-ordinates radiation monitoring programs.

15.4. Doses associated with OPAL are typically low, due to design features which limit operational exposure. These features include a reactor pool that incorporates a hot water layer which reduces ambient dose-rates associated with activation and contamination products. Other features include dedicated hot cells for handling irradiated materials and the demarcation of areas - with restricted access during reactor operation.

15.5. Dose records are submitted quarterly to ARPANSA and recorded in the Australian National Radiation Dose Register maintained by ARPANSA.

15.6. ARPANSA conducts independent environmental monitoring programme at ANSTO and publishes the results online. To date no issues have been identified with the results.

New information for 10th Review Meeting

15.7. In 2025, ARPANSA published a new framework[33] for the development, implementation and communication of environmental monitoring and assessment activities, including measurement, analysis, modelling and risk assessment. The Framework applies to ionising and non-ionising radiation exposures to people and the environment from natural and artificial sources. As part of the development of the framework, ARPANSA sought public feedback on the development of community values which are shown in Figure 3 and include:

- Ecosystem health - the overall health and integrity of the ecosystem and wildlife populations
- Cultural and spiritual heritage - protecting traditional land use and sites of importance to First Nations peoples
- Food and drinking water safety - food and water are safe for consumption
- Clean air - air is safe for human activities in the environment
- Recreation and environment - recreation activities can be enjoyed safely
- Economic activity - a safe environment for industrial use and economic benefit
- Public advice - relevant and accurate information to support decision making.

[33] See Monitoring and Assessment of Radiation in the Australian Environment

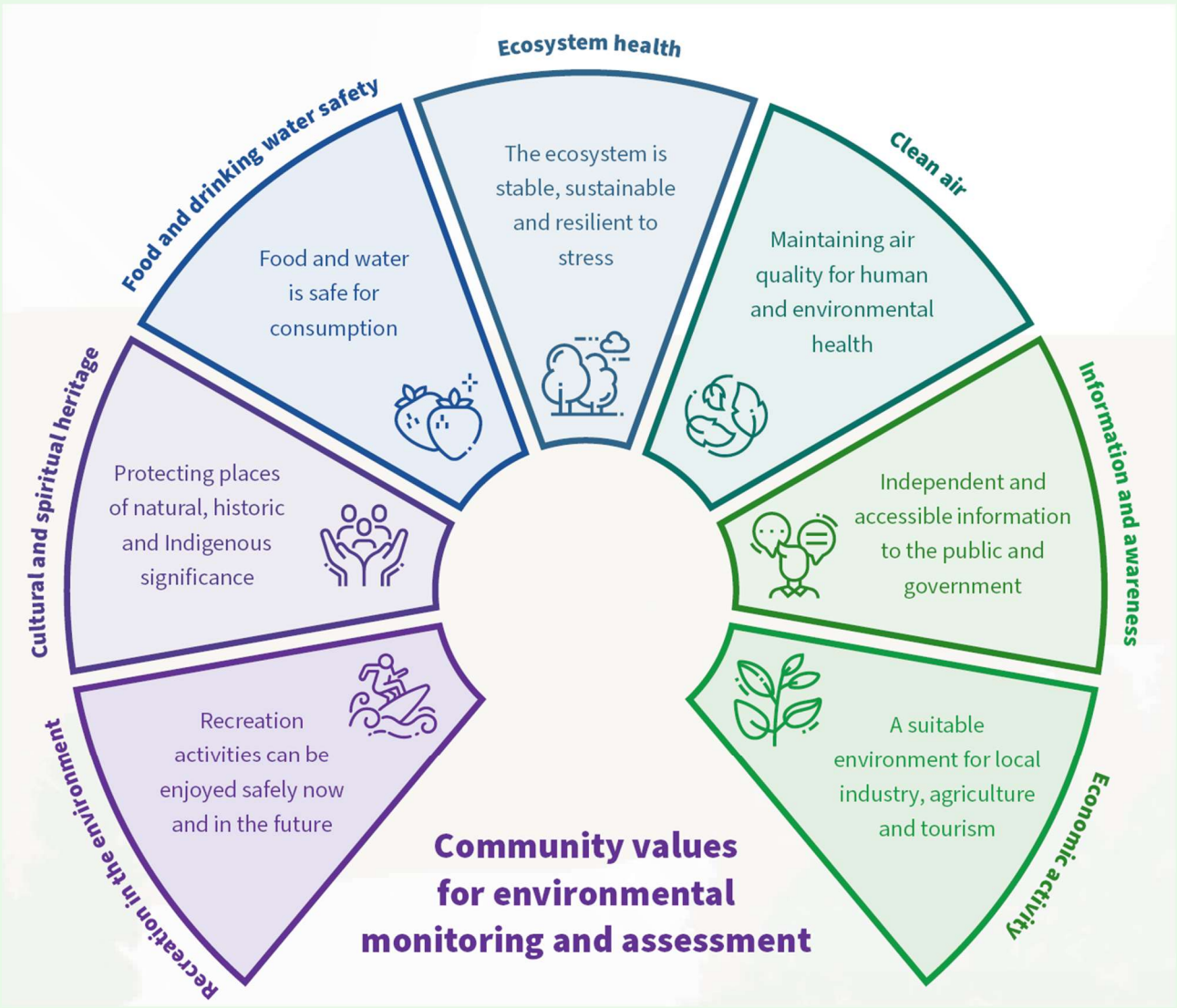


Figure 3– Community Values for Environmental Monitoring and Assessment – ARPANSA

Article 16 – Emergency preparedness

INFCIRC/572/Rev.8 -Article 16 (1) Emergency plans and programmes

- *Overview of the Contracting Party's arrangements and regulatory requirements for onsite (including multi-unit nuclear installations and/or multi-facility sites) and off-site emergency preparedness*
- *Overview and implementation of main elements of national plan (and regional plan, if applicable) for emergency preparedness, including the chain of command and roles and responsibilities of the licence holder, the regulatory body, and other main actors, including State organizations*
- *Implementation of emergency preparedness measures by the licence holders.*
    - *classification of emergencies*

- *main elements of the on-site and, where applicable, off-site emergency plans for nuclear installations, including, availability of adequate resources and authority to effectively manage and mitigate the consequences of an accident*
- *facilities provided by the licence holder for emergency preparedness*

- *Training and exercises, evaluation activities and main results of performed exercises including lessons learned*
- *Regulatory review and control activities*
- *International arrangements, including those with neighbouring States, as necessary*

Article 16 (2) Information of the public and neighbouring States –

- *Overview of the Contracting Party's arrangements for informing the public in the vicinity of the nuclear installations about emergency planning and emergency situations*
- *Arrangements to inform competent authorities in neighbouring States, as necessary*

Article 16 (3) Emergency preparedness for Contracting Parties without nuclear installations

- *Contracting Parties with no nuclear installations on their territory, but that are likely to be affected by an emergency at a nuclear installation in another country, should describe:*
  - *measures for the preparation and testing of emergency plans that cover the activities to be carried out on their territory in the event of such an emergency*
  - *international arrangements, including those with neighbouring States, as necessary*

16.1. 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 three 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.

16.2. 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.

16.3. ARPANSA has published a *Guide for Radiation Protection in Emergency Exposure Situations* (RPS G-3, Parts 1 and 2, 2019). This is based on the requirements of IAEA GSR Part 7. This guide provides the framework in Australia for the protection of emergency workers, helpers, the public and the environment in emergency exposure situations as well as providing guidance for the planning, preparedness, response and transition required to effectively respond to an emergency. The guide also provides for classification of emergencies.

16.4. ANSTO has an emergency response plan for the entire site, which is integrated with the emergency plans of the State of New South Wales.[34] There is a sub-plan covering a major incident at ANSTO which may involve local evacuations. An emergency plan exists for OPAL, with the requirement for a major exercise every two years and more frequent drills on particular aspects of the plan. Major exercises have been held regularly in accordance with the plan. These exercises were witnessed by ARPANSA inspectors.

[34] See Lucas Heights emergency sub plan | NSW Government

16.5. The implementation of these emergency plans for the ANSTO site is regularly discussed with emergency response agencies, local council and others at the ANSTO Local Liaison Working Party, in which ARPANSA is an observer.

16.6. Assessments of the radiological consequences of acts of sabotage and terrorism in relation to OPAL have been undertaken by ANSTO and reviewed by ARPANSA. Both ANSTO and ARPANSA concluded that the current emergency plans and arrangements, including adoption of the World Health Organisation (WHO) guidelines for the dissemination of iodine tablets, provide adequate protection of the public for such events.

16.7. The geographical location of Australia and also the nature of the OPAL Reactor means that an emergency -at OPAL should not result in a transboundary release.

16.8. Australia is a party to the Convention on the Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. ARPANSA is the designated national competent authority for these conventions and the Australian Government National Situation Room (NSR), operated by the National Emergency Management Agency, a division of the Department of Home Affairs, is the designated national warning point. ARPANSA maintains capabilities registered in the IAEA Response and Assistance Network (RANET) that can be deployed to other countries under the Assistance Convention.

16.9. The Australian Government has recently updated the Australian Government Crisis Management Framework (AGCMF) for the management of events. The Australian Government Crisis Management Framework articulates how hazards and events will be managed at the Commonwealth/Federal level and has assigned the hazard of radiological and nuclear events to ARPANSA. ARPANSA is now writing the Australian Radiological and Nuclear Event Plan or AUSRNEPLAN. This plan will cover a range of scenarios where the commonwealth will provide support in a federated context including space debris re-entry, nuclear powered warships, nuclear reactors, maritime radiological events, etc. The AUSRNEPLAN should be drafted by December 2025.

16.10. ARPANSA also maintains an Emergency Operations Centre which can be activated in response to a radiological or nuclear emergency and provides 24-hour access to expert radiation protection and nuclear safety advice. This capability has been enhanced with adoption of the Australasian Inter-Service Incident Management Framework (AIIMS) and associated incident management software. The operations centre maintains communication links with the Australian Government Department of Home Affairs NSR, ensuring the Australian Government and public are provided with appropriate and timely information during an emergency. This information would also be sent to the IAEA Incident and Emergency Centre as required.

16.11. Australia is not geographically close to any IAEA member state operating a nuclear installation as defined under the CNS. Nevertheless, Australia has appropriate precautions in place in relation to radiation emergencies in other countries, including the provision of information to the public and decision makers and the monitoring of imported foodstuffs. For example, during the Fukushima nuclear emergency, ARPANSA and ANSTO provided continuous technical advice to the Australian Government. Using weather prediction data, ARPANSA modelled the movement of airborne radioactive plumes, both potential and real, on a daily basis to ensure that Australians were given adequate advice while in Japan. ARPANSA also worked with Australia's food standards regulator to assess the available information on contamination levels in water, milk and foodstuffs in Japan and to screen foodstuffs imported to Australia from Japan and made the information available publicly.

16.12. Whilst not a nuclear installation as defined under the CNS, Australia does receive visits by foreign nuclear-powered warships (NPW) and arrangements have been established including conditions of entry to ensure that the safety of the general public is maintained during visits by such vessels.

These visits are overseen by an inter-governmental panel which includes ANSTO and ARPANSA. This panel requires emergency arrangements to be in place at all Australian ports visited by NPW in the unlikely event of a radiological emergency, including a requirement that there be the capability to undertake radiation monitoring of the port environment.

Recovery of a Lost Source

16.13. In January 2023, in Western Australia (WA), a 19-gigabecquerel caesium-137 ceramic source (measuring 8mm length by 6mm diameter) was reported missing by a mining company which is under the jurisdiction of the WA Radiological Council regulator. The source was part of a radiation gauge and was transported from a mine site north of Newman to a depot in Perth. The capsule was reported missing after it was discovered that the container it was in had been damaged on a truck.

16.14. The search for the capsule was coordinated by the Western Australian Department of Fire and Emergency Services and involved ANSTO, ARPANSA and Defence as part of a multi-agency response effort. The team of radiation experts from ANSTO located the source 2 metres from the roadside on the Great Northern Highway during a vehicle search, travelling at 70km an hour, using a suite of radiation equipment including ANSTO's own custom-developed radiation detection and imaging technology.

16.15. The portable radiation detection technology was a modified version of ANSTO's own CORIS360® which produces fast, precise, and high-quality 360-degree images that pinpoint the identity and location of radiation in an area, whilst minimising the need for workers to stay within a radiation environment.

Article 17 – Siting

INFCIRC/572 Rev 8 Article 17 (1) Evaluation of site related factors

- *Overview of the Contracting Party's arrangements and regulatory requirements relating to the siting and evaluation of sites of nuclear installations, including applicable national laws not mentioned under Article 7 of the Convention:*
- *overview of assessments made, and criteria applied for evaluating all site related factors affecting the safety of the nuclear installation, including multi-unit failure, loss of infrastructure, and site access following an event.*
- *overview of design provisions used against human made external events and natural occurring external events such as fire, explosion, aircraft crash, external flooding, severe weather conditions and earthquakes and the impact of related sequential natural external events (e.g. tsunami caused by an earthquake, mud slide caused by heavy rain).*
- *Regulatory review and control activities.*

Article 17 (2) Impact of the installation on individuals, society and environment

- *Criteria for evaluating the likely safety related impact of the nuclear installation on the surrounding population and the environment.*
- *Implementation of these criteria in the licensing process.*

Article 17 (3) Re-evaluation of site related factors

- *Activities for re-evaluation of the site related factors as mentioned in Article 17 (1) of the Convention to ensure the continued acceptability of the safety of the nuclear installation conducted according to appropriate standards and practices.*
- *Results of recent re-evaluation activities.*
- *Regulatory review and control activities.*

Article 17 (4) Consultation with other Contracting Parties likely to be affected by the installation

- *International arrangements.*
- *Bilateral arrangements with neighbouring States, as applicable and necessary*

17.1. In addition to the general requirements for licensing (see Article 7), 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
- ARPANSA would expect any new application for a research reactor to follow the relevant requirements of the IAEA Siting of Nuclear Installations (SSR-1) and associated guides.

17.2. The ANSTO site was authorised for the construction of OPAL only after ANSTO demonstrated to ARPANSA's satisfaction that the site is suitable for the construction, operation and decommissioning of a research reactor while providing adequate protection of the health and safety of people and the environment.

17.3. The ARPANSA Act and regulations require the CEO to invite public consultation on new licence applications for nuclear installations.

17.4. The ANSTO site characteristics are assessed periodically for change. An example of this was in the OPAL 2021 PSSR.

Article 18 – Design and construction

INFCIRC/572/Rev.8 Article 18 (1) Implementation of defence in depth – Overview of the Contracting Party's arrangements and regulatory requirements concerning the design and construction of nuclear installations:

- *Status with regard to the application for all nuclear installations of the defence in depth concept, providing for multiple levels of protection of the fuel, the primary pressure boundary and the containment, with account taken of internal and external events and the impact of related sequential natural external events (e.g. tsunami caused by an earthquake, mud slide caused by heavy rain)*
- *Extent of use of design principles, such as passive safety or the failsafe function, automation, physical and functional separation, redundancy and diversity, for different types and generations of nuclear installations*
- *Implementation of design measures or changes (plant modifications, backfitting) with the objective of preventing beyond design basis accidents and mitigating their radiological*

consequences if they were to occur (this applies to the entire nuclear installation including spent fuel pools)

- *Implementation of particular measures to maintain, where appropriate, the integrity of the physical containment to avoid long term off-site contamination, in particular actions taken or planned to cope with natural hazards more severe than those considered in the design basis*
- *Improvements implemented for designs for nuclear power plants as a result of deterministic and probabilistic safety assessments made since the previous National Report. and an overview of main improvements implemented since the commissioning of the nuclear installations*
- *Regulatory review and control activities.*

Article 18 (2) Incorporation of proven technologies – Contracting Party's arrangements and regulatory requirements for the use of technologies proven by experience or qualified by testing or analysis:

- *Measures taken by the licence holders to implement proven technologies*
- *Analysis, testing and experimental methods to qualify new technologies, such as digital instrumentation and control equipment*
- *Regulatory review and control activities.*

Article 18 (3) Design for reliable, stable and manageable operation:

- *Overview of the Contracting Party's arrangements and regulatory requirements for reliable, stable and easily manageable operation, with specific consideration of human factors and the human–machine interface (see also Article 12 of the Convention*
- *Implementation measures taken by the licence holder*
- *Regulatory review and control activities.*

18.1. ARPANSA's Regulatory Guide - *Applying for a Licence for a Nuclear Installation*[35] 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 and specifically refers to IAEA Specific Safety Guide, *Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report SSG-20.*

18.2. The OPAL licence application was assessed against the ARPANSA Regulatory Assessment Principles which were derived from IAEA requirements/guidance. The principles included the following expectations at the design stage:

- facilities are designed with systematic consideration of human factors and ergonomic principles to reduce the potential for human error, facilitate correct actions by operators, and reduce operator stress
- safety systems at nuclear reactors are designed to be automatically initiated and to require no immediate operator action within 30 minutes, while permitting operator initiation or action where necessary to ensure or enhance safety
- control and control room layout provide ergonomic disposition of data and controls for actions important to safety, including accident management
- diagnostic aids are provided to speedily resolve questions important to safety and to monitor the status of the reactor

- maintenance and inspection aspects such as access are considered in the design of equipment and systems
- reliable and redundant communications systems are provided for all operations staff
- Defence in Depth must be applied
- the principles for redundancy, independence, diversity and fail safe apply
- account was taken of external and internal hazard events (and combinations of) on the plant design.

18.3. A significant change to design reported at the 7th CNS Review meeting was the addition of a Heavy Water Upgrade System to remove light water from the heavy water in the reflector vessel**.** Although the operation of the reactor was adapted to the modification, the safety effect was demonstrated to be minimal and fully within the safety design capabilities.

Article 19 – Operation

INFCIRC/572/Rev.8 Article 19 (1) Initial authorization – overview of the Contracting Party's arrangements and regulatory requirements for the commissioning of a nuclear installation, demonstrating that the installation, as constructed, is consistent with design requirements and safety requirements:

- *Conduct of appropriate safety analyses*
- *Commissioning programmes*
- *Programmes of verification that installations, as constructed, are consistent with the design and in compliance with safety requirements*
- *Regulatory review and control activities.*

19.1. The ARPANSA licensing process, laid out in the Regulatory Guide Applying for a Licence for a Nuclear Installation and associated guides, requires the applicant to furnish specific information when applying for a licence to operate a nuclear research reactor. These include:

- Arrangements for maintaining criticality safety during loading, moving or storing nuclear fuel and other fissile materials
- A description of the structures, components, systems and equipment of the reactor as they have been constructed
- A safety analysis report (SAR) that demonstrates the adequacy of the design, the operating limits and conditions, and arrangements for commissioning and operations.

19.2. In assessing a licence application for a nuclear research reactor, ARPANSA must, under the Act, take into account international best practice in radiation protection and nuclear safety.

INFCIRC /572 Rev.8 Article 19 (2) Operational limits and conditions – Overview of the Contracting Party's arrangements and regulatory requirements for the definition of safe boundaries of operation and the setting of operational limits and conditions:

- Implementation of operational limits and conditions, their documentation, training in them, and their availability to plant personnel engaged in safety related work.
- Review and revision of operational limits and conditions as necessary
- Regulatory review and control activities.

19.3. The Regulations require an applicant for an operating licence to specify the operational limits and conditions (OLC) and demonstrate training in these. Failure to comply with an OLC may be a breach of a condition of licence. ARPANSA continues to monitor compliance with OLCs and surveillance requirements. The licence holder may not make any change to an OLC (other than minor editorial changes that do not challenge the intent of the condition) without prior approval from ARPANSA.

INFCIRC /572 Rev.8 Article 19 (3) Procedures for operation, maintenance, inspection and testing – Overview of the Contracting Party's arrangements and regulatory requirements on procedures for operation, maintenance, inspection and testing of a nuclear installation:

- Establishing of operational procedures, their implementation, periodic review, modification, approval and documentation.

- Availability of the procedures to the relevant nuclear installation staff.
- Involvement of relevant nuclear installation staff in the development of procedures.
- Incorporation of operational procedures into the management system of the nuclear installation.
- Regulatory review and control activities.

19.4. The Regulations require licence applications to contain plans and arrangements to ensure the safety of a reactor throughout all stages of its life, including a decommissioning plan. Procedures and instructions for operation, maintenance, inspection and testing of the reactor must form part of these plans and arrangements and are reviewed and approved by ARPANSA before a licence is issued.

19.5. ARPANSA's Regulatory Guide Plans & Arrangements for managing safety set 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.

19.6. Approved procedures for the operation, maintenance, inspection and testing of OPAL are undertaken in accordance with the Reactor Operations Business Management System (BMS). The head document of the BMS is the - Reactor Operations and Waste Management Services integrated Business Management System Manual, and below this lies the range of manuals, procedures, instructions, and forms for all operations, maintenance, testing and inspection activities.

19.7. ARPANSA regularly inspects compliance with inspection testing and maintenance and also the BMS system.

INFCIRC/572 Rev.8 Article 19 (4) Procedures for responding to operational occurrences and accidents

- *Overview of the Contracting Party's arrangements and regulatory requirements on procedures for responding to anticipated operational occurrences and accidents*
- *Establishment of event based and/or symptom-based emergency operating procedures*
- *Establishment of procedures and guidance to prevent severe accidents or mitigate their consequences*
- *Establishment of procedures and guidance to manage accident situations at multi-unit nuclear installations and/or multi-facility sites*
- *Regulatory review and control activities.*

19.8. ARPANSA's regulatory guidance, which references latest international best practice, set the expectations on how OPAL should demonstrate that limits of normal operation and anticipated operational occurrences and safety systems settings, including the minimum plant configuration, are derived from safety analyses. The applicant is expected to demonstrate that the operation of the reactor will be constrained by the safety settings.

19.9. The applicant must also demonstrate how, at defence in depth level 4, it is possible for operators to diagnose the status of the reactor and to make accident management arrangements. Accident management arrangements may include maintaining or restoring at least one barrier for the confinement of radioactive material and should be based on the outcomes of the safety analysis. The instrumentation important for monitoring the status of the reactor and to undertake effective accident management arrangements is regularly inspected, tested and maintained.

19.10. As with other plans and arrangements that form part of the application, the measures relating to the procedures for responding to anticipated operational occurrences and accidents become mandatory upon issue of licence.

19.11. The Reactor Operations BMS has a number of procedures dealing with arrangements for symptom-based incidents/emergencies ranging from minor abnormal occurrences to major events, including reactor transients, water leaks and radiation events such as airborne releases or the failure of fuel cladding. These procedures provide guidance on actions which should be taken within the OPAL operations environment and the circumstances under which a wider ANSTO site response is required.

INFCIRC /572 Rev.8 Article 19 (5) Engineering and technical support –

- *General availability of necessary engineering and technical support in all safety related fields for all nuclear installations, under construction, in operation, under accident conditions or under decommissioning*
- *General availability of necessary technical support on the site and also at the licence holder or utility headquarters, and procedures for making central resources available for nuclear installations*
- *General situation with regard to dependence on consultants and contractors for technical support to nuclear installations*
- *Regulatory review and control activities.*

19.12. In determining whether to issue a licence to an applicant, the Regulations require ARPANSA to consider whether the applicant has the capacity to comply with the Regulations and any licence condition. ARPANSA's Regulatory Guide *Applying for a licence for a nuclear installation* and associated guides and associated guides set expectations on what an applicant should consider when developing an appropriate management structure and resources. For example, the regulatory guideline on *Plans and Arrangements* provides guidance on how to demonstrate effective control and management of safety under normal operation, incidents, and accident conditions. To demonstrate this, the licence holder should show the availability of all necessary engineering and technical support resources in all safety-related fields.

19.13. ANSTO has a corporate plan which identifies the development and retention of technical and engineering skills in its human resources, which will support safe operation of all its facilities. There is a human resource plan for Nuclear Operations, which is reviewed annually.

19.14. ANSTO has a corporate Strategic Asset Management Plan and facility specific Asset Management Plans applicable to all the ANSTO facilities, including the OPAL reactor. These plans are based on best international practice, specifically ISO 55001: Asset Management, and are intended to maximise the net benefit to public health, society, science and industry from ANSTO's landmark nuclear science and technology assets by safely and sustainably realising value from assets throughout the life of the assets. The Asset Management Plan for the OPAL Reactor is integrated with other business planning processes as part of the OPAL reactor Integrated Management System and addresses the ageing of the OPAL reactor during its lifetime.

INFCIRC/572 Rev.8 Article 19 (6) Reporting of incidents significant to safety

- *Overview of the Contracting Party's arrangements and regulatory requirements to report incidents significant to safety to the regulatory body*
- *Overview of the established reporting criteria and reporting procedures for incidents significant to safety and other events such as near misses and accidents*

- *Statistics of reported incidents significant to safety for the past three years*
- *Documentation and publication of reported events and incidents by both the licence holders and the regulatory body*
- *Policy for use of the INES scale*
- *Regulatory review and control activities.*

19.15. The Regulations requires every licence holder to report any significant incident to ARPANSA within 24 hours of its occurrence. Guidance on how to report, including what constitutes a reportable incident (for example an INES Level 2 incident) is published on the ARPANSA website. 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.

19.16. Significant incidents (for example International Nuclear Event Scale (INES) Level 2 and above) are reported to the IAEA under the INES reporting system.

19.17. Under the Reactor Operations BMS, ANSTO implements a process for identifying, recording, analysing and reporting abnormal occurrences and accidents to ARPANSA within appropriate timeframes.

INFCIRC/572 Rev.8 Article 19 (7) Operational experience feedback

- *Overview of the Contracting Party's arrangements and regulatory requirements on the licence holders to collect and analyse and share operating experience*
- *Overview of programmes of licence holders for the feedback of information on operating experience from their own nuclear installation, from other domestic installations and from installations abroad*
- *Procedures to analyse domestic and international events*
- *Procedures to draw conclusions and to implement any necessary modification to the installation and to personnel training programmes and simulators*
- *Mechanisms to share important experience with other operating organizations. – Use of international information databases on operating experience*
- *Regulatory review and control activities for licence holder programmes and procedures*
- *Programmes of the regulatory body for feedback of operational experience and the use of existing mechanisms to share important experience with international organizations and with other regulatory bodies.*

19.18. ARPANSA's Regulatory Guide *Plans & Arrangements for managing safety* 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 reactors 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.

19.19. ANSTO uses a Governance Risk and Compliance (GRC) system for incident management. The system is used to manage and record all incidents, including abnormal occurrences, accidents and near misses. The system is also used to detail the investigations and analyses related to those events. ANSTO is required to report to ARPANSA within 24 hours events that are considered to be notifiable.[35] However, ANSTO also reports non-notifiable events to ARPANSA every quarter.

19.20. Australia supports the IAEA Incident Reporting System for Research Reactors (IRSRR). Programs for corrective actions and learning lessons from incidents are integral to ANSTO's Event Management System.

19.21. ANSTO has, since 2006, taken part in a collaboration agreement with operators of the SAFARI-1 reactor (South Africa) and High Flux Reactor (HFR - The Netherlands). The aim of the agreement is to work together to increase safety and reliability through cooperation as OPAL, SAFARI-1 and HFR are similar reactors performing similar roles and functions. Meetings are held every 12 to 18 months to exchange ideas, experiences and good practices.

19.22. ARPANSA shares information and lessons learned from its licence holders through licence holder forums and on its website. ARPANSA also shares information from its relevant international commitments such as from the Incident Reporting System for Nuclear Installations (IRSNI) with relevant licence holders.

19.23. ARPANSA also maintains the Australian Radiation Incident Register which is a national database of incidents involving the use of radiation or radioactivity. Reports are provided by Commonwealth, state and territory radiation protection authorities. The register aims to highlight useful data and reports to licence holders and regulatory bodies with a view to implementing improvements in operation of owners and users of radiation apparatus, facilities and sources.

INFCIRC/572/Rev.8 Article 19 (8) Management of spent fuel and radioactive waste on the site

- *Overview of the Contracting Party's arrangements and regulatory requirements for the on-site handling of spent fuel and radioactive waste*
- *On-site storage of spent fuel*
- *Implementation of on-site treatment, conditioning and storage of radioactive waste.*
- *Activities to keep the amount of waste generated to the minimum practicable for the process concerned, in terms of both activity and volume*
- *Established procedures for clearance of radioactive waste*
- *Regulatory review and control activities.*

19.24. In relation to the handling, storage, transport, discharge, and disposal of any radioactive waste attributable to a nuclear reactor, ARPANSA's guidelines, which are based on international best practice set expectations that:

- suitable provisions, including waste management facilities, must exist for radioactive waste arising from operations
- where radioactive waste is stored prior to being discharged or disposed of, there are to be suitable provisions for its interim containment

[35] See Regulatory Guide - Radiation incidents (ARPANSA-GDE-1749) | ARPANSA

- handling facilities for radioactive waste are to be sufficiently flexible to cope with faulty containers, and radioactive waste of non-standard physical or chemical composition
- the form, locations and quantities of any radioactive waste or discharges, are to be specified, monitored and recorded
- where relevant, the safety analysis is to include consideration of radioactive waste and to confirm compliance with the radiation dose limits.

19.25. ARPANSA provides codes and guidance on a range of radioactive waste and disposal matters, drawing on IAEA requirements and guidance. It includes a requirement for the applicant to provide documentation detailing procedures for the minimisation of the generation of radioactive waste.

Management of spent fuel and radioactive waste

19.26. Detailed procedures for waste management at OPAL are included in the Reactor Operations BMS. Solid and liquid radioactive wastes are managed across the whole of the ANSTO site by ANSTO's Waste Management Services within the Nuclear Operations and Nuclear Medicine Division.

19.27. OPAL's radioactive waste management plan addresses waste minimisation, segregation and classification of the different waste types and waste streams. Intermediate level solid waste is stored in the OPAL service pool and will be disposed of to the National Radioactive Waste Management Facility (NRWMF) operated by the Australian Radioactive Waste Agency (ARWA) when that is established.

19.28. Treated effluent is managed under the existing Waste Management Services arrangements for discharge to the sewer under the trade waste agreement (TWA) with Sydney Waste. The TWA requires that, by the time discharges from the Lucas Heights site reach the sewage treatment plant, the levels of radioactivity comply with the WHO derived concentration limits for drinking water. OPAL liquid discharges are part of the site general discharges.

Limiting exposure during handling, treatment, transport, storage and transfer or ultimate disposal of spent fuel and radioactive waste

19.29. Limitation of exposure is implemented by ANSTO through guidance documents and work instructions in the WHS management system and the Reactor Operations BMS. The guidance and instructions comply with all applicable ARPANSA and international codes and standards.

Packaging and containment of radioactive waste

19.30. All solid waste is stored on-site in approved packaging in facilities specifically designed and licensed for this purpose. Prior to discharge, all radioactive liquid waste is stored in appropriate containment vessels and subject to appropriate treatment methods.

19.31. A program is also in place for the solidification of intermediate level radioactive liquid wastes from molybdenum-99 production using ANSTO's SYNROC© process at the proposed ANSTO SyMo Facility which is under construction.

Discharge reports

19.32. The OPAL operating licence has conditions requiring quarterly and annual reports to ARPANSA on airborne radioactive discharges arising from all ANSTO's activities. The existing stack monitoring equipment continuously samples gaseous discharges using TC45 cartridges. The filters are measured weekly by ANSTO's Nuclear Assurance Group to provide information on gaseous discharges. Notification and correction levels are set by ARPANSA.

Management of ultimate disposal or transfer of radioactive wastes

19.33. In accordance with its Radioactive Waste Management Strategy, ANSTO stores its radioactive wastes on site until suitable disposal routes are available. There is currently no Commonwealth disposal route for radioactive waste within Australia, and this limits the options to on-site storage or return to manufacturer. See Introduction section for more information on the NRWMF.

Spent fuel management strategy

19.34. The Australian Government decided in 1997 that an appropriate management strategy for HIFAR spent fuel was to ship it overseas and store any resulting long-lived intermediate level wastes in Australia in a form suitable for acceptance into a national storage facility. Reprocessed wastes from those shipments were returned to Australia in 2015 and in 2022 and are temporarily stored in the ANSTO Interim Waste Store at Lucas Heights. These wastes will remain at Lucas Heights until the establishment of the NRWMF.

19.35. In 2018, the first shipment of 236 spent fuel assemblies from the OPAL reactor were shipped to the AREVA (now ORANO) La Hague facility in France for reprocessing in 4 TN-MTR casks. Residual waste from the reprocessing of these spent fuel assemblies will be returned to Australia in around 2035-2040 as per the waste from the HIFAR spent fuel. The next shipment of spent fuel assemblies from the OPAL reactor is scheduled to occur in September 2025.

19.36. The Australian Government continues to seek an appropriate site for Australia's National Radioactive Waste Management Facility (NRWMF) in order to provide a single purpose-built facility to permanently store low level waste and temporarily store intermediate level waste. See Summary of this report for more information.

Appendix 1 – Australia's compliance with the Vienna Declaration on Nuclear Safety Principles

Principle 1 of the Vienna Declaration states *New nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off-site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions.* Australia meets this expectation with respect to research reactors in the following ways:

- The siting of OPAL took into account the elements covered by Principle 1 of the Vienna Declaration, namely, the prevention of accidents during the commissioning and operations phase.
- ARPANSA's Regulatory Guide - *Applying for a Licence for a Nuclear Installation* is structured to reflect internationally accepted principles of defence in depth. The guide states the need for proven engineering practice and standards in the siting, design, manufacture, construction, installation, and commissioning of a reactor.
- ARPANSA's Regulatory Guide - *Applying for a Licence for a Nuclear Installation* sets out international best practice applicable to siting of nuclear installations and is based on IAEA Safety Standards – *Site Evaluations for Nuclear Installation* SSR -1 (2019).

The siting of OPAL took into account the elements covered by Principle 1 of the Vienna Declaration, namely, the prevention of accidents during the commissioning and operations phase.

Summary of how Australia meets the Vienna Declaration on Nuclear Safety Principle 2

Australia meets the Vienna Declaration Principle 2 in relation to Research Reactors: *Comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements are implemented in a timely manner*.

This is achieved through:

- requiring a licence holder to take all reasonably practicable measures to implement its plans and arrangements for managing safety. The licence holder is also required to review those plans and arrangements at least once every three years. Any change to plans and arrangements that may have significant implications for safety must be approved by ARPANSA prior to implementation.
- OPAL is required to undertake periodic safety and security reviews (PSSR).
- OPAL completed a full DEC Analyses as part of a revision of the SAR in 2022.
- Reasonably practicable/achievable safety improvements arising from these reviews are required to be implemented in a timely manner.

Summary of how Australia meets the Vienna Declaration on Nuclear Safety Principle 3

Australia meets the Vienna Declaration Principle 3 in relation to Research Reactors: *taking into account IAEA Safety Standards and other good practises identified in Review Meetings of the CNS* in the following ways:

- In assessing a licence application, ARPANSA must, under the Act, take into account international best practice in radiation protection and nuclear safety. The relevant international best practice documents (primarily IAEA Safety Standards) are listed on the ARPANSA website.

- Publishing of ARPANSA Regulatory Guide: *Periodic Safety and Security Review for Research Reactors* (based on IAEA SSG-10) in 2016 and Regulatory Guide*: Decommissioning of Controlled Facilities* published in 2018 based on IAEA SSG-47. In addition, publishing of Regulatory Guide: *Applying for a licence for radioactive waste storage or disposal facility* based on the IAEA Safety Series including GSG-1 *Classification of Radioactive Waste* and SSR-5 *Disposal of Radioactive Waste*.

- A set of performance objectives and criteria (PO&C) are used by inspectors for a transparent and graded approach to assess licence holders' practices and is consistent with the risk of the facility. The PO&Cs reflect international best practice.

- Hosting of a full scope IRRS mission in 2018 which reviewed Australia's national, legal, and governmental framework for nuclear and radiation safety against the IAEA's Safety Standards.

- Imposing a licence condition to require OPAL to assess and report on DECs as per the IAEA SSR-3 *Safety of Research Reactors* Requirement 22. The DECs were submitted to ARPANSA in June 2021 in the form of a revision to the OPAL Safety Analysis Report and subsequently approved in 2022.