6.1.2. Organisation and technical resources for review and assessment

Related to GSR Part 1 (Rev. 1): Requirement 4, paragraph 2.8; Requirement 11, paragraphs 2.34–2.38; Requirement 15, paragraphs 3.3–3.5; Requirement 16, paragraph 4.4–4.5; Requirement 17, paragraph 4.6; Requirement 18, paragraphs 4.11–4.13 and Requirement 20, paragraphs 4.18–4.22

As described in section 3.3 of this Summary Report, staffing and competence of the regulatory body, each regulator has resources available for review and assessment. For ARPANSA, this includes approximately 20 regulatory staff who perform review and assessment with support from a significant number of staff sourced from across the agency, with expertise in dosimetry, health, communication and other areas relevant to regulatory review and assessment. Where appropriate, such as when there is a gap in expertise, ARPANSA engages contractors to assist in inspection and assessment.

As previously stated, advisory bodies, committees and councils are used by the regulatory bodies where additional external expertise are desirable, such as for complex applications or policy decisions. For ARPANSA, the primary advisory body for this purpose is the Nuclear Safety Committee. In some jurisdictions, such as ACT, the council holds powers to approve authorisations, and therefore perform reviews and assessments where applicable. For more information on advisory bodies to ARPANSA, see section 0.

6.1.3. Basis for review and assessment

Related to GSR Part 1 (Rev. 1): Requirements 23 and 24, paragraphs 4.33–4.34; Requirements 25 and 26, paragraphs 4.40–4.41, GSR Part 4: Requirements 14–15

The principal basis for all review and assessment is the relevant jurisdictional legislation, and the national codes that are adopted in a jurisdiction, which apply to the type of application. The national codes are listed on the website, and for ARPANSA licence holders a list is provided of which codes are applicable to different types of sources and facilities. See section 9 on the development and adoption of national codes and other guidance.

	Example requirement
***Code for Radiation Protection in Planned Exposure Situations 2016*, Radiation Protection Series C-1 (RPS C-1)**	3.1.4 The Responsible Person must ensure that the radiation management plan: a) adopts objectives for protection and safety in accordance with the requirements of this Code b) applies measures for protection and safety that are commensurate with the radiation risks associated with the exposure situation both in normal operation and in the event of an incident or accident c) is adequate to ensure compliance with the requirements of this Code. 3.1.5 The Responsible Person must ensure the radiation management plan addresses protection commensurate with the level of radiation risk that it seeks to mitigate of: (a) occupationally exposed persons (b) members of the public (c) the environment.

	Example requirement
***Code of Practice for Radiation Protection in the Medical Applications of Ionizing Radiation* 2008 (RPS 14)**	Schedule A: The Radiation Management Plan must address the following: a) work practices and protocols for all procedures involving medical exposure to ionizing radiation, including those: (i) to ensure that the prescribed radiation procedure is performed on the correct patient; (ii) for the proper planning and delivery of radiotherapy doses; (iii) for preparation and dispensing of radiopharmaceuticals; (iv) for optimising the protection of the patient consistent with section 2 of this Code; and (v) for observation 11 of the patient by the operator throughout procedures where the dosimetry or image quality could be affected by patient movement b) construction and shielding of the medical facility or premises so that dose constraints acceptable to the relevant regulatory authority are applied for occupationally exposed persons and members of the public c) the action to be taken if the radiation doses to occupationally exposed persons or members of the public are found to exceed the dose constraints d) optimisation of the shielding so that external radiation exposure rates are kept as low as reasonably achievable, economic and social factors being taken into account e) arrangements for appropriate isolation of hospital in-patients undergoing treatment with sealed or unsealed radioactive sources f) the training, qualifications and supervision of the staff of the medical facility and their roles and responsibilities g) the licensing requirements of the radiation regulatory authority h) personal radiation monitoring requirements for persons involved in the use of radiation i) personal protective equipment to be worn by persons involved in the use of radiation ...see RPS14 for additional requirements...

	Example requirement
Code of Practice and Safety Guide for Portable Density/Moisture Gauges Containing Radioactive Sources 2004 (RPS 5)	2.1 Each Responsible Person, supplier or service provider who deals with a portable density/moisture gauge must ensure that a Radiation Management Plan is developed, documented, implemented and regularly reviewed to ensure safety in all applicable dealings with the portable density/moisture gauge, including: a) work practices b) roles and responsibilities c) radiation monitoring requirements, including details of how the availability or accessibility requirements for the monitoring equipment are to be achieved d) control of an incident involving the gauge (section 4.3) e) storage of the gauge (section 5.1) f) transport of the gauge (section 5.2) g) repairs and maintenance of the gauge (section 6.1) h) what to do with the gauge (e.g. sale, transfer, disposal) when it is no longer required (Sections 6.2 and 6.3) i) accountability and records (section 6.4) j) any other requirement that may have a bearing on safety.

Table 7. Examples of requirements under Codes

For source and facility applications under the Commonwealth, State and Territory legal frameworks, safety assessments are part of the Radiation Management Plan, or similar documentation of plans and arrangements. This may include attached documents, such as shielding plans, and an assessment by the licence holder of typical doses, and doses likely to be received as part of abnormal events. This assessment may take into account complex modelling, personal dosimetry data or typical radiation doses for the industry, depending on the complexity of the application.

All jurisdictions have the ability to request additional information if not satisfied by the information provided in the application. For ARPANSA, information which may be requested is listed in schedule 3 of the Australian Radiation Protection and Nuclear Safety Regulations 1999 (the Regulations). For example, for a facility operating licence, the CEO of ARPANSA may require 'A final safety analysis report that demonstrates the adequacy of the design of the controlled facility and includes the results of commissioning tests.'

In addition to regulatory requirements and Australian guidelines, when considering an application the CEO of ARPANSA must under sections 32 and 33 of the *Australian Radiation Protection and Nuclear Safety Act 1998* (the Act) take into account international best practice. The international standards listed on ARPANSA's website are a key basis for ARPANSA's review and assessment, particularly were there are no relevant Australian codes, guides or other documents.

Further guidance on the criteria of assessment is available in:

- the 'regulatory assessment criteria for the design of new controlled facilities and modifications to existing facilities', which has been earmarked for revision as some of the documentation referenced is not current. However, the principles remain relevant and continue to be used until the document is updated

- the 'regulatory assessment principles for controlled facilities' which is provided for historical purposes only. New applications will be assessed against relevant current international best practice. For more information on guides, see section 9.

The international standards listed on the website include the IAEA safety standards. For example, while there is no Australian specific guidance on safety assessments, the following documents are can be drawn on to support safety assessments:

- GSR Part 4 Safety Assessment for Facilities and Activities
- GS-G-4.1 Format and Content of the Safety Analysis Report for Nuclear Power Plants
- SSG-2 Deterministic Safety Analysis for Nuclear Power Plants
- SSG-3 Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants
- SSG-4 Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants
- WS-G-5.2 Safety Assessment for the Decommissioning of Facilities Using Radioactive Material
- SSG-20 Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report
- SSG-27 Criticality Safety in the Handling of Fissile Material
- GSG-3 The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste

6.1.4. Performance of review and assessment

Related to GSR Part 1 (Rev. 1): Requirements 25 and 26, paragraphs 4.43–4.48, GSR Part 4: Requirements 2–21

When a person applies to for an authorisation from the regulatory body within the relevant jurisdiction, prior to granting such an authorisation, an assessment is performed by the regulator against relevant documents detailing the requirements, as described in the previous section.

In all jurisdictions where changes to the authorisation occurs, e.g. in relation to any particulars that appear on a licence, an application to amend the authorisation is required. In some jurisdictions, such as QLD, changes to the radiation management plan require prior approval. These changes are assessed in the same manner as a new application.

State and Territory authorisations are issued for a fixed term, being one year or up to three years in most jurisdictions. Once the authorisation expires, a re-application or renewal is required. The licence holder is required to identify any review of plans and arrangements and submit the information as applicable. This provides an opportunity to review the operations of the licence, the radiation management plan and associated documentation where changes have occurred. Most sources require periodic certificates of compliance at certain intervals – from one to three years depending on jurisdiction and hazard/risk of the source. In some jurisdictions, this certification and re-authorisation processes are linked, while in other jurisdictions certification is on a separate cycle to the authorisation.

For ARPANSA, authorisations (licenses) can be time-limited but are often not. Any changes with significant safety implications, which change the details in the application, or modify the source or facility, require

prior approval. These changes are assessed in accordance with internal procedures and may include an amendment of the licence or conditions. Non-safety-significant changes require notification within three months, which provides the opportunity for regulatory review should this be warranted.

In accordance with a graded approach, detailed periodic reviews by the licence holder that are assessed by the ARPANSA, are only required for the highest hazard/risk sources or facilities, such as the research reactor.

For example, the following condition applies to the OPAL reactor:

> *A detailed plan for the next Periodic Safety and Security Review (PSSR) of the OPAL Reactor must be submitted to the CEO of ARPANSA and to the Director General of the Australian Safeguards and Non-proliferation Office (ASNO) no later than 30 November 2019. The conduct of the PSSR must follow relevant ARPANSA and ASNO regulatory guidance and include the results of an international peer review on the safety and security of the OPAL Reactor. The report on the findings of the PSSR and resulting action plan must be submitted to the CEO of ARPANSA no later than 30 November 2021 in a form stipulated in the regulatory guidance.*

While the following condition applies to all source and prescribed radiation facility licences:

> *The licence holder must comply with applicable codes and standards and must, at least once every three (3) years, conduct a self-assessment against each applicable code and standard to ensure compliance. Applicable codes and standards can be found on the ARPANSA website at: www.arpansa.gov.au/codes-standards-for-sources.*

Reviews are performed as part of the inspection process, see also section 6 of this Summary Report. For example, ARPANSA maintains a three-year baseline inspection schedule for facilities and a six-year baseline inspection schedule for sources. The frequency is set based on the hazard only for sources, and by the hazard and level of control for facilities ('risk').

In addition to scheduled inspections, additional inspections are carried out when a need is identified, such as following a report of a safety concern, or following an event with safety implications such as a reported incident. When a regulatory inspection is performed, review and assessment of the requirements, including any requirements under national codes or commitments is made in the plans and arrangements. This can include verification of requirements on certification, maintenance and record keeping. This is typically using a checklist or a pro-forma in accordance with the requirements of the regulatory body's management system.

Appropriate enforcement actions are taken, as and if necessary, as described in section 8.

6.2 Review and assessment for radiation, sources facilities and activities

Related to GSR Part 1 (Rev. 1): Requirements 23, 25 and 26, GSR Part 3: Requirements 10-13

As described in the preceding sections, authorisations, including licences for the possession and use of sources and facilities, require detailed assessment by the relevant jurisdiction's regulatory body. These assessments focus heavily on the 'plans and arrangements' or 'radiation management plan' which outlines the commitments made by the applicant or licence holder. Compliance with this plan is generally a condition of licence.

ARPANSA review and assessment

Once an application has been received by ARPANSA, the application will be examined to ensure that all the necessary information has been included, that it is properly signed by a person authorised to submit an application, and that the application fee has been paid. If so, the applicant will receive a letter of acknowledgment. However, if any of the mandatory information is not included, the applicant may be contacted for further information or the application and application fee may be returned with a covering letter describing the omission. Applications are then forwarded to a Regulatory Officer for assessment. Where matters require clarification, the Regulatory Officer will contact the applicant or the licence holder's nominee. The Regulatory Officer may also consider that an inspection or site visit is necessary and may contact the applicant to make arrangements.

Once the Regulatory Officer has reviewed and assessed all the information provided, a Regulatory Assessment Report (RAR) is produced. This report will address the matters to be taken into account by the CEO of ARPANSA in accordance with subsection 32(3) of the Act, namely international best practice in relation to radiation protection and nuclear safety and the matters specified in the regulations. Regulations 41 and 42 of the Regulations specify the matters to be taken into account by the CEO. For a facility licence they are:

a) whether the application includes the information asked for by the CEO

b) whether the information establishes that the controlled apparatus or material can be dealt with without undue risk to the health and safety of people, and to the environment

c) whether the applicant has shown that there is a net benefit

d) whether the applicant has shown that the magnitude of individual doses, the number of people exposed, and the likelihood that exposure will happen, are as low as reasonably achievable, having regard to economic and social factors

e) whether the applicant has shown a capacity for complying with the Regulations and the licence conditions that would be imposed under section 35 of the Act

f) whether the application has been signed by an office holder of the applicant, or a person authorised by an office holder of the applicant

g) in the case of a nuclear installation, the content of any submissions made by members of the public about the application.

The RAR will make a recommendation to the CEO (or delegate) about whether to issue a licence and may recommend the licence conditions to be imposed under section 35 of the Act. All relevant documentation is sent to the decision maker. The applicant will be advised in writing of the decision. For major facility licences, e.g. for nuclear installations, a Statement of Reasons is prepared which outlines matters which the CEO took into account. The Statement of Reasons is published on the ARPANSA website.

The workflow for review and assessment of an application for a licence for a nuclear installation (which includes public consultation, is schematically outlined below (note that time scales can vary considerably).

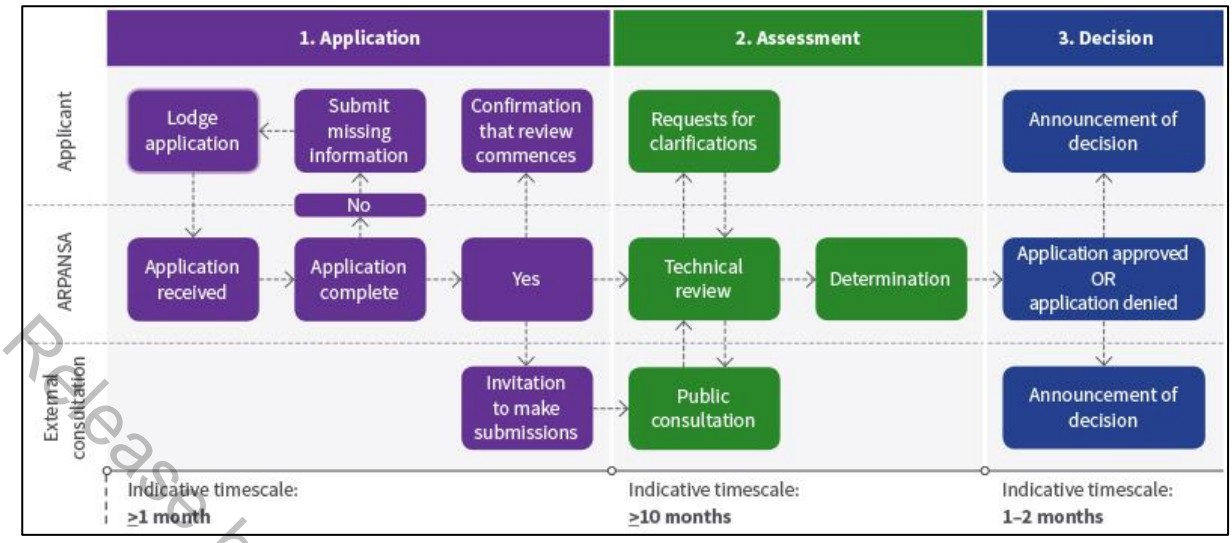

Figure 11. Workflow for review and assessment

State and Territory authorisations

In each jurisdiction, the regulatory body must consider the justification of the practice as part of the application process, similar to the ARPANSA process described above. Detail on the justification must be supplied in the Radiation Management Plan or as evidence in other supporting documentation. The level and detail of information supplied in support of the application is based on a graded approach. Any authorisations for activities with higher potential consequence (hazard) or an unusual application require more detail in support of the application, including the justification of the practice.

For example, the ACT Radiation Council, under the *Radiation Protection Act 2006*, must not issue a licence unless they are satisfied that it is in the public interest to do so. They must also consider any competence, security, or similar requirements set out in the NDRP. However, the graded approach is not applied uniformly across jurisdictions for different source types. For example a dentist in one state may be expected to submit more information than one in another jurisdiction.

Strategies for optimisation must be described in the radiation management plan, and where applicable in the shielding plan.

The requirements for shielding and equipment standards vary by jurisdiction. This is further discussed in section 13.

6.3 Review and assessment for research reactors

Related to SSR-3: Requirements 1 and 5

Reviews and assessments of research reactors are carried out over the lifecycle of the reactor and are, in principle, carried out following the same or similar procedures as used for review and assessment of other controlled facilities.

The licence application requirements are set under the Act and in the Regulations (Schedule 3, Part 1), for each stage in the life cycle (see section 5.3 of this report). ARPANSA performs reviews against the requirements in the Act and Regulations, and in ARPANSA regulatory guides including *Siting of Controlled Facilities* and *Plans and Arrangements for Managing Safety*. In addition, for areas that are not specifically

covered by ARPANSA guides, relevant IAEA documents are used. International best practice (IBP) is required to be considered under the Act, which in ARPANSA's approach includes the IAEA Specific Safety Requirements *Safety of Research Reactors (SSR3)*, the General Safety Requirements Part 1, 2, 3, 4 and 7, and Specific Safety Guides such as SSG-20, SSG-22, and NS-G-2.11.

For example, the Safety Case and Safety Analysis Report (SAR) are reviewed against IAEA SSG-20 and the fundamental safety principles, and design criteria are stated in SSR-3. These documents also contain the requirements on the Operating Limits and Conditions (OLCs) content and structure.

The recently retired ARPANSA guide Regulatory Assessment Principles (RAPs) consolidated design and operational requirements which applied to specific practices including research reactors. However, the RAPs became outdated and the decision was made not to maintain this guide. Instead, the relevant international standards (for both radiation and nuclear safety and nuclear security) replace the RAPs. This guidance and the use of international standards and risk assessments is further discussed in section 9.3.

As with all applications handled by ARPANSA, reviews and assessments are recorded in the ARPANSA record management system. A regulatory officer prepares a RAR, which summarises the review and assessment. For new research reactor applications, and complex changes or licence variations, the CEO of ARPANSA issues a Statement of Reasons (SOR) which is a public document outlining the decision making process and the factors taken into account to reach the licensing decision. For example, a SOR was prepared for the original operating licence, modified fuel design and licence amendment following the periodic safety review.

As a condition of licence, the OPAL reactor is subject to a periodic review every 10 years (or if necessary, earlier) in line with the guide *Periodic Safety and Security Review for Research Reactors*. In addition to this mandatory periodic safety review, and the requirement to review plans and arrangements every three years, regulatory approval is required for changes with significant implications for safety (regulation 51 of the Regulations). Examples of safety significant changes are found in the *Regulatory Guide: When to seek approval to make changes under Regulation 51*. These changes are assessed against the same requirements as new applications, including international standards that form part of international best practice.

Periodic reporting is required quarterly for research reactors as a condition of licence, this includes notification of any other changes (regulation 52 of the Regulations), as well as incidents and similar information. During ARPANSA inspections, a review of the licence holders' assessment of their changes is performed. Non-inspection meetings with licence holders also allow for discussion of these changes.

6.4 Review and assessment for waste management facilities

Related to GSR Part 6: paragraph 3.3

ARPANSA currently licenses a number of licence holders who store radioactive material temporarily, which may be disposed of in future disposal facilities. This includes a number of waste management facilities which are operated by ANSTO at the Lucas Height Science and Technology Centre. ANSTO's radioactive waste management facilities comprise:

- a low-level solid waste store
- a decontamination centre
- a low-level solid waste compaction facility

- a low-level liquid waste treatment facility
- a delay and decay facility for decay of short-lived waste
- an intermediate-level liquid waste storage facility
- a 'hot cells' facility
- an interim intermediate-level solid waste store facility
- a waste treatment and packaging facility
- spent fuel ponds
- a dedicated redundant source store and storage hot cells
- an Interim Waste Store housing a single TN-81 cask containing vitrified waste product from reprocessing of HIFAR spent fuel, and cemented technological waste arising from the reprocessing (pipework etc.).

ARPANSA also licences a prescribed legacy site, the Little Forest Legacy Site at Lucas Heights, and a facility for the disposal of low level material from past mining practices in the Alligator River region in the NT. These facilities are discussed in section 11.3.

For construction of all facilities, Item 12 of Part 1 of Schedule 3 of the Regulations requires the applicant to provide the arrangements of testing and commissioning of the facility. Further, ARPANSA *Regulatory Assessment Criteria for the Design of New Facilities and Modifications to Existing Facilities* (design criteria 235, 237-242) recommends that design of the safety systems needs to ensure that they can be tested, inspected and maintained before operation and throughout the OLCs of the facility to assure acceptability for service. Testing of safety systems determines or verifies the capability of such systems to meet specified requirements by subjecting the systems to a set of physical, chemical, environmental or operational conditions.

The design of a facility is approved through a construction licence and construction of an item important for safety is subject to regulatory approval under regulation 54 of the Regulations. ARPANSA *Regulatory Guide for Construction of an item important for safety* provides guidance on principles and criteria to be followed for construction of an item important for safety. This includes verification and validation criteria to be followed. Item 15 and Item 16 of Part 1 of Schedule 3 of the Regulations require the following:

- Item 15: A description of the structures, components, systems and equipment of the controlled facility as they have been constructed
- Item 16: A final safety analysis report that demonstrates the adequacy of the design of the controlled facility, and includes the results of commissioning tests.

The commissioning results demonstrating that the design objectives have been achieved are considered in the regulatory assessment for granting the operating licence of a facility.

The documented arrangements for operating a facility are required under Item 19 of Part 1 of Schedule 3 of the Regulations. Such arrangements include periodic maintenance, testing and inspection of safety systems. In addition, Item 17 of Part 1 of Schedule 3 of the Regulations requires the provision of the OLCs and condition of the facility derived from the safety analysis that defines the safety envelope of the facility. It is a licence condition for operation of a facility to comply with OLCs and conditions at all times.

Radioactive waste that is also nuclear material is to be managed then the security systems and infrastructure protecting the nuclear material will need to comply with the requirements under the Amendment to the *Convention on the Physical Protection of Nuclear Material* and the IAEA *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities*. This is managed under the *Nuclear Non-Proliferation (Safeguards) Act 1987* by the Australian Safeguards and Non-Proliferation Office (ASNO).

There is currently no centralised national waste management facility for interim storage or disposal in Australia. Sections 1.7 and 5.4 of this Summary Report provide detailed information on the plans and framework supporting the establishment of a national facility. ARPANSA has provided significant guidance on the requirements and review and assessment that will take place once an application for a national waste management facility for storage and disposal of radioactive waste is made (see sections 5.4 and 9.4). This assessment is in line with other facilities described in this section, and includes requirements for the applicant to demonstrate effective systems and processes:

- that provide assurance that the controlled facility can be sited, constructed, operated, decommissioned and closed in a way that does not pose undue risk to the health and safety of people and to the environment
- that the controlled facility provides an overall net benefit
- that protection of workers is optimised during operation and decommissioning and that worker protection is optimised during monitoring and remedial works including in the post-closure phase of a disposal facility
- that prevent unauthorised access, theft and acts with malicious intent including actions that would contribute to proliferation of nuclear material considering the security vulnerabilities of the controlled facility and entire system for waste management
- that maintain adequate capacity for the full lifecycle of the controlled facility and records are established and preserved for the future.

6.5 Review and assessment for decommissioning activities

Related to GSR Part 6: paragraph 3.3

ARPANSA requires licences for the decommissioning stage of facilities, and a licence holder must apply for authorisation to abandon a facility. ARPANSA has previously issued such authorisations, however there are currently no facilities that hold an ARPANSA decommissioning licence. The application process is described in the preceding sections, see section 5.5. To support decommissioning applications detailed information is required, which is reviewed and assessed prior to making a licensing decision. In addition to decommissioning, an approval is required under regulation 53 of the Regulations for the disposal of radiation sources. In other jurisdictions, such approval or notification is also required.

The ARPANSA Guide *Surrender of a Facility Licence and Release from Regulatory Control* is based on IAEA Safety Standards *Release of Sites from Regulatory Control on Termination of Practices WS-G-5.1 2006*. This guide contains further guidance to assist the determination of whether the CEO should accept the surrender of a facility licence following decommissioning, and release it from regulatory control. A Regulatory Guide on *Decommissioning of Controlled Facilities*, which is based on the IAEA General Safety Requirements GSR Part 6 *Decommissioning of Facilities*, is in its final stages of publication. Relevant international standards, which are taken into account during review and assessment, also include *WS-G-5.2 Safety Assessment for the Decommissioning of Facilities Using Radioactive Material.*

Further information is provided in section 5.5 of this Summary Report.

6.6 Review and assessment for transport activities

Related to SSR-6

Routine transport

Authorisation is required for the transport of radioactive material. The information submitted by the applicant is assessed against the codes applied by relevant jurisdiction legislation. For ARPANSA the application is reviewed against the requirements of *Code for the Safe Transport of Radioactive Material 2014*, Radiation Protection Series C-2 (RPS C-2), and RPS C-1. This is part of the licensing process described in the preceding sections.

Special arrangements, package validation and other transport approvals

Previously, the ARPANSA Regulatory Guide *Safety Guide for Approval Processes for the Safe Transport of Radioactive Materials (2012)*, Radiation Protection Series No.2.2 (RPS 2.2) was used in the review of transport approvals. This document was replaced with direct reference to the guidance: *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (*SSG-26), and *Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material 2012 Edition (SSG-33).*

ARPANSA's assessment of package design, shipment approval, and validation of designs includes identification, consideration and tracking of the serial numbers of approved package designs. Validated package design data is recorded by ARPANSA in the document management system, which includes details of the original design certificate and serial numbers of packages. ARPANSA is informed of the serial number of each packaging manufactured to a design approved under paragraphs 808, 811, 814 and 820 of RPS C-2 (direct adoption of IAEA SSR-6 *Regulations for the Safe Transport of Radioactive Material*).

Applications for approval are assessed against all relevant regulatory requirements. The results of assessment determine whether an approval certificate will be issued. The approval process also takes into account that the applicant and subsequent consignors and carriers have adequate provisions in place for preparedness for and response to an emergency in the transport of radioactive material.

When considering applications for approval of shipments under special arrangement, ARPANSA takes into account the demonstration by the applicant that the overall level of safety provided by the design of the package and the supplementary operational controls during transport is at least equivalent to that which would be achieved if all applicable regulatory requirements were met.

ARPANSA considers special arrangement to be exceptions, to be applied on a case-by-case basis where it is impracticable to demonstrate compliance with specific clauses of the SSR-6. Approvals are granted to single shipments with controls and measures strengthened to meet the standard that would otherwise be expected and achieved.

Security enhanced transport

Under the ARPANSA *Code of Practice for the Security of Radioactive Sources 2007*, Radiation Protection Series No.11 (RPS 11) a Source Transport Security Plan must be provided to the relevant regulatory body at least seven days in advance of the proposed date of each shipment of a Category 1 source; for Category 2 or 3 sources, notification is required at least seven days in advance of the shipment, or the first shipment if shipments are to be frequent.

This plan must contain the information required in Schedule A2 of RPS 11, which includes:

- a description of the source to be transported including: nuclide, activity (including date of measurement), physical and chemical form, serial number, transport packaging and the categorisation
- details of the conveyance in which the source will be transported and the arrangements for securing the shipment during transport and any stops on the route
- the name, address and business and after hours contact details for the consignor, consignee, carrier and, where used, guard or police service
- specific security concerns to be addressed, for example theft or sabotage, or mechanical or electronic failure of a physical security measure
- the physical and procedural security measures in place
- arrangements for review and revision of the Source Transport Security Plan.

Personal doses during transport

Persons involved with high activity radiation sources such as those used in industrial radiography, borehole logging and geotechnical measurements are typically required to wear a personal radiation dosimeter to record their dose, including when they are using or transporting the radioactive sources. In most jurisdictions, monitoring is required if there is potential for exposure to be greater than 1 mSv. Some jurisdictions, e.g. TAS, issue specific guidance on monitoring frequency in relation to potential doses. In other jurisdictions, including Commonwealth, while there is no specific guidance, such as a level at which monitoring is required, the requirement is effectively implemented under RPS C-1, applicants must outline dose-monitoring techniques in their application and there is an expectation of monitoring workers who may potentially incur higher exposures. Depending on the individual circumstances, the potential to exceed the annual effective dose limit for members of the public of 1mSv is typically applied as the threshold where monitoring is required, consistent with the guidance of other jurisdictions. Where determined to be required, dynamic monitoring during carriage of particularly hazardous loads could be undertaken on a specific need basis. However, this is not typically required. Similarly, independent verification of transport worker doses is typically not undertaken.

6.7 Conclusions and actions

Australian jurisdictions perform review and assessments of applications for authorisation in a manner that generally meets the expectations set out in the IAEA safety standards. The regulatory body reviews and assesses relevant information including from applications and submissions to determine whether facilities and activities comply with regulatory requirements and the conditions specified in the authorisation. Review and assessment of information is performed over the lifetime of the facility and is commensurate with the radiation risks, in accordance with a graded approach.

Requirements and processes for regular, periodic review and assessment by the licence holder are included in licence conditions, regulations and regulatory guidance. The regulatory body will perform an assessment of the initial application and when significant changes are made that may impact safety. Notification of changes and routine updates provide the opportunity for review: this occurs in States and Territories on re-application, and through regular reporting in the case of ARPANSA. Additional reviews may occur as part of the inspection process.

ARPANSA maintains a high level of transparency in its review and assessment. This includes publishing online major assessments, including relevant regulatory assessment reports and statements of reason.

7. Inspection

This section includes responses from all Australian jurisdictions on generic issues (7.1), and from most jurisdiction on sources, facilities and activities (7.2), and transport (7.6).

The sections on research reactors (7.3), waste management (7.4) and decommissioning (7.5) relate to the Commonwealth regulator, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

7.1 Generic issues

Related to GSR Part 1 (Rev. 1): Requirements 27–29, paragraphs 4.50 and 4.53

Inspections are performed by each jurisdiction's regulatory body in accordance with the legal framework of each jurisdiction. Inspectors are authorised to carry out inspections of licence holders or in relation to suspected unauthorised possession or use and to investigate reported non-compliance. staffing and competence of the regulatory body is described in section 3.3.

The inspections are carried out, utilising a graded approach, of licence holder facilities, sources, and activities. Both scheduled and reactive inspections may be performed by all jurisdictions. Unannounced inspection are carried out judiciously as they may be more disruptive to the licence holder and third parties, e.g. patients in a medical setting, and key staff may not be available.

In addition to formal inspections, site visits and meetings may be undertaken. Generally, site visits are used by inspectors to familiarise themselves with processes, procedures or personnel, to follow up on specific progress, or as part of educative and consultative campaigns. Meetings also include scheduled meetings such as to discuss licence holder quarterly reports or project updates.

Inspections are planned and carried out in accordance with written procedures and focus on a number of topical areas. Inspection results are discussed with and provided to the licence holder - or as relevant the operator, owner, or site occupier. This includes inspection outcomes and request for actions, as necessary.

7.2 Inspection of radiation sources facilities and activities

Related to GSR Part 1 (Rev. 1): Requirements 27–29 and GSR Part 3: Requirement 3

Related to GSR Part 1 (Rev. 1): Requirement 29, paragraphs 4.51 and 4.52

ARPANSA inspections

ARPANSA inspections are scheduled and carried out in accordance with long term schedules, which are based on hazard or risk, or are carried out for a specific cause (augmented inspections). Scheduled physical inspections include prior notification to the licence holder, entrance meetings to discuss scope, and exit meetings to review findings. The inspection reports are, following licence holder review for factual correctness and internal approval, placed on the ARPANSA website (except for security sensitive material). Once the report is published online a survey is sent to the licence holder's representatives that were present during all or part of the inspection to seek feedback on the inspection.

The ARPANSA inspection process, as summarised in this section, is also provided on ARPANSA's website to ensure that licence holders are aware of processes and expectations. Specific procedures are captured in ARPANSA's *Inspection Manual*, which is maintained in the Regulatory Management System (RMS) and published online.

The CEO appoints inspectors under the *Australian radiation Protection and Nuclear Safety Act 1998* (the Act) (see section 3.3 of this report on regulatory body resources including numbers of inspectors). Part 7 of the Act sets the powers available to inspectors to inspectors, which include the power of entry and inspection at any time, search, seize, inspect, take samples, take photographs or records, and require the occupier to answer questions or produce records.

Types of inspections

The types of Inspection carried out include:

- scheduled physical inspections - Routine inspections are scheduled in accordance with a hazard/risk informed frequency
- scheduled e-inspections - Licence holders with lowest hazard sources and low hazard sources located in remote locations may be asked to provide evidence of effective control in the form of documentation and photographs for desktop review as an alternative to an inspector visiting the site. As an example, e-inspections may be carried out for an X-ray baggage scanner located overseas at an Australian embassy
- unannounced inspections - These may be performed with the consent of the occupier or, if the licence holder refuses, with a warrant
- augmented inspections – These are performed with notice, but in addition to any inspections due according to a scheduled frequency, and are typically in response to a specific issue or incident.

An inspection may be performed at any premises to assess compliance with the Act or the Australian Radiation Protection and Nuclear Safety Regulations 1999 (the Regulations), which could include where the inspector believes that activities or dealings are being undertaken which require authorisation, and is not limited to the inspection of the licence holder's premises.

Site visits and meetings supplement the inspection program but are not inspections. Generally, site visits are used by inspectors to familiarise themselves with processes, procedures or personnel. The information gathered is often used to inform a decision-making process such as licence application assessment, requests for approval to undertake a change with significance for safety under regulation 51 of the Regulations, or other required approval. Site visits may also be used to share information with a licence holder or educate them on regulatory matters relevant to the activities they undertake. Observations and information are recorded in a Site Visit Report. There is no requirement to provide the site visit report to the licence holder or for its publication. However, observations are discussed with the licence holder's management and personnel during the site visit. Meetings are also held, including regularly scheduled meetings to discuss quarterly or sixth monthly report outcomes, or project updates.

Frequency of inspections and graded approach

ARPANSA adopts a graded, risk or hazard-informed approach to compliance monitoring and inspection. Inspection frequency ranges from quarterly to six yearly. For some low hazard sources, ARPANSA utilises non-inspection based compliance monitoring and reporting. Inspection schedules are maintained in the RMS.

For facility licences, ARPANSA applies a risk ranking methodology to prioritise inspection effort, and to determine inspection frequency. For source licences, an inherent source hazard methodology is applied based on the hazard groupings of sources. These methods are outlined in ARPANSA's *Inspection Manual.*

Inspection frequency	Facility		Source	
	Regulatory priority	Examples	Regulatory priority	Examples
3 months	Very high	Research reactors	Not applicable	-
1 Year	High	Waste storage facility	1	Industrial radiography
1-2 Years	Medium	Large accelerator facilities	2	High level laboratory
3-4 Years	Low	Small irradiator facilities	3	Portable gauges
4-5 Years	Very low	-	4	Medical apparatus
5-6 years (or alternative arrangement)	-	-	5,6	Baggage scanners, UV source

Table 8. Inspection frequency summary

All facilities and sources with Regulatory Priority 1 are inspected by 2 or more inspectors.

Inspection areas

Areas of inspection are outlined in the Performance Objectives and Criteria (PO&C). These are detailed in section 1.9 of ARPANSA's *Inspection Manual*. Prior to inspection, facility or site-specific questions are developed to assess adherence to the PO&C. While source licence inspections cover all modules of the PO&C, facility licence inspections will sometimes focus only on specific modules. Each module is broken down into smaller sub-modules to focus on specific areas. Source licences utilise the same approach as facilities using a condensed PO&C format. A summary of the PO&C areas is provided below:

- **1 – Performance reporting and verification.** This module addresses the reporting culture, both internally and externally, including discrepant or unreported performance data, performance indicator verification, compliance with the operating limits and conditions.
- **2 – Configuration management.** This module addresses the knowledge of and control of physical configuration and operational methods. It includes evaluation of changes (Regulations 51 & 52 the Regulations), equipment alignment, operability determinations, temporary facility modifications, safety and security system design and capability.
- **3 – Inspection, testing and maintenance.** This module addresses the regime of inspection, testing and maintenance that ensures the safety of the controlled activity. It includes post-maintenance testing, in-service testing and inspection, surveillance testing, maintenance, management arrangements.
- **4 – Training.** This module addresses the systematic use of personnel training, authorisation and accreditation to ensure that all workers are suitably qualified and experienced thus ensuring that the controlled activity is undertaken safely and securely.

- **5 – Event protection.** This module addresses the licensee's consideration and implementation of controls to manage and mitigate the effects of outside influences including adverse weather, fire protection including bush fires, flooding, and land management.
- **6 – Security.** This module addresses the security arrangements and requirements to prevent unauthorised access or damage; loss, theft or unauthorised transfer; and unauthorised use, of controlled apparatus or radioactive sources.
- **7 – Radiation protection.** This module addresses the access control, dosimetry, optimisation, radiation monitoring instrumentation, effluent system monitoring, radioactive material processing and transportation etc., that protect people and the environment from the harmful effects of radiation.
- **8 – Emergency preparedness and response.** This module addresses the anticipation of hazards and threats, the assessment of consequences and the preparation of appropriate systems and measures to ensure an effective, timely, integrated, controlled and coordinated response to a nuclear or radiological emergency. It includes exercises and drills, emergency response organisation testing, and notification testing.
- **Cross Cutter 1 – Safety culture.** This module addresses the shared values and beliefs, throughout an organisation, that produce behavioural norms that provide an appropriate and demonstrable attention to safety.
- **Cross Cutter 2 – Human performance.** This module addresses the standards and expected behaviour of workers and the organisational features that are in place to ensure that the organisation maximises the strengths and minimises the weaknesses of human performance by providing workers with appropriate policies, processes, practices and equipment.
- **Cross Cutter 3 – Performance improvement.** This module addresses how the organisation monitors and learns from operational experience. It covers the understanding of how deviations from expected performance are understood, the identification, evaluation and solution of problems; and the implementation of opportunities for improvement.

Inspection reporting

Inspection reports are prepared and, following licence holder review for factual correctness and internal approval, placed on the ARPANSA website.

The inspection report provides observations and findings and may include areas for improvements or potential non-compliances identified during the inspection. These help the licence holder to review the issues and identify potential strategies to address their causes.

When ARPANSA identifies a potential non-compliance, the licence holder is given an opportunity to respond before a determination is made whether the licence holder has been in breach of the Act. Once a non-compliance has been confirmed as a breach of the Act, it is placed in a register and tracked to ensure relevant corrective actions have been performed by the licence holder.

Inspection outcomes are also analysed and distributed:

- internally, to staff quarterly via emailed reports and annually as part of internal training. This provides for an opportunity to change regulatory processes, and raises awareness of issues from across the regulatory body

- externally, at licence holder forums, and summarised on the ARPANSA website. This helps licence holders to be aware of common findings, which may assist in driving improvement in practice and culture
- where a past incident is identified during an inspection, they are also recorded in the Australian Radiation Incident Register (ARIR). ARIR reporting requirements apply to all jurisdictions and are specified in Schedule 13 of the *National Directory for Radiation Protection*. ARPANSA publishes yearly summaries of the over 300 incidents reported to the register annually.

Independence, conflict of interest and joint inspections

As outlined in the Policy for ARPANSA's Regulatory Activities, ARPANSA acts independently of any other interests in carrying out its regulatory activities. This includes independent advice, overseeing licence holder activities, and ensuring that the prime responsibility rests with the licence holder.

ARPANSA staff, including the CEO, are obliged to declare any interests in matters related to regulatory decision making to enable determination whether such interests may constitute a real, potential or perceived conflict of interest.

ARPANSA's Regulatory Services Branch (RSB) engages internal staff from other branches (if appropriate) or external subject matter experts for particular inspections. External inspectors (currently from Queensland Department of Health) are engaged to provide independent oversight of inspection activities by performing joint inspections with RSB staff where ARPANSA is also the licence holder. These processes are captured in procedures such as ARPANSA's *Inspection Manual*.

ARPANSA collaborates with other agencies, including joint inspections with:

- Comcare – the Commonwealth workplace health and safety regulator
- Australian Safeguards and Non-Proliferation Office (ASNO) – the nuclear security and safeguards regulator.

States and Territories

Scope

State and Territory inspections focus on compliance with relevant jurisdiction requirements and licence conditions, which may include adherence to codes and standards. In general, the inspections concentrate on ensuring that the minimum requisite safety standard is achieved. In addition, where an issue is identified which may indicate that a licensee does not demonstrate a capacity or willingness to comply with requirements, further actions may be taken.

Some State and Territory inspections do not typically investigate the practices of a possession licensee against international best practice or considerations such as safety culture. However, authorised parties are encouraged to improve practices.

Areas of inspection are dependent on the source and the relevant codes which apply to these sources. For example, inspection categories may include:

- medical imaging practices
- medical practices involving nuclear medicine

- medical practices involving interventional fluoroscopic apparatus
- veterinary practices
- operations involving mining, including mineral sands mining, and processing
- practices involving industrial radiography equipment
- practices involving portable density/moisture gauges.

Types of inspections

The relevant jurisdictional legislation allows for both announced and unannounced inspections, which may be in accordance with a schedule or where a need is identified. Inspections are typically performed with consent of the owner or occupier, but may also be performed under a warrant if circumstances so require.

In many situations, particularly with medical practices, scheduled (routine) inspections are announced inspections. Therefore, prior to inspection, the licence holder (or representative) and the regulator agree a mutually convenient time to undertake the inspection. Prior notice varies by jurisdiction and inspection type. With regard to medical practices, negotiation of timeframes helps to minimise interruptions to the workplace and patient flow, as well as ensures that relevant staff and equipment are available.

In most jurisdictions, unannounced inspections are typically only undertaken as the result of a suspected or confirmed non-compliance or an incident and may form part of a formal investigation process. This could be part of enquiries and complaints regarding potential environmental contamination or health risks caused by radiation sources or activities. In some jurisdictions (e.g. QLD) certain types of inspections are scheduled and carried out as unannounced inspections.

Graded approach and frequency of inspections

Each jurisdiction sets their inspection program in accordance with local jurisdiction resources and priorities. These take into consideration the risk and context of the source. For example, the SA regulatory body performs 100 inspections per year across the diagnostic medical, industrial and scientific areas, prioritising higher activity sources and higher risk applications such as uranium mining (with quarterly inspections).

Inspections on a targeted industry or practice modality may also be conducted as part of a campaign, for example due to a change in requirements or reported non-compliance.

Many source types, including medical sources, are also inspected through third-party compliance testing to assess whether the equipment meets certain criteria. This testing frequency depends on the type of source and the jurisdiction in which the equipment is located. See compliance tests in this section.

Inspections may be carried out where non-compliance is suspected, including where a licence holder has not renewed their authorisations by the due date, or where incidents have occurred.

Some jurisdictions have experienced significant staff reductions, which have affected the risk-based-informed compliance monitoring practices. As such, these jurisdictions focus on reactive (based upon incidents, complaints or notifications) rather than proactive inspections (in line with long-term inspection schedule). However, other jurisdictions (e.g. VIC) have been actively enhancing their in-field presence with a target of 480 inspections per year.

Inspection reporting

The regulatory inspections assess the licence holder's compliance with the legal responsibilities, including compliance with national codes and standards. This may result in recommendations, areas for improvement or findings of non-compliance.

Recommendations generally do not reflect a non-compliance with legislative requirements, but identify areas where practice could be improved. The recommendations, or areas for improvement, are usually based on best practice radiation regulation, for example found in the ARPANSA Radiation Protection Series (RPS) publications. The licence holder is provided with educative material to consider. Implementation is typically tracked though site visits or other non-inspection contacts or activities.

Breaches of acts and regulations, which typically require actions to be taken to return to compliance, may, depending on the type or severity, include enforcement actions (see section 8 of this Summary Report).

Third-party inspections (compliance tests)

In addition to inspections by the regulator, jurisdictions accredit persons to assess the compliance of sources, or places where sources are kept, against criteria set by the jurisdiction. For example, the NSW regulatory body requirements for testing medical diagnostic X-ray equipment is published in Guideline 6 - Registration requirements & industry best practice for ionising radiation apparatus used in diagnostic imaging. This is organised by the licence holder directly with the third party who submits evidence of compliance outcomes to the regulator directly or through the licence holder. There is considerable variation in frequency, types of tests and what needs to be tested across the jurisdictions, which introduces uniformity issues for sources which are moved between jurisdictions (see section 13.5 on national uniformity).

Third-party compliance testers may be audited by the local jurisdiction regulatory body to ensure that standards are being maintained.

7.3 Inspection of research reactors

Related to SSR-3 paragraphs 3.13–3.16

Related to GSR Part 1 (Rev. 1): Requirement 29, paragraphs 4.51 and 4.52

The ARPANSA general inspection process is followed for the inspection of research reactors. This is described on the ARPANSA website and detailed information is provided in section 7.2 of this Summary Report. In addition to the inspection requirements that apply to all sources and facilities, some requirements apply only to the ANSTO OPAL Research Reactor.

The eight functional inspection areas that are covered by the program, plus three additional cross-cutting areas that are applicable to all functional areas, apply to the inspections of the OPAL reactor. For the OPAL reactor, on average, one or more functional areas are inspected per quarter. The eight functional areas and three cross-cutting areas are described in section 7.2.

The regulatory expectations are further detailed and supplemented by additional information and guidelines in the ARPANSA regulatory guides (e.g. Periodic Safety and Security Review for Research Reactors). The international best practice documents which apply to research reactors includes IAEA Specific Safety Requirements *Safety of Research Reactors* (SSR-3), and supersede many principles of the

now archived Regulatory Assessment Principles guide and are also applicable to the requirements for research reactor design. These documents cover safety aspects such as control of radiation exposure, restricting probability of events, mitigating consequences, reactivity control, heat removal, and application of defence in depth.

There is one ARPANSA inspector dedicated to the OPAL research reactor, supported by an alternate inspector who maintains general oversight of the facility. Both of these inspectors are senior regulatory officers who have experience in the nuclear industry and regulation. Inspectors are periodically rotated with regard to their assigned facilities to develop skills and reduce the risk of regulatory capture. Additional support is provided as needed from other RSB officers or other experts appointed internally or externally. See section 3.3 for further information on staffing and competence of the regulatory body.

As with all facility inspections (described in section 7.2), inspection results are discussed, reviewed, reported, published online, and corrective actions followed up. Site visits supplement the inspection program. These are regular, frequent and informal visits to the premises of a licence holder for the purpose of familiarisation with a facility or source, associated processes or procedures, and personnel. The site visits of the OPAL research reactor are conducted in 2-3 week intervals. There are no research reactor specific additional requirements for inspections.

7.4 Inspection of waste management facilities

Related to GSR Part 5: paragraphs 4.22, 5.14, 5.15, 5.20

Related to SSR-5: paragraphs 3.15, 3.48, 5.19

Related to GSR Part 1 (Rev. 1): Requirement 29, paragraphs 4.51 and 4.52

There are a number of waste management facilities managed by the Commonwealth, as previously discussed in sections 5.4 and 6.4. Among the Commonwealth waste management facilities, ANSTO operates the largest number of facilities (see section 6.4 of this Summary Report). ANSTO is also responsible for a legacy waste site from the 1960s containing radioactive waste produced by its predecessor, the Australian Atomic Energy Commission.

For storage of radioactive waste, it is ARPANSA's expectation that there should be documented procedures for inspection, maintenance and monitoring as described in the ARPANSA Regulatory Guide: Plans and arrangements for managing safety (section 4). The review for adequacy for storage capacity is stipulated through facility licence conditions, and review of performance assessment of the facility is required to be undertaken at least every three years.

ARPANSA undertakes inspection in accordance with the ARPANSA *Inspection Manual* applying the PO&C as described in section 7.2 above. There are no other specific instructions for inspection of waste facilities.

7.5 Inspection of decommissioning activities

Related to GSR Part 6: paragraph 8.5

Related to GSR Part 1 (Rev. 1): Requirement 29, paragraphs 4.51 and 4.52

There are currently no decommissioning licences issued by ARPANSA. ARPANSA has, in the past, licensed the decommissioning of the Moata research reactor and the National Medical Cyclotron (NMC).

The Moata research reactor was a 100kW Argonaut class reactor that operated for more than 30 years. It was decommissioned in 2009, during which it was subject to an extensive inspection program to verify that the requirements of the decommissioning safety case were met. Prior to the surrender of the Moata licence, ARPANSA inspected the disposal routes for all radioactive waste from the facility and verified that the building that had housed the reactor had activity levels consistent with the building prior to the operation of the reactor.

The same process was conducted for the decommissioning of the NMC, the licence for which was surrendered in 2012 (licence F0230). In this instance a new cyclotron was installed at the refurbished facility (licence F0251). Copies of these licenses are found in the evidence folder of the decommissioning module.

ARPANSA also licences the permanently shutdown 10 MW HIFAR research reactor under a Possess or Control licence (F0184). Under this licence the operator must care and maintain the reactor including refurbishment were needed. Subject to approval, the operator may undertake activities to radiologically characterise it in preparation for decommissioning. However, the operator is not permitted to remove any radioactive components from that facility before it applies for and is issued with a decommissioning licence. The HIFAR research reactor is also subject to regular inspections to ensure that the requirements of the Possess and Control licence are met.

Inspection of decommissioning stage facilities are planned and executed as per other inspections. Inspections will in in accordance with the PO&C and will verify whether or not any conditions of licence are met. This will include an assessment against appropriate standards relating to decommissioning.

7.6 Inspection of transport activities

Related to SSR-6: paragraphs 302, 306, 503,582, 801

Compliance monitoring includes two aspects:

- confirming that transport has been appropriately authorised, and that relevant provisions have been made in the consignor's management system. Requirements on these provisions are part of the licence of the organisation who controls or transports the material
- that transport arrangements are carried out in accordance with the *Code for the Safe Transport of Radioactive Material 2014,* Radiation Protection Series C-2 (RPS C-2). In some jurisdictions, such as QLD and WA, the individuals transporting material by road will have individual licences.

In line with a graded approach, inspections are targeted at the areas of highest risk. Australian regulatory bodies do not generally consider the routine transport of radioactive material as a high risk to public health or the environment in Australia. Consequently, inspections that target facilities and activities related to transport of radioactive material are rare in most jurisdictions and such inspections would typically only be conducted in case of suspected non-compliance, e.g. following complaints or input from informants.

ARPANSA

ARPANSA's authorisations cover the licence holder organisation (including staff and contractors), who may transport material.

ARPANSA inspects transport arrangements as part of the routine inspection program where applicable. ARPANSA's PO&C include checking that transport of radioactive material is carried out in accordance with RPS C-2. ARPANSA may undertake announced or unannounced inspections of any phase of transport, including transport providers, transit storage and dispatch. The majority of transport shipments that occur involving ARPANSA's licence holders are of a routine or low risk nature. As a consequence, no recent inspections have been performed specifically of these routine transports. Inspections focus on management arrangements and authorisations of licence holders, rather than on compliance of individual shipments. Joint campaigns with other transport authorities have been undertaken as needed. For example, ARPANSA and the Civil Aviation Safety Authority (CASA) undertook a joint inspection on airborne transport in Sydney, based on information provided by CASA.

For specific high profile shipments ARPANSA works with the licence holder to ensure appropriate regulatory oversight. For example, in July 2018, ANSTO shipped four casks of spent fuel from the OPAL reactor at ANSTO to France for reprocessing. The shipment approval was granted by ARPANSA. ARPANSA validated three French casks for use within Australia, while the fourth cask of the same design was granted design approval as a B(U)F package. An ARPANSA inspector was in attendance during the first leg of the transport routine from Lucas Heights to the designated port for loading onto the vessel prior to embarking into international waters en route to France.

Guidance on areas to cover during transport is provided in an appendix to the ARPANSA Regulatory Guide: Transport of Radioactive Material. However, this guide has not been reviewed since 2013 and provides limited practical guidance for ARPANSA licence holders transporting radioactive material.

States and Territories

Inspections are performed of licence holders, and cover transport where applicable. Victoria is proposing to monitor compliance by participation in joint transport operations to be delivered in conjunction with other regulators of the transport of hazardous materials. These operations are run as short term targeted interventions to monitor transport vehicles in busy transport routes. This is considered to be an efficient and effective measure of monitoring whether transporters are complying with the requirements to hold a management licence and comply with RPS C-2.

In several jurisdictions, including VIC, there are requirements on monitoring through personal dosimetry for personnel who are predicted to be above 1 mSv per annum. While this would not typically apply to general transport, personnel who perform transport as part of their activities, such as industrial radiographers, are subject to these monitoring requirements.

7.7 Conclusions and actions

Australian jurisdictions perform inspections in a manner that generally meets the expectations set out in the IAEA safety standards.

Regulatory bodies carry out inspections of facilities and activities to verify that the authorised party is in compliance with the regulatory requirements and with the conditions specified in the authorisation. Jurisdictions, including ARPANSA, have an inspection program that, in line with the graded approach, justifies the type and frequency of inspections carried out. However, there is significant variation between the jurisdictions in inspection frequencies and scope. A number of jurisdictions have risk ranking methodologies to inform inspection frequency, such as the matrix provided in ARPANSA's *Inspection Manual*. However these have not been harmonised across jurisdictions. Some jurisdictions do not have a formal schedule of inspections, or similar document, which outline inspection frequencies. The uniformity of inspection processes is further discussed in section 13.

In addition to the core regulatory elements, regulatory bodies play an important role in promoting positive culture for safety amongst licence holders. For ARPANSA, this is reflected in the inspection cross cutting PO&C and the finding of areas for improvement which are not non-compliances but which may assist the licence holder in improving safety.

As a means of carrying out inspections in remote areas and overseas territories, ARPANSA has developed an electronic inspection (e-inspection) program to satisfy the inspection program. These e-inspections are for low risk sites and sources, in line with the graded approach.

All jurisdictions have the power to carry out both announced and unannounced inspections. Many jurisdictions, including ARPANSA, make use of unannounced inspections as required rather than on a regular, scheduled, basis.

An improvement opportunity has been identified to enhance APRANSA inspection oversight of transport activities:

- ARPANSA inspects compliance with RPS C-2 as part of routine inspections; however, this program does not currently confirm routine transport arrangements of material after it has left the premises. See action plan item 13.

8. Enforcement

This chapter includes responses from all Australian jurisdictions.

8.1 Enforcement policy and processes

Related to GSR Part 1 (Rev. 1): Requirements 30 and 31, paragraphs 4.54, 4.57–4.60

Each jurisdiction's legal framework defines the compliance monitoring, and investigative and enforcement activities which may be undertaken. This includes the appointment of authorised officers, scope of authority, identification, powers to require information or records, powers the authorised officers have at premises, and powers to question and identify persons.

When a non-compliance has been identified, inspectors may use a range of options under their respective acts. These range from informal measures, through formal warnings and improvement notices, to prohibition notices or directions. Inspectors may seize radiation sources and evidence. Each regulatory body has the powers to suspend or cancel authorisations as well as to impose conditions on the authorisation. The regulatory body may also initiate prosecution of alleged offenders, typically through the jurisdictional department of public prosecution. However, in accordance with a graded approach, typically, the minimum regulatory action would be taken which will provide for a return to compliance.

In addition to managing non-compliance, the regulatory body may make recommendations or suggestions which assist the licence holder in applying best practice, while being mindful of not overstepping the demarcation between the responsibility of the operator and the responsibility of the regulator.

ARPANSA enforcement

ARPANSA's *Compliance and Enforcement Strategy* describes the promotion and monitoring of compliance and a graded response to non-compliance. The ARPANSA Regulatory Guide *Graded Approach to Dealing with Licence Holder Non-Compliance,* complements the policy and is targeted at licence holders. Both the strategy and guide are published on ARPANSA's website. The considerations on which enforcement tool should be used include the safety consequences, nature of the discovery, impact, the licence holder level of intent, their compliance history and other factors. The potential actions are graded below:

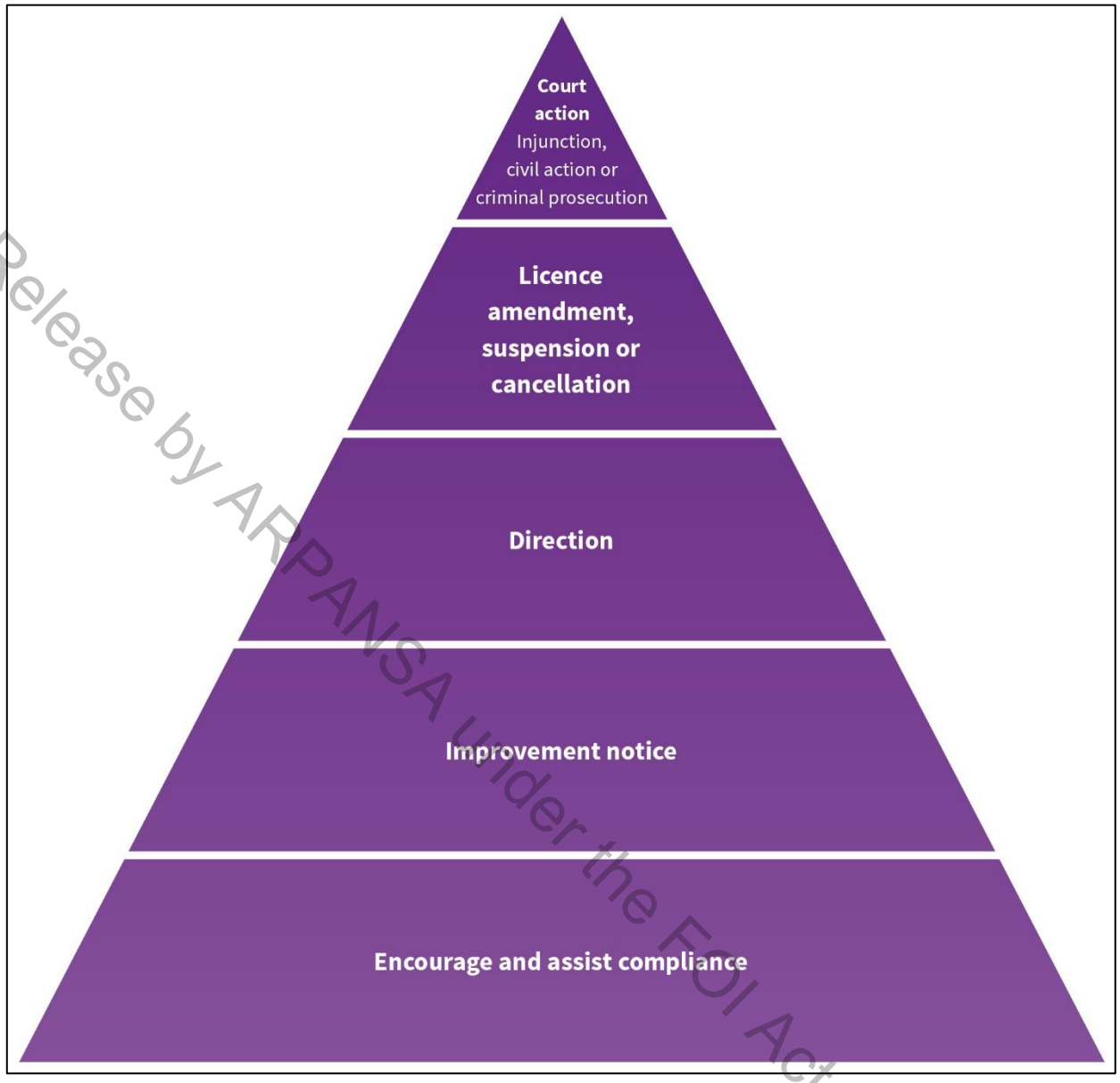

Figure 12. Potential enforcement grades

Under ARPANSA's Regulatory Management System, actions required by the licence holder to return to compliance are also followed up by inspectors, using a graded approach. For example, an improvement notice must be complied with within the timeframe specified, while the rectification of a finding in an inspection report may, in some instances, not be confirmed until the next scheduled inspection. Informal contact is generally used as part of encouragement and assistance. A follow-up register is used by ARPANSA officers to track actions associated with non-compliances.

The licence holder is required under regulation 46 of the Australian Radiation Protection and Nuclear Safety Regulations 1999 to investigate any non-compliance. In accordance with ARPANSA procedures, the licence holder is allowed 28 days to respond to any potential non-compliances identified in a report before ARPANSA makes a determination on whether the licence holder was non-compliant and what further actions to take. At this time, the licence holder is requested to identify actions and timeframes to implement those actions. Non-compliances that do not have significant safety implications are reported without naming the licence holder in the statutory quarterly and annual reports to Parliament. All other

non-compliances with potentially significant safety implications are reported to Parliament with the licence holder identified. The determination of a breach is made by the CEO of ARPANSA or their delegate, the Chief Regulatory Officer.

Inspectors may issue an improvement notice that requires the licence holder to remedy a non-compliance or prevent a likely non-compliance from occurring. An improvement notice may be used when resolution at the lower levels has failed to result in a return to compliance; there is immediate and significant safety implications; multiple or recurrent non-compliance of the same nature; or the licence holder refuses to take action in response to identified areas for improvement that are considered likely to lead to non-compliance.

The CEO may issue a direction to protect the health and safety of people or to avoid damage to the environment if the CEO on reasonable grounds believes that a controlled person is not complying with the *Australian Radiation Protection and Nuclear Safety Act 1998* (the Act).

In addition to non-compliances, ARPANSA issues areas for improvement (AFI), which are in the form of recommendations or suggestions that assist the licence holder in applying best practice. ARPANSA follows up within three months to evaluate if action is being taken for the areas of improvement. AFIs and potential non-compliances are listed in the inspection reports.

8.2 Enforcement implementations

Related to GSR Part 1 (Rev. 1): Requirement 31, paragraphs 4.55–4.56

In all jurisdictions, the regulator has access to a number of enforcement options. Including for inspectors to seize radiation sources, and either take, or recommend that their regulatory body take disciplinary action. Disciplinary actions include informal resolution or reprimanding; a requirement for specific actions or training to be undertaken such as through an improvement notice; imposing or varying conditions; and licence suspension or cancellation. Prosecution may also be pursued, such as through a recommendation to the State or Territory director of public prosecutions. NSW, NT and TAS have the power to issue Penalty Infringement Notices, which require the payment of a fine. A graded approach is used in implementing different enforcement actions.

ARPANSA enforcement actions

As described in section 8.1, powers under the Act enable or include:

- AFIs, which are in the form of recommendations or suggestions that assist the licence holder in applying best practice and avoiding potential non-compliances
- resolution of non-compliances though informal or formal communication, and the publication of non-compliances in annual and quarterly reports. Resolution actions and timeframes are recorded in the Breach Register and followed up
- improvement notice issued by an inspector under section 80A of the Act
- directions, given by the CEO under section 41 of the Act
- licence amendment, cancellation or suspension under sections 36 and 38 of the Act
- referring matters to the Director of Public Prosecutions. However, the ability to prosecute under the Act is limited; section 4 of the Act states that nothing in the Act renders the Crown liable to be prosecuted for an offence.

When an inspector identifies a potential non-compliance, through inspection or notification from the licence holder, the potential non-compliance is graded in accordance with the Regulatory Guide: *Graded Approach to Dealing with Licence Holder Non-Compliance*. Inspectors, after considering any comments from licence holders, provide the CEO with a recommendation to determine if a non-compliance occurred. The use of directions and improvement notices was discussed in section 8.1.

ARPANSA statistics for	2016-17	2017-18*
Areas for improvement (not a non-compliance)	154	97
Minor non-compliances (no or minor safety implications)	8	13
Significant non-compliances (significant safety implications)	2	4
Improvement notices	1	0
Directions, suspensions, Injunctions	0	1

*The 2017-18 annual report has not yet been completed and final reported numbers may vary from the presented data.

Table 9. ARPANSA enforcement statistics for last two financial years

APRANSA identifies AFI and potential non-compliances in inspection reports, which are published online. ARPANSA's practice is to follow-up within three months to evaluate if action is being taken for the areas of improvement. This helps in evaluating the effectiveness of the recommendations made, as well as provides information on the performance of the licence holder. For non-compliances, follow up is conducted on an individual basis, within negotiated timeframes as recorded in a breach register.

As part of internal education and training, ARPANSA prepares quarterly and annual inspection outcome reports, which analyse the types of AFIs and potential non-compliances found and any feedback received from licence holders. This information is also summarised and placed on the ARPANSA website and discussed at ARPANSA Regulatory Services Branch annual training days.

State and Territory enforcement actions

Most of the regulatory bodies have specific guidance on compliance and enforcement for their regulatory officers. For example, in QLD, the guidance document *Radiation Safety Act 1999*: Strategy to achieve compliance includes an enforcement guidance tool to guide consistent and supported enforcement actions to remedy identified non-compliance. Other jurisdictions, such as Victoria, have draft documents, which are being developed for this purpose.

These documents outline procedures for investigating non-compliance, determining the level of risk, identifying the enforcement options to most effectively improve compliance, and deciding on follow up actions.

For example, the NSW Environmental Protection Authority, during 2016-17 financial year, took the following actions:

NSW EPA Regulatory enforcement statistics for 2016-17	
Advisory letters	41
Show cause	3
Formal warning	1
Official cautions	19
Penalty infringement notices (fine)	2

8.3 Conclusions and actions

Regulatory bodies across Australia have established and implemented enforcement policies and practices in accordance with the legal framework of each jurisdiction, meeting the expectations of the IAEA safety standard in this area. ARPANSA has comprehensive documentation on the implementation of a graded approach to non-compliances, which is available to stakeholders.

The policies allow for enforcement measures to be taken according to the significance and severity of non-compliance, including taking immediate action in some situations (a graded approach).

9. Regulations and guides

This section considers Commonwealth arrangements, and the collaboration between all jurisdictions to develop nationally consistent regulatory documents; it does not consider the specifics of the State and Territory regulations and guides.

9.1 Generic issues

Related to GSR Part 1 (Rev. 1): Requirements 32–34, paragraphs 4.61–4.62, GSR Part 3: Requirement 3

Regulations and legislative change

Legislative change in each jurisdiction of Australia must pass through that jurisdiction's parliament. These parliaments act independently of each other. In general, a bill to create or amend an Act must be passed by both houses (the House of Representatives and the Senate for the Commonwealth; the Legislative Assembly and Legislative Council for States and Territories except QLD, which only has one house of parliament) and ratified by the Governor General or governor. Regulation, and other subordinate legislation, is made by the executive branch of government and authorised by parliament. The executive branch of government is drawn from the legislature.

The Federal Executive Council, which in practice gives legal effect to the decisions of the cabinet, comprises the Prime Minister and Ministers of State who advise the Governor-General. For more information see section 1. The relevant jurisdiction legislation is listed in *Appendix A – Reference Documents.*

For the Commonwealth, a Regulation Impact Statement (RIS) is required for any policy proposal or other decision designed to introduce, amend or abolish regulation and that may have an impact on businesses, community organisations or individuals, unless the proposed change is a minor or machinery in nature. The RIS outlines the potential impacts and opportunities which may be created by an approach and considers alternative approaches. The Australian Government Guide to Regulation outlines this process, with specific guidance such as Australian Government RIS Preliminary Assessment Form: Is a RIS required? The Office of Best Practice Regulation (OBPR) advises on, and assesses, Regulation Impact Statements and Post-Implementation Reviews, as well as prepares regular compliance reports, which are published on its website.

States and Territories have similar requirements, see e.g. the ACT Best Practice Guide for Preparing Regulatory Impact Statements. These require that the impact of introducing new requirements on business and individuals be assessed and communicated appropriately, which may include public consultation. Where there are differences in the requirements of the different jurisdictions, national uniformity issues may arise, as described in section 13 of this Summary Report.

National regulatory documents

ARPANSA, on behalf of all jurisdictions, publishes a range of documents to promote nationally consistent approaches to safety. Foremost in these publications is the Radiation Protection Series (RPS) suite of publications.

These include the *National Directory for Radiation Protection* (NDRP), which was first published in 2004 with regulatory principles and requirements and a process for the development and adoption of national codes and standards for radiation protection. The current NDRP is due to be replaced by a revised

2nd edition of the NDRP, which has been endorsed by the regulators from all Australian jurisdictions in July 2018, through the Radiation Health Committee. It is in an advanced stage of the national approval process and is expected to be approved by the Health Ministers by mid-2019.

Apart from the NDRP, which is a stand-alone depository for agreed regulatory principles and approaches, publication categories within the RPS are *Fundamentals*, *Codes*, and *Guides*:

- Fundamentals set the basic principles for radiation protection and describe the fundamental radiation protection, safety and security objectives. They are written in an explanatory and non-regulatory style and describe the basic concepts and objectives based on international standards and best practice.
- Codes are regulatory in style and may be referenced by regulations or conditions of licence. They contain either general safety or security requirements which may be applicable for all dealings with radiation, or practice-specific requirements. They provide overarching requirements and are expressed as 'must' statements which are to be satisfied to ensure an acceptable level of safety.
- Guides provide guidance on how to comply with the Codes or apply the principles of the Fundamentals. They are written in an explanatory and non-regulatory style and indicate the measures recommended for good practice. They are generally expressed as 'should' statements.

All codes that could potentially be used by regulators as conditions of licence or registration are subject to the Council of Australian Governments (COAG) Best Practice Regulation - A Guide for Ministerial Councils and National Standard Setting Bodies (Oct 2007). This means that such publications are treated as 'quasi-regulation' and are required to undergo a process of regulatory impact assessment to the satisfaction of the Office of Best Practice Regulation. The process includes public consultation.

The Radiation Health Committee (RHC) (see section 1.4) oversees the preparation of RPS documents which are produced in accordance with agreed priorities. This is a function of the RHC under section 23 of the Act:

- to develop policies and to prepare draft publications for the promotion of uniform national standards of radiation protection
- from time to time, to review national policies, codes and standards in relation to radiation protection to ensure that they continue to substantially reflect world best practice.

The RHC approves the RPS documents. ARPANSA will then, on behalf of all jurisdiction, seek the view of the Radiation Health and Safety Advisory Council (RHSAC) to endorse the publication, which is then published on the ARPANSA website. RHSAC includes representation from industry, public health, and health care and research. Endorsement from the RHSAC can provide additional assurance that community concerns, emerging issues, and adoption requirements have been taken into account.

National adoption of amendments to the NDRP and codes that have been referenced in Schedule 11 of the NDRP, require agreement by Health Ministers represented on the COAG (Council of Australian Governments) Health Council. They can then be implemented in the legal framework, e.g. as mandatory conditions of licence. For example, ARPANSA lists a number of Codes in Regulation 48 as mandatory licence conditions, and additional specific RPS publications on the website.

The RPS suite of publications also includes 'standards' and 'recommendations'. The matters covered in these publications will be updated within the structure of Fundamentals, Codes and Guides with time, and RPS will no longer refer to 'standards' and 'recommendations.

In addition, ARPANSA publishes RHC statements on particular issues, all of them on behalf of the jurisdictions and other RHC members.

The codes, standards and guides are updated taking into account international best practice such the IAEA safety standards. For example, the *Code for Radiation Protection in Planned Exposure Situations (2016)* (RPS C-1), and *Code for Radiation Protection in Medical Exposure* (RPS C-5) (under development) update pre-existing RPS documents by taking into account IAEA GSR Part 3. The Guide for Radiation Protection in Existing Exposure Situations (RPS G-2) is a new RPS publication based largely on GSR Part 3.

A list of the publications is provided under codes and guidance documents, in *Appendix A – Reference Documents.*

Regulatory guides for ARPANSA licence holders

ARPANSA regulatory guides are published on the website to give specific guidance to licence applicants and licence holders.

These documents provide guidance on ARPANSA's regulatory requirements. Interested parties are notified of changes through ARPANSA website and email, and have been consulted beforehand. ARPANSA holds a Licence Holder Forum annually to, among other things, inform licence holders about the updated status of regulations, Codes and Guides. For example, the 2017 feature topic was the *Code for Radiation Protection in Planned Exposure Situations* (RPS C-1), and the forum included a panel discussion between licence holders as well as a fulsome presentation on the RPS C-1.

These codes and guides have been developed drawing on past experience, best practice and international standards such as the IAEA safety standards. These guides are part of the Regulatory Management System (RMS) and as such subject to periodic review.

ARPANSA Regulatory Guides include:

- guides to assist prospective licence holders, which demonstrate a graded approach, requiring more detail for complex applications (graded approach):
    - How to apply for a source licence - October 2017
    - How to apply for a licence for a prescribed radiation facility - May 2016
    - How to apply for a facility licence for a nuclear installation - May 2016
    - Applying for a licence for a radioactive waste storage or disposal facility – May 2017
- Plans and Arrangements for Managing Safety – This guide sets out the requirements that should be demonstrated in an applicant's or licence holder's plans and arrangements. It may also assist licence holders in their review of plans and arrangements required under Regulation 50.
- Transfer or disposal of sources - August 2015 - This guide provides information on how to apply for approval to dispose of controlled apparatus or controlled material or transfer controlled apparatus or controlled material out of Commonwealth jurisdiction.
- How to determine whether a UV source is a controlled apparatus - October 2017 - This guide is provided to assist controlled persons determine whether a UV source falls within the definition of a controlled apparatus under the ARPANS regulations. It is valid for both pulsed and continuous sources of ultraviolet radiation where the exposure duration is not less than 0.1 ms. It does not apply to ultraviolet lasers.
- Inspections website – This site provides information for licence holders on inspection processes, outcomes, and what to expect during inspections.

- Graded approach to dealing with licence holder non-compliance - This document provides guidance to staff and stakeholders about ARPANSA's regulatory response to licence holder non-compliance (enforcement).

International best practice (IBP)

Under sections 32 and 33 of the Act, the CEO must consider international best practice in relation to radiation protection and nuclear safety when deciding whether to issue a licence. In addition, the Commonwealth Government proposed, in the Industry Innovation and Competitiveness Agenda: An Action Plan for a Stronger Australia, and subsequently adopted the policy principle that 'if a system, service or product has been adopted under a trusted international standard or risk assessment, then our regulators should not impose any additional requirements for approval in Australia, unless it can be demonstrated that there is a good reason to do so.'

An international standard and risk assessment does not become 'trusted' before its relevance and applicability in the Australian context has been assessed, documented and decided. The Commonwealth's policy (and ACC Guidance) on international standards and risk assessment states that portfolios need to work with stakeholder groups to identify criteria that take into account a number of considerations, including the applicability in the Australian context, and whether any necessary Australian specific conditions or circumstances warrant distinct regulatory standards and risk assessment processes.

ARPANSA promotes implementation in Australia of relevant international standards and risk assessments, in consultation with stakeholders. Two parallel but interconnected processes are being followed: one that is directly related to Commonwealth entities regulated by ARPANSA and one that develops codes and guides to be used nationally across all jurisdictions and, as relevant, referenced in the National Directory for Radiation Protection (NDRP). The RHC plays a key role in the latter process.

The ARPANSA website lists international best practice documents that represent international consensus on risks and what constitutes a high level of safety and protection of people and the environment from the harmful effects of radiation. The documents are considered in regulatory review and assessment, as well as in inspections and other activities. ARPANSA considers these documents within the Australian context and determines whether all requirements and guidance is applicable in the Australian regulatory environment, and whether any Australian-specific conditions or circumstances require further requirements or guidance.

As stated earlier, some of these international documents are referenced in ARPANSA's regulatory guides. For example IBP requirements on Management Systems, includes the requirements document GSR Part 2 Leadership and Management for Safety and associated safety guides which including G-3.1 Application of the Management System for Facilities and Activities, GS-G-3.5 The Management System for Nuclear Installations, TS-G-1.4 The Management System for the Safe Transport of Radioactive Material.

The ARPANSA guide Regulatory Assessment Principles (RAPs), which consolidated design and operational requirements, was recently retired in favour of direct reference to IBP documents. An analysis of international standards in the Australian context, as a replacement for the RAPs, is under way.

Regulatory guides for States and Territories licence holders

Similarly, State and Territory regulators publish information on their website, including but not limited to compliance testing requirements, shielding requirements, guidance on applications and the preparation of management plans. National uniformity is further discussed in section 13.

9.2 Regulations and guides for radiation sources, facilities and activities

Related to GSR Part 1 (Rev. 1): Requirements 32-34

The overarching document Fundamentals for Protection Against Ionising Radiation (2014) (RPS F-1) provides the protection objective and the basis for the regulatory requirements. This adopts the IAEA Fundamental Safety Principles SF-1 and underpins all further considerations.

In addition to the ARPANS Act and Regulation, the following codes apply to all licences:

- *Code for Radiation Protection in Planned Exposure Situations* (2016) (RPS C-1) based on requirements in IAEA GSR Part 3
- *Code for the Safe Transport of Radioactive Material* (RPS C-2) directly adopts the IAEA Transport Code SSR-6 & associated safety guides SSG-26 and SSG-33
- *Code of Practice - Security of Radioactive Sources* (RPS 11) which covers security arrangements for sealed sources
- *Code of Practice for the Disposal of Radioactive Wastes by the User* (1985) [for licences which allow dealing with Sources] – note that this has been superseded by Schedule 14 in the NDRP; the RHC has also agreed that this will be published a separate Code in the RPS suite of publication (RPS C-6).

Additionally, specific codes and guides are provided for industries or sources, such as:

- *Code of Practice and Safety Guide for Portable Density/Moisture Gauges Containing Radioactive Sources* (2004)
- *Code of Practice and Safety Guide for Radiation Protection in Dentistry* (2005).

For ARPANSA the website lists which specific codes apply to specific sources and facilities. In other jurisdictions, these are listed in the applicable licence condition.

ARPANSA also provides guidance for licence holders on topics such as applying for authorisations, plans and arrangements, and specific requirements and applies international best practice in its review, assessment and decisions, in relation to licence applications or in other regulatory activities This has been covered under 9.1 above.

9.3 Regulations and guides for research reactors

Related to SSR-3: paragraphs 3.1 to 3.4

Codes that apply to all facilities also apply to research reactors, including relevant Radiation Protection Series documents. There are no specific additional requirements under the Act or Regulations, which apply only to research reactors. However, ARPANSA has prepared guidance documents for these licence holders, such as Regulatory guide - Periodic Safety and Security Review of Research Reactors. The preparation of a periodic review, normally every 10 years but otherwise as necessary or requested by the CEO, is a licence condition on the OPAL reactor

As with all licence applications, the CEO of ARPANSA must consider how IBP is applied. For research reactors, international best practice is carefully considered and commitments to follow IBP documents are part of the licence holders plans and arrangements. The following IAEA documents are listed on the IBP page and are used as the regulatory basis for review and assessments of research reactors:

Safety requirements

- SSR-3 Safety of Research Reactors

Safety guides

- SSG-20 Safety Assessment for Research Reactors and Preparation of the Safety Analysis Report
- SG-24 Safety in the Utilization and Modification of Research Reactors
- NS-G-4.1 Commissioning of Research Reactors
- NS-G-4.2 Maintenance, Periodic Testing and Inspection of Research Reactors
- NS-G-4.3 Core management and Fuel Handling for Research Reactors
- NS-G-4.4 Operational Limits and Conditions and Operating Procedures for Research Reactors
- NS-G-4.5 The Operating Organization and the Recruitment, Training and Qualification of Personnel for Research Reactors
- NS-G-4.6 Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors
- SSG-22 Use of a Graded Approach in the Application of the Safety Requirements for Research Reactors
- SSG-10 Ageing Management for Research Reactors
- NS-G-2.11 A System for the Feedback of Experience from Events in Nuclear Installations
- NS-G-2.13 Evaluation of Seismic Safety for Existing Nuclear Installations
- SSG-37 Instrumentation and Control Systems and Software Important to Safety
- SSG-38 Construction of Nuclear Installations

9.4 Regulations and guides for waste management facilities

Related to GSR Part 5: Requirements 2, 6, 8, 9, 10, 11 and 12, SSR-5: Requirements 5, 7, 10, 15, 19, 20, 22 and 26

Plans are in place for establishing a National Radioactive Waste Management Facility for disposal of low level waste and storage of intermediate level waste. The framework governing these activities also includes plans for finding a site, and establishment of a facility, for disposal of intermediate level waste (see section 1.7; Australian Radioactive Waste Management Framework, April 2018). To assist in the preparation of such a site ARPANSA has published Regulatory guide: Applying for a licence for a radioactive waste storage or disposal facility - May 2017 and Information for Stakeholders: Radioactive Waste Storage and Disposal Facilities.

For routine disposal of waste in all jurisdictions, the requirements of RHS 13, *Code of practice for the disposal of radioactive wastes by the user* (1985), was essentially superseded by the incorporation of user disposal requirements in Schedule 14 of the *National Directory for Radiation Protection* (RPS 6) in 2017. As explained in section 9.2, RHC has agreed to republish Schedule 14 as a stand-alone Code, RPS C-6.

ARPANSA in collaboration with State and Territory Regulators has prepared the *Code for Facilities for Disposal of Solid Radioactive Waste* (RPS C-3), which in an advanced stage of the approval process (it has been approved by the RHC), and which will replace the current Radiation Health Series 35 - *Code of practice for the near-surface disposal of radioactive waste in Australia* (1992). It expands the scope of the 1992 Code to include disposal of solid radioactive waste in all types of disposal facilities (not just near-surface disposal). The publication will inform potential applicants for a licence to dispose of radioactive waste in a disposal facility, other stakeholders and the public of the issues that will have to be addressed by the applicant. The Code describes objectives for protection of human health and of the environment, drawing upon international best practice in relation to radiation protection and radioactive waste safety, e.g. the IAEA *Disposal of Radioactive Waste* (SSR-5).

Additionally, ARPANSA in collaboration with State and Territory regulators has published a Safety Guide for the Predisposal Management of Radioactive Waste (2008) and Safety Guide for Classification of Radioactive Waste (2010). This provides guidance to all Australian licence holders who may generate waste and are required to manage this waste until a disposal solution is in place.

9.5 Regulations and guides for decommissioning activities

Related to GSR Part 6

While some jurisdictions, including ARPANSA, can issue explicit licences for decommissioning under the relevant legislation, other jurisdictions can achieve the safety objective through, e.g., the use of licence conditions (see section 5).

As with all applications to ARPANSA, the CEO is required to consider international best practice, which includes requirements and guidance such as *GSR Part 6 Decommissioning of Facilities* and *WS-G-5.2 Safety Assessment for the Decommissioning of Facilities Using Radioactive Material.* These provide expectations of what to include with an application.

ARPANSA guidance on decommissioning includes the ARPANSA Guide Surrender of a Facility Licence and Release from Regulatory Control.

ARPANSA has prepared the Regulatory Guide: Decommissioning of Controlled Facilities which is being finalised for publication. This guide will provide guidance to licence holder and other interested parties on planning, conducting and completing the decommissioning of nuclear installations. It aims to assist in ensuring that the decommissioning of these facilities is conducted in a safe and environmentally acceptable manner in accordance with international best practice. This document will also be used for regulatory assessment of a licence application for decommissioning a controlled facility.

Once the draft guide has been approved and published, the plans and arrangements guide will be updated to ensure it references all applicable provisions such as decommissioning strategies and resource arrangements.

Sites that have been contaminated, including with radiation, by past activities are typically identified at the closure of the activity or discovered during changes to land use – for example, from industrial to residential use. In most cases these can be managed at the time that the change of land use occurs. In rare cases, some sites are found to present an unacceptable risk to human health or to the environment and must be dealt with as a priority. Guidance on legacy situations is contained in in RPS G-2 Guide for Radiation Protection in Existing Exposure Situations (2017), developed in collaboration with State and Territory regulators, and approved by the RHC.

9.6 Regulations and guides for transport activities

Related to SSR-6

In Australia, the *Code for the Safe Transport of Radioactive Material* 2014 (RPS C-2) provides the nationally agreed framework and requirements for safe transport of radioactive material. RPS C-2 adopts the IAEA's Regulations for the Safe Transport of Radioactive Material, 2012 Edition (SSR-6). Additionally, the *Code of Practice for the Security of Radioactive Sources* 2007 (RPS 11) contains requirements for the transport of security enhanced (sealed) sources.

These requirements are implemented by the relevant jurisdiction's listed in Schedule B of Radiation Protection Series C-2 and on the website. However, some jurisdictions are still using the previous 2008 or 2001 version of the code within the relevant jurisdiction legislation.

Previously ARPANSA maintained RPS 2.1 *Safety Guide for the Safe Transport of Radioactive Material (2008 Edition)*, and RPS 2.2 *Safety Guide for Approval Processes for the Safe Transport of Radioactive Materials (2012)*. However, as of 2016, ARPANSA directs all stakeholders to:

- SSG-26 *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material*
- SSG-33 *Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition).*

Additionally ARPANSA maintains checklists on the ARPANSA website, to assist persons making applications:

- Approval of Special Form Radioactive Material & Low Dispersible Radioactive Material Checklist
- Special Arrangement Approval Checklist
- Shipment Approval Checklist
- Package Design Approval Checklist
- Validation of Certificate Approval Checklist.

9.7 Guides for promotion of safety culture or 'holistic safety'

ARPANSA approaches the need for a strong safety culture through a holistic approach, a best practice, systemic, approach to safety that is consistent with the requirements of GSR Part 2 requirements 2 and 12. ARPANSA has published a range of information and guidance on its holistic safety webpages and has also engaged with stakeholders through meetings, forums and conferences to encourage a proactive approach to holistic safety.

ARPANSA's holistic approach was developed to address vulnerabilities that are associated with common contributing causes of accidents. Drawing on modern safety science ARPANSA has emphasised the following seven characteristics for holistic safety which address technical, human and organisational factors of safety in an overlapping and integrated manner:

- human aspects – competency and training, equipment and process design, operational environmental design
- non-technical skills – communication, leadership, team working, decision making and situational awareness

- defence in depth – conservative and proven design, control and limiting systems, safety systems, accident mitigation, and off-site response
- management system – integration of safety management requirements into all business processes
- resilience – the abilities to respond, monitor, anticipate and learn
- safety culture – based on INSAG 15 with an additional attribute of integration across organisational boundaries
- security culture – security management should be informed and integrated.

ARPANSA's Holistic Safety Guide discusses the characteristics and attributes of organisations that have good holistic safety practices. This is supported by another guide providing examples of questions that licence holders can ask themselves to explore their own organisations performance. ARPANSA has also published tools that can be used or adapted by organisations to help them identify strengths and weaknesses in key aspects of holistic safety.

The characteristics of holistic safety have also been woven into the inspection Performance Objectives and Criteria, (PO&Cs) and are examined through the ARPANSA inspection programme. The PO&Cs are published on the ARPANSA website to enable licence holders to proactively identify and address weaknesses before they are identified by inspectors.

9.8 Conclusions and actions

Australia generally meets the expectations of the IAEA safety standards with regard to regulation and guides.

The RHC develops, jointly and with the support of ARPANSA staff, a number of national Codes, and Guides for adoption across Australia. These are published by ARPANSA as part of the Radiation Protection Series and made available on the website. There is national agreement on regulatory elements and basic principles and approaches, captured in the National Directory for Radiation Protection, which also adopt certain Codes by reference, for national implementation. Consultation is undertaken for all these documents, as well as an assessment of the impact on businesses, persons and other stakeholders.

These national documents, together with relevant jurisdiction legislation which is periodically reviewed and revised, specify the principles, requirements and criteria for safety upon which regulatory judgements, decisions and actions are based.

The RHC has agreed to, as applicable and practicable in the Australian context, implement what broadly is referred to as international standards in Codes and Guides; ARPANSA links to international best practice on its website to provide guidance to license holders on appropriate international standards that may be considered.

ARPANSA has developed regulatory guides on a variety of topics for Commonwealth licence holders, which build on international best practice such as the IAEA safety standards. The documents also communicate the requirements for safe operations and protection of people and the environment, to a broader audience. As an example, to provide clear guidance on the regulatory process for the proposed national radioactive waste management facility, ARPANSA has been in regular contact with stakeholders and provided guidance documents on the website – including Information for Stakeholders: Radioactive Waste Storage and Disposal Facilities.

ARPANSA actively promotes safety culture with licence holders through initiatives such as the holistic safety guidelines and the Performance objectives and criteria, which are used during inspections as well as review and assessment.

The ARPANSA guide Regulatory Assessment Principles (RAPs), which consolidated design and operational requirements for ARPANSA licence holders, was recently retired in favour of direct reference to international best practice documents. An action on ARPANSA has been identified as follows:

- a comprehensive analysis on which international standards (and similar) documents are applicable to which facilities, and any gaps, has commenced but is not yet completed; it should be pursued in order to ascertain appropriate consideration of international standards' in ARPANSA's licensing activities. See Action Plan item 14.

10. Emergency preparedness and response (EPR)

This section focuses on the Commonwealth arrangements, with additional information provided on State and Territory arrangements where relevant.

The Australian Government Crisis Management Framework

The Australian Government Crisis Management Framework (the Crisis Framework) version 2.2 (December 2017) outlines the arrangements enabling the Australian Government's 'all hazards' crisis management approach. This approach is a continuum of: prevention, preparedness, response and recovery. The Crisis Framework covers a range of crises, including terrorist incidents, health pandemics, natural disasters and other incidents (including radiological and nuclear); and covers incidents affecting Australians and Australian interests domestically and overseas. The Crisis Framework provides ministers and senior officials with guidance on their respective roles and responsibilities. It also sets out the arrangements that link ministers and the work of key officials, committees and facilities, within the Australian Government, and guides the interfaces between jurisdictions in the Australian Federal System. The Crisis Framework is overseen by the Commonwealth Department of Prime Minister and Cabinet.

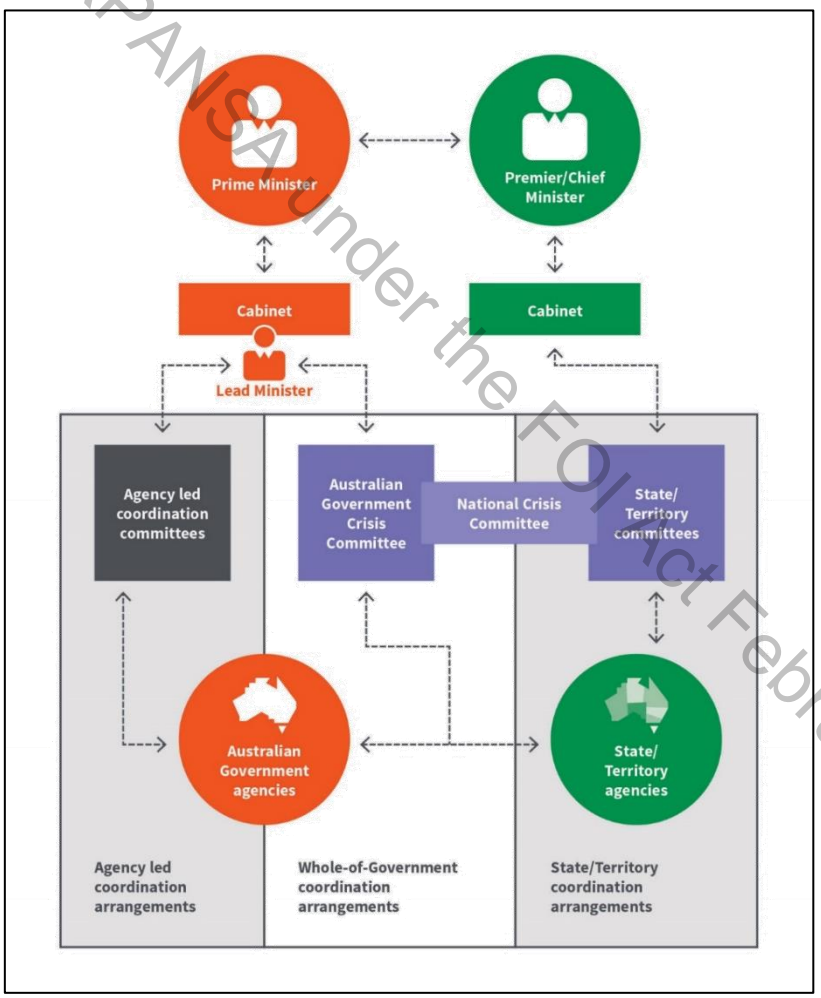

Figure 13. Crisis coordination arrangements (December 2017).

The Crisis Framework does not replace existing crisis plans on specific hazards or functions. Rather it sets out the guidelines for the Australian Government's response to any crisis. The Crisis Framework also identifies the Responsibilities of the Commonwealth and State and Territory governments.

State and Territory responsibilities

Under the Crisis Framework the States and Territories have legislated responsibility for the protection of life, property and the environment within the bounds of their jurisdiction. They control most functions essential for effective crisis prevention, preparedness, response and recovery. The nature of the response is recorded in specific State or Territory emergency plans. The response can cover a range of functions, including health, law and order, energy supplies, transport, water and local government. Where crises involve actual or potential national consequences there may be a need for a high level of collaboration and coordination within and across all levels of government (for example: response to potential nuclear emergencies, such as an offsite release from the OPAL reactor or a nuclear powered warship).

Commonwealth Responsibilities in a crisis

The Commonwealth Government responsibilities in a crisis and how they relate to the State/Territory who have the primary responsibility for first response, are summarised in figure 14. The Commonwealth also provides financial assistance to states and territories to support prevention and preparedness activities, including crisis management exercises, and national leadership and coordination on policy and capability through the Council of Australian Governments (COAG) Committees, such as the Australia-New Zealand Emergency Management Committee, the Australian Health Protection Principal Committee (AHPPC) and the Australia-New Zealand Counter-Terrorism Committee (ANZCTC).

Supporting role	Joint management	Primary responsibility
Providing support to the states and/or territories where the need of a response overwhelms resources and Australian Government coordinated assistance has been requested	Working together with the states and/or territories to manage a crisis that has potential to affect, or has affected, more than one jurisdiction, the broader community or an Australian Government area of responsibility	Managing any crisis that is not the responsibility of a state or territory
Financial assistance		
Providing financial assistance to state and territory governments and individuals affected by a major crisis		

Figure 14. Commonwealth Government responsibilities (December 2017)

Commonwealth agencies also develop national plans and maintain a national exercise program which is delivered through the Commonwealth Department of Home Affairs. This Department, through Emergency Management Australia, operates the Crisis Coordination Centre (CCC). Through the CCC, EMA are able to coordinate the execution of Commonwealth plans in accordance with the Crisis Framework and facilitate the formal communication channels between the jurisdictions and the Commonwealth Government during a crisis. EMA is also responsible for initiating and hosting the Australian Government Crisis Committee and the National Crisis Committee (see Figure 13). Additionally, the Department of Foreign Affairs and Trade and the Department of Defence manage a program for incidents that may affect Australians or Australian interests overseas. The CCC also acts as the National Contact Point identified by the Australian Government in relation to the Emergency Notification and Assistance Conventions for radiological and nuclear emergencies and ARPANSA is the designated National Competent Authority.

Response plans related to nuclear or radiological incidents

There are a number of Australian Government plans that may relate to a nuclear or radiological incident, including:

- Australian Government Disaster Response Plan (COMDISPLAN)
- National Counter Terrorism Plan (NCTP)
- Australian Government Space Re-Entry Debris Plan (AUSSPREDPLAN)
- National Health Emergency Response Arrangements (and sub-plan the Health Chemical, biological, radiological and nuclear Incident Response Plan (Health CBRN Plan)
- National Plan for Maritime Environmental Emergencies.

These plans are drafted and reviewed through a range of committees, including the

- Chemical Biological, Radiological and Nuclear Security Sub-Committee (CBRNSSC)
- Australian Health Protection Principal Committee (AHPPC)
- Australian Government Planning Group (AGPG)
- National Plan Strategic Coordination Committee (NPSCC).

There are also other Commonwealth plans and arrangements that relate to more specific nuclear or radiological activities and interface with multiple plans across jurisdictions. These include:

- ANSTO Emergency Management Plan; this plan interfaces with a range of state based plans including the NSW State Emergency Plan, the NSW State Lucas Heights Emergency Sub-Plan and the NSW State CBRN Hazardous Materials Emergency Sub-Plan
- Defence Operations Manual: Visits to Australia by Nuclear-Powered Warships (OPSMAN 1, Edition 10). This manual sets out the requirements for emergency plans that must be developed at the jurisdiction level for ports receiving visits by nuclear-powered warships, it also guides Commonwealth response responsibilities and interfaces with COMDISPLAN and the Health CBRN Plan.

As the National Competent Authority and Commonwealth Regulator, the role of ARPANSA domestically would depend on the type of emergency and which emergency plan is activated. ARPANSA, as a Commonwealth agency, may be called on as part of a wider Commonwealth involvement in an incident or emergency, as liaison officers, or to support State or Territory emergency response.

ARPANSA's contribution in the event of a radiological or nuclear incident may include:

- location and characterisation of likely sources of radiological threat
- collection and analysis of monitoring data
- prediction of dispersion of radioactive substances
- technical analysis and assessment of simulated and actual data
- provision of expert advice including radiation protection and nuclear safety and security advice.

ARPANSA's support to State and Territory governments would mainly be provided to the relevant regulatory body in the jurisdiction who holds primary responsibility under the relevant State or Territory legislation. ARPANSA may provide staff and specialist resources, or support in the form of radiation protection advice, technical advice, detachment of liaison officers, or technical products provided by electronic means. The regulatory bodies in each jurisdiction play a key part in preparedness and response in relation to radiological and nuclear emergencies.

10.1 Authority and responsibilities for regulating on-site EPR of operating organisations

Related to GSR Part 7: Requirements 2, 20 and 25, GSR Part 1 (Rev. 1): Requirements 16, 26 and 27

All States and Territories have emergency management requirements established by the radiation regulator under the relevant jurisdiction legislation, and additional requirements under emergency response legislation such as fire and rescue services. These requirements aim to be consistent with national codes and guides (see section 10.2). The current nationally adopted guide is the *Recommendations for Intervention in Emergency Situations Involving Radiation Exposure* (2004) RPS 7, which is intended to be replaced with *Guide for Radiation Protection in Emergency Exposure Situations*, RPS G-3. RPS G-3 is currently in an advanced stage of preparation for publication which is likely to occur towards the end of 2018. These guides are further discussed below.

ARPANSA's regulation of EPR

ARPANSA is the Commonwealth regulator for safety, security and EPR of Commonwealth use of radiation sources, radioactive materials, nuclear installations and radiation facilities. The responsibilities of ARPANSA under the ARPANS Act and Regulations are reviewed in section 3 of this Summary Report.

Even though radiological emergencies can be considered to be low probability events among Commonwealth licence holders, there is potential for high radiation exposures of people and impact on the environment if such an emergency were to occur. As such, it is part of ARPANSA's mandate to regulate licence holder's implementation of EPR systems, and also to promote national uniformity in this area (see the ARPANS Act, section 15, 1a).

Commonwealth agencies with radiation protection expertise and additional radiation emergency response capabilities, such as ARPANSA, ANSTO and Defence, can act in support of the States and Territories when requested. Information on ARPANSA's role in EPR is provided publicly on the ARPANSA website.

Operators of nuclear installations, which may have radiological consequences in an emergency, are regulated by ARPANSA.

ARPANSA verifies compliance of on-site arrangements through the review and assessment of documentation during the licensing process, including the emergency plans. Inspections are carried out by ARPANSA on EPR arrangements of the operator and ARPANSA also observes some emergency exercises conducted by the operator. These operations are integrated into the routine compliance monitoring discussed below and in sections 5, 6, 6 and 8 of the Summary Report.

ARPANSA is an observer on the Sutherland Shire Council Emergency Planning Committee, which consists of ANSTO, the Council and various emergency response organisations including NSW Police, fire brigade, ambulance, etc. These meetings improve the coordination and organisation of interactions during exercises and actual emergencies. ARPANSA provides independent guidance and support on compliance with GSR Part 7 for the on-site and off-site interfaces.

In addition to the regulation of nuclear installations by ARPANSA, the Defence Operations Manual: Visits to Australia by Nuclear-Powered Warships (OPSMAN 1, Edition 10) also details the requirements for emergency plans that must be developed at the jurisdiction level for ports receiving visits by nuclear-powered warships. These requirements are developed and maintained by an inter-departmental committee, the Visiting Ships Panel (Nuclear) (VSP(N)), which involves a number of agencies, including ARPANSA, at the Commonwealth and State/Territory level. The implementation of these plans and arrangements are exercised, reviewed and validated on a regular basis (at least 2 yearly). Any new port requested for use by a nuclear powered warship must be validated by the VSP(N) prior to any visit being undertaken. Information on these visits is also provided on the ARPANSA website.

10.2 Regulations and guides on on-site EPR of operating organisations

Related to GSR Part 7: Requirements 2 and 8, GSR Part 1 (Rev. 1): Requirement 2

The Radiation Health Committee (RHC), develops draft national codes and guides which are ultimately published by ARPANSA. Through the National Directory for Radiation Protection (NDRP), jurisdictions agree to implement the codes within their jurisdiction.

ARPANSA has published, or is in an advanced stage of drafting, the following documents which provide guidance on EPR nationally:

- Fundamentals for Protection Against Ionising Radiation (2014) [RPS F-1]
- Code for Radiation Protection in Planned Exposure Situations (2016) [RPS C-1]
- Recommendations for Intervention in Emergency Situations Involving Radiation Exposure (2004) [RPS7]
- Guide for Radiation Protection in Emergency Exposure Situations (DRAFT) [RPS G-3].

Regulatory Guides, which establish emergency arrangements expectations for ARPANSA licence holders, include:

- Plans and arrangements for managing safety (Section 7)
- How to apply for a source licence (section 7 – Emergency Plan)
- How to apply for a licence for a prescribed radiation facility (section 6 – Emergency Plan)
- How to apply for a licence for a nuclear installation (section 6 – Emergency Plan)
- Periodic safety and security review for research reactors (Safety Factor 13 – Emergency Planning).

ARPANSA maintains a list of international best practice documents, which may be considered in the regulatory process. These include:

- GSR Part 3 Radiation Protection and Safety of Radiation Sources: Basic Safety Standards
- GSR Part 7 Preparedness and Response for a Nuclear or Radiological Emergency
- NSS-13 Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5)
- NSS-14 Nuclear Security Recommendations on Radioactive Material and Associated Facilities
- NSS-15 Nuclear Security Recommendations on Nuclear and Other Radioactive Material out of Regulatory Control.

The Regulations (Schedule 3, part 1, Item 4(f)) require the licence holder to include an emergency plan in the application for a facility licence, which will be subject to ARPANSA's review during the licensing process. A graded approach is applied, where the level of scrutiny is commensurate to the level of hazard/risk. Examples of licences that have required emergency plans include:

- OPAL – The Open Pool Australian Lightwater Reactor (OPAL) licence required detailed emergency plans. Resources are coordinated and exercised with the NSW Government for off-site response. The next revision of these plans will reflect the requirements of GSR Part 7
- ANM – ANSTO Nuclear Medicine. These plans refer to the on-site response and are in alignment with GSR Part 7
- spent fuel transport operations.

Specific regulation and guidance

The draft *Guide for Radiation Protection in Emergency Exposure Situations*, RPS G-3, which is planned for publication by the end of 2018 has been developed to implement the requirements of GSR Part 7 and provides advice on:

- a National Hazard Assessment for all jurisdictions (part 1, section 2.4) as well as the requirement for performing a hazard assessment (part 1 with further details in part 1, sections 3.1 and 3.1.18 to 3.1.26)
- emergency plans that are based upon the outcomes of the hazard assessment and the graded approach (part 2, planning and preparedness)
- declaration of a nuclear or radiological emergency (part 3, section 3.1). This includes application of the graded approach, further advice on response time objectives, the beginning of the emergency response, including initiation of on-site response
- planning of emergency zones (see part 2, section 3.3)
- protective measures, including urgent protective actions (part 3, section 3.2.2)
- measures to protect emergency workers and helpers (part 3, section 3.2.3)
- the mitigating actions for on-site and off-site response (part 3, section 3.1 and 3.2), including a General Emergency, a Site Area Emergency, a Facility Emergency or an Alert
- protective measures, including urgent protective actions (part 3, section 3.2.2)
- communication of the response organisations that are providing support, including off-site notification point, to ensure suitable, reliable communication using diverse means
- measures to protect emergency workers and helpers are specifically considered (part 3, section 3.2.3)
- communication with the public (part 1, 3.2.69 to 3.2.75 and part 3, section 8)
- waste management (part 1, 3.2.84 to 3.2.88)
- transition (section 4) and termination (section 5)
- development of capability to effectively respond in an emergency (part 1, 3.3.16 to 3.3.21) including training, drills and exercises (see part 1, 3.3.28 to 3.3.33)
- management of documentations (see part 1, 3.3.34 to 3.3.39).

For Commonwealth licence holders, these requirements are expanded in section 7 of the regulatory guide plans and arrangements for managing safety. This includes detailed requirements for:

- emergency plans for any conduct or dealing that could give rise to a need for emergency intervention. The plan, based on an assessment of the consequences of reasonably foreseeable accidents or incidents, should aim to minimise the consequences and ensure the protection of on-site personnel, the public and the environment
- comprehensive emergency procedures, to be prepared in accordance with the objectives of the emergency plan for any conduct or dealing which could give rise to the need for emergency intervention
- emergency preparedness arrangements, including ensuring that all organisations identified in the emergency plan are prepared for such emergencies, including that adequate facilities and equipment are available and maintained.

While the Regulatory Guide *Plans and Arrangements for Managing Safety* includes the key elements described above, it currently refers to RPS 7 rather than RPS G-3 which has not yet been formally adopted and published. Following publication of RPS G-3, the guide will be revised to include RPS G-3 including:

- expectation of response time objectives and emergency action levels in operator plans (extent depends on hazard)
- general, site area, facility and alert levels of classification
- requirement for redundancy/diversity in off-site communications in the Plans and Arrangements Guide
- consideration of waste generated in an emergency.

Whilst this advice is in place, and is consistent with RPS-7, the application of protective measures for workers is inconsistent throughout Australia. In some states, emergency workers are treated as members of the public with regard to dose limits. This inconsistency was identified as an area for priority action in the recommendations (for radiation emergencies) from the Joint External Evaluation (JEE) of International Health Regulation Core Capacities of Australia undertaken in November 2017.

Australia in general terms has a comprehensive system in place for communication with the public in emergencies, across Commonwealth, state and territory governments and this was confirmed in Australia's JEE Mission Report. However the public continues to seek information from more sources, particularly social media. Many emergency response agencies, have social media strategies that have been effectively implemented during events such as tropical cyclones (QLD), there is inconsistent or slow adoption of social media in some parts of government, where a preference for more traditional media prevails.

In the case of radiological emergencies in Australia, there are formal elevation procedures that ARPANSA must follow for communications from the Commonwealth (by traditional means) there is currently no procedure in place to implement fast social media messaging. However, the JEE Mission report also recommended three areas for priority action in Australia, these are:

- *implement a risk communication training programme for communications staff, emergency response employees, senior management decisions-makers and other relevant staff to establish a common understanding and expertise*
- *develop guidance for the strategic use of social media in emergencies that includes protocols for coordination among jurisdictions, sectors and stakeholders*

- *establish a mechanism that monitors community engagement activities across jurisdictions and shares lessons learned to inform risk communication planning and message development in emergencies.*

ARPANSA is now working closely with the Commonwealth Department of Health who have the lead on developing and implementing National Action Plan for Health Security to address the JEE report recommendations, including the three Risk Communication recommendations above.

10.3 Verifying the adequacy of on-site EPR of operating organisations

Related to GSR Part 7: Requirements 2 and 25, GSR Part 1 (Rev. 1): Requirements 26-31

ARPANSA verifies compliance of on-site arrangements through a variety of means, which are documented below

Review and assessment of documentation elaborating operator's emergency arrangements during licensing process

The operator's emergency plan is specifically required by the ARPANS Regulations, in Schedule 3 part 1. For more information on this process, see section 6 on review and assessment.

IAEA GSR Part 7 forms the high-level basis for reviewing the appropriateness of the EPR Plans. The inspection Performance Objectives and Criteria (PO&C) are also used to assess the effectiveness of EPR Plans. During review and assessment international best practice, such as specific details in guides such as IAEA GSG 2.1 are also used by the regulator to review a plans adequacy.

Examples include:

- OPAL reactor licensing, the emergency plan was reviewed against international standards (note IAEA GSR2 and IAEA GSR Part 7 were not published at that time [2004])
- ANSTO Nuclear Medicine (ANM) facility application, both onsite and off-site response plans were reviewed, which resulted in ANSTO revising the plan taking into account the (draft) Emergency Exposure Guide and for consistency against GSR Part 7.

In the case of the OPAL reactor, the emergency and preparedness review is scheduled biennially. However, due to the reactor sharing the site with other facilities, segments of the site EPR arrangements are inspected more often under those facility inspection programs. The review assures that the external organisations as well as internal service providers are involved in exercises so the coordination interfaces are well developed.

Inspections of EPR arrangements of operator

EPR is periodically inspected for all licences with a graded approach applied (see section 6 for more information on the inspection process). Inspectors examine the EPR plans and arrangements periodically according to the inspection schedule. In line with a graded approach, the OPAL reactor EPR arrangements are examined at two-year intervals. In addition to the scheduled inspections, augmented inspections may be carried out if there is the potential that the EPR performance or effectiveness has been diminished. The inspection is performed against the PO&C, which has been developed based on international standards and guides.

PO&C - BM8 – Emergency preparedness and response: This module addresses the anticipation of hazards and threats, the assessment of consequences and the preparation of appropriate systems and measures to ensure an effective, timely, integrated, controlled and coordinated response to a nuclear or radiological emergency. It includes exercises and drills, emergency response organisation testing, and notification testing.

For high consequence facilities (including nuclear installations), ARPANSA's licencing regime covers siting, construction, operation and decommissioning. Hot/cold commissioning, which is normally staged e.g. through conditions of licence, is usually the stage where ARPANSA observes or assesses the results of emergency tests.

Enforcement actions are taken in accordance with section 8.

Evaluating emergency response exercises conducted by operator

ARPANSA observes exercises by the operator on a regular basis. Every exercise that ARPANSA observes is evaluated and recorded, such as through a site visit report. However, not all are evaluated against a formal set of criteria. Evaluation may include considering outcomes against international best practice and the objectives of the exercise. ARPANSA records actions arising from the exercises and ensures that the operator appropriately raises and enters these into their action tracking system. ARPANSA typically monitors the implementation of the actions through inspections, site visits and meetings as applicable.

Integration of requirements

ARPANSA gives guidance to licence holders on the integration of safety and security in the Regulatory Guide Plans and Arrangements for Managing Safety. Other guidance on security and safety interfaces, including integration of security terms such as 'Unacceptable Radiological Consequences', is provided in the Emergency Exposure Guide. This has recently been applied in the licensing process for the ANM facility.

Security and safety are considered in the review and assessment of the operator's EPR plans, using the PO&C during inspection, and during the Periodic Safety and Security Review (PSSR), which also requires integration with onsite and offsite organisations. Integration of safety and security plans and arrangements (contingency plans) are reviewed in parallel with EPR plans to ensure integration.

The EPR considerations for nuclear installations are a key focus area for ARPANSA. However, ARPANSA also considers EPR for radioactive material and other sources. This can have national significance such as the coordination between jurisdictions for transportation of radioactive materials. Nationally, requirements on the transportation of materials and the associated EPR is detailed in the *Code for Safe Transport of Radioactive Material* (RPS C-2; based upon IAEA SSR-6), and the *Code of Practice - Security of Radioactive Sources* (RPS 11) for security enhanced sources. More information can be found on the ARPANSA website.

10.4 Roles of the regulatory body in a nuclear or radiological emergency

Related to GSR Part 7: Requirements 2, 20-26, GSR Part 1 (Rev. 1): Requirements 3 and 8

As outlined in section 10.1, activation of any plan within the Australian Government Crisis Management Framework can involve a large number of stakeholders and in a nuclear or radiological emergency the role of the agencies is based on the scenario. These arrangements are captured in local jurisdictional emergency plans. For example, the Queensland state disaster management plan and Radiological disaster plan clearly define roles of the regulator during an emergency and how interactions with other parties is managed. For radiological emergencies in Queensland (such as an event involving a nuclear powered warship visit to the Port of Brisbane), Queensland Health will be the lead agency while the Queensland Fire and Rescue Service's Fire Controller, in liaison with Queensland Health, will be responsible for the identification and establishment of hazardous material safe operating zones.

ARPANSA's functions

ARPANSA administers the conventions on Early Notification of a Nuclear Accident and Assistance in the case of a Nuclear Accident or Radiological Emergency (ENAC). As the National Competent Authority and Commonwealth Regulator the role of ARPANSA domestically would depend on the type of emergency and which emergency plan is activated.

In the event of a radiological or nuclear incident, as described in section 10.1, ARPANSA may be involved in a range of actions:

	**Release Scenario** • Collection and analysis and assessment of simulated and actual data to aid: o early: implement urgent protective actions o intermediate: restriction of food stuff and dose reconstruction o long-term: ongoing monitoring.
	**Lost/stolen or orphan source (search)** • wide area mapping • localised search and survey • unknown container assessments
	**National strategic or special event** • room searches • venue clearance • choke point detection

Figure 15. ARPANSA's functions in different scenarios

ARPANSA adopts an evidence-based and risk-informed approach to decisions and advice. To achieve this, ARPANSA performs technical analysis and consequence modelling, assesses the exposure pathways from accidents, recommends protective actions and advises on potential health consequences.

ARPANSA primarily provides support to each State and Territory government's relevant regulatory body that holds primary responsibility under the relevant State or Territory legislation. ARPANSA support may be in the form of liaison officers or technical products provided by electronic means. Elevated response may be requested by States or Territories. Examples of ARPANSA's response for various domestic incidents include:

- the response to a missing well-logging source in WA 2006, where ARPANSA provided a search team to assist the authorised officers of the Radiological Council in the search
- search team provided support of the Victorian Department of Health and Human Services in 2008 to search a scrap yard for two sources improperly disposed of by a state licence holder
- search teams deployed to support Special Events such as the Commonwealth Games and meetings of the G20.

As the ENAC designated National Competent Authority, ARPANSA is notified of radiological or nuclear emergencies though the Australian Government Crisis Coordination Centre (CCC), operated by the department of Home Affairs. The CCC is a 24/7 staffed facility that provides situational awareness for all of the Commonwealth on any hazard. The CCC acts as the 'National Warning Point' to receive, and coordinate the further distribution of emergency notifications from the Incident and Emergency Centre (IEC) at the IAEA. While ARPANSA's duty officer will also receive direct notifications from the IAEA in the event of a radiological or nuclear emergency, our duty officer is a 24/7 on-call arrangement. The CCC will contact the duty officer to ensure notifications are received from the IAEA. In addition to IAEA alerts, the CCC will also provide updates on terrorist events and natural disasters such as earthquakes or tsunamis that may lead to a nuclear emergency.

In the case of an international radiological or nuclear emergency ARPANSA would be the primary source of advice to the Australian Government, but would not be the lead agency. An example of this situation was the response provided in relation to the Fukushima Daiichi nuclear accident and radiological release in 2011, where modelling and radiation protection advice were provided to the Commonwealth Government and Australians abroad. ARPANSA coordinated closely with both the Department of Foreign Affairs and Trade and the Department of Health in this situation.

ARPANSA also hosts a World Health Organisation (WHO) Collaborating Centre for Radiation Protection, and is a member of the WHO's Radiation Emergency Medical Preparedness and Assistance Network.

As noted earlier, for visits to Australian ports by nuclear powered warships (NPW), an inter-departmental committee, the Visiting Ships Panel (Nuclear) (VSP(N)) oversees the arrangements. VSP(N) involves a number of agencies at the State/Territory and Commonwealth level including the Commonwealth Departments of Defence, Department of Health, ARPANSA, ANSTO and Emergency Management Australia. Specific roles and responsibilities relating to visits from Nuclear Powered Warships, including monitoring, are detailed in the Naval Operations Manual OPSMAN1, and the port specific safety plans, which vary according to the jurisdiction responsible for the port. ARPANSA provides OSL monitors and analyses marine samples. In the event of a NPW accident, ARPANSA would provide additional teams and the Commonwealth Technical Advisor to support the State response through the COMDISPLAN.

ARPANSA is also in the process of establishing a memorandum of understanding (MoU) with the Australian Maritime Safety Authority (AMSA) who are responsible for the day-to-day management of the Arrangements outlined in the National Plan for Maritime Environmental Emergencies (NPMEE). While this plan makes no specific mention of radiological or nuclear emergencies, AMSA is supportive of establishing an MoU with ARPANSA in order to conduct joint exercises and training, and understand how ARPANSA's assistance could be requested via COMDISPLAN and interface with the NMPEE in a radiological or nuclear emergency. This MoU will be drafted before the end of 2018.

ARPANSA also takes part in table top emergency exercises, which combine Safety and Security, including those associated with the Global Initiative to Combat Nuclear Terrorism (http://www.gicnt.org/) and Australian Crisis Coordination Centre.

Coordination and integration of emergency arrangements is tested through emergency exercises. An example of this is Exercise Pacific Protector 2017, involving the Australian Border Force, ARPANSA, ANSTO, Royal Australian Navy and other Commonwealth and international participants.

ARPANSA's capability and resourcing

ARPANSA has established a Radiation Emergency Coordination Centre in Melbourne, which provides 24 hour access to expert radiation protection advice in the event of a radiological or nuclear incident. This service is utilised when receiving a request for international assistance (such as through the IAEA's Response and Assistance Network), or at the request of Commonwealth Licence holders and jurisdictional regulators. ARPANSA's dedicated EPR staff are recruited to fulfil specialist roles, and have been assessed on their capacity to perform during an emergency. Each of the three positions within the EPR Group are allocated a position description aligned to the EPR Program brief and broader Branch and section programs. While other staff within ARPANSA do not currently have EPR expertise identified in their roles, ARPANSA can draw on all staff during emergencies. Staff expertise include nuclear physics, nuclear engineering, environment monitoring, mathematics and chemistry.

ARPANSA maintains equipment and expertise to operate as an integrated capability that will provide the measurement and analysis requirements for all postulated radiological and nuclear emergencies within Australia, and abroad. Specialised radiation monitoring capability supports the assessment of radiation levels and the extent of radioactive contamination in the event of a radioactive release from a nuclear or radiological emergency. These capabilities include:

- gamma and neutron search
- health physics survey
- portable radio-isotope identification devices
- portable high purity germanium gamma spectroscopy
- low and high volume air sampling
- general environmental sampling.

The capabilities and roles of these teams are consistent with the requirements of the IAEA Response Assistance Network (RANET) capabilities.

ARPANSA also maintains laboratory-based facilities for the detailed analysis of environmental samples and for the measurement of radioactivity in contaminated people, and has in recent years established the Australasian Radioanalytical Laboratory Network (ARLN). The ARLN aims to strengthen capacity and

capability within Australia and New Zealand for the testing of radioactivity in food and environmental samples. This need is particularly important in the event of a radiological or nuclear emergency when potentially many samples will require analysis and laboratories may be overwhelmed.

10.5 Conclusions and actions

The Commonwealth, States and Territories have an established an effective framework for responding to radiological and nuclear emergencies. Roles and responsibilities are clearly articulated within the Australian Government Crisis Management Framework and are underpinned by legislation within jurisdictions and a range of supporting plans. Processes for coordination between Commonwealth departments and agencies at all levels of government are in place with the key outcome always focussed on the protection of life, property and the environment.

ARPANSA has a proven track record of providing high quality advice as the competent authority on emergency preparedness and response to radiological and nuclear events, for example during the response to the nuclear accident after the Great East-Japan Earthquake and Tsunami in 2011.

As an outcome of our learnings from the Fukushima accident and other subsequent exercises ARPANSA has implemented a range of initiatives, including the implementation of the Australasian Radio-analytical Laboratory Network (ARLN). The ARLN has been established in order to maintain critical capabilities, and to address vulnerabilities in the system of EPR in Australia. There are also other actions that ARPANSA has initiated but not yet completed such as the development of the Automated Radiation Monitoring System and establishment of a Memorandum of Understanding with the Australian Maritime Safety Authority.

The new national guide, RPS G-3, is in an advanced stage of drafting to enhance compliance to emergency preparedness requirements in GSR Part 7. While the ARPANSA Plans and Arrangements Guide includes the key elements described above, it currently refers to RPS 7 rather than RPS G-3, which has not yet been formally adopted and published.

- Following publication of RPS G-3 the Plans and Arrangements Guide will need to be revised (see Action Plan item 15**Error! Reference source not found.**) to incorporate aspects of RPS G-3, including:
    - expectation of response time objectives and emergency action levels in operator plans (extent depends on hazard)
    - general, site area, facility and alert levels of classification.
    - requirement for redundancy/diversity in off-site communications in the Plans and Arrangements Guide
    - consideration of waste generated in an emergency.

The plans and arrangements for nuclear powered warship visits will also need to be reviewed following the release of RPS G-3. Following the publication of RPS G-3 and subsequent implementation of this guidance there will be a need for ARPANSA to consider how effectively these new aspects are implemented and addressed by the operating organisations. It is foreseen that this would be done as part of emergency exercise evaluations. Currently, there is no formal methodology or criteria developed that would assist the inspectors during an exercise evaluation. This may be an area of work for ARPANSA to consider prior to the implementation of RPS G-3.

More broadly ARPANSA is also involved in developing the Action Plan that the Commonwealth, State and Territory governments are currently in the process of finalising to address the WHO JEE Mission recommendations (i.e. Australia's National Action Plan for Health Security (NAPHS)). Within the NAPHS ARPANSA has been identified as the lead agency for addressing the recommendations identified for the radiation emergencies core competencies. The three recommendations are:

- *enhance the interoperability of Federal and state/territory radiation operations through broad multisectoral/multijurisdictional exercises*
- *develop federal guidance for jurisdictional first responder occupational exposures*
- *conduct a national hazard assessment, to include creating an inventory of radiation sources, and establish a national radiation capability register.*

Some of the work towards addressing these recommendations will be achieved with the publication of RPS G-3, however the longer term implementation of RPS G-3 will present a significant body of work and ARPANSA will need to work cooperatively with the Radiation Health Committee (RHC) and other stakeholders to achieve these outcomes.

The third of these recommendations provides a more significant challenge for ARPANSA following the RHC decision in 2016 to abandon the previous National Sealed Source Register. In 2017 Australia received a follow up IAEA International Physical Protection Advisory Service (IPPAS) Mission and the IPPAS team challenged the RHC decision and evaluated that the network of jurisdictional registers that remains does not align to the expectations of the Code of Conduct on the Safety and Security of Radioactive Sources. The IPPAS Mission recommended that Australia should establish a national register to improve arrangements for an accurate and real-time national radioactive source register. ARPANSA will continue to work with the RHC and other stakeholders to improve arrangements for accurate storage and retrieval of information on sources by building on existing arrangements, reiterating the benefits of such a register and strengthening the linkage between safety and security and threat prevention.

ARPANSA will also be a stakeholder in implementing a number of other JEE recommendations including:

- *consider simultaneous reporting to states and territories and IHR NFP from national reference laboratories, chemical sector and radiation sector for urgent and high risk hazards (Core competency: National Legislation, Policy and Financing)*
- *enhance the existing public health exercise program to address all IHR-relevant hazards and to integrate multisectoral and multijurisdictional elements (Core competency: Emergency Response Operations)*
- *use existing data sources, including relevant accreditation schemes, to define the public health workforce for conducting forward planning, recruitment of appropriate categories of staff (including toxicology and radiation specialists) and development of future credentialing schemes (Core competency: Workforce Development)*
- *work with states and territories to ensure sustainable mechanisms for epidemiologists and other public health professionals at state, territory and local level (Core competency: Workforce Development)*
- *ensure public health emergency response plans at multiple levels and multiple sectors are linked appropriately and efficiently to facilitate a coordinated response across the country and across the agencies (Core competency: Preparedness)*

- *implement a risk communication training programme for communications staff, emergency response employees, senior management decisions-makers and other relevant staff to establish a common understanding and expertise (Core competency: Risk Communication)*
- *develop guidance for the strategic use of social media in emergencies that includes protocols for coordination among jurisdictions, sectors and stakeholders (Core competency: Risk Communication)*
- *establish a mechanism that monitors community engagement activities across jurisdictions and shares lessons learned to inform risk communication planning and message development in emergencies (Core competency: Risk Communication).*

*Establish clear mechanisms for coordinating regular information sharing and joint risk assessments across health and security agencies at the Australian Government, state and territory levels. (Core competency: Linking Public Health and Security Authorities)*Australia's NAPHS to address the JEE recommendations will be implemented on a priority basis over the next five years.

- An identified action is to continue the implementation of the recommendation from the JEE. This is captured in the Action Plan, item 16.

11. Additional areas

This section includes responses from most Australian jurisdictions on medical exposure (11.1).

The sections on occupational exposure (11.2), and 'discharges, materials for clearance, and existing exposure situations; environmental monitoring for public radiation protection' (11.3) relates to the Commonwealth regulator, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

11.1 Control of medical exposures

Related to GSR Part 3, Requirements 34-42, paragraphs 3.145-3.185

ARPANSA has published *the Code of Practice for Radiation Protection in the Medical Applications of Ionising Radiation 2008* (RPS 14) and the *Code of Practice for the Exposure of Humans to Ionising Radiation for Research Purposes 2008* (RPS 8). The Codes were developed in collaboration with the States and Territories under the auspices of the Radiation Health Committee (RHC). These Codes are supported by four guidance documents:

- Recommendations for the Discharge of Patients Undergoing Treatment with Radioactive Substances (2002) RPS 4
- Safety Guide for Radiation Protection in Diagnostic and Interventional Radiology 2008 (RPS 14.1)
- Safety Guide for Radiation Protection in Nuclear Medicine 2008 (RPS 14.2)
- Safety Guide for Radiation Protection in Radiotherapy 2008 (RPS 14.3).

Additionally ARPANSA has published two practice specific codes; the *Code of Practice and Safety Guide for Radiation Protection in Dentistry 2005* (RPS 10) and the *Code of Practice for Radiation Protection in the Application of Ionizing Radiation by Chiropractors 2009* (RPS 19).

The requirements for dental imaging facilities, clinicians and other staff in RPS 10 are similar to the requirements in RPS 14 for diagnostic imaging. RPS 10 also outlines responsibilities for referrers and for persons supplying, installing and servicing equipment. RPS 10 includes equipment compliance standards, requirements for film handling and processing, and procedural requirements for radiation safety.

RPS 19 is an abbreviated version of RPS 14 with the requirements relating to radiotherapy and nuclear medicine removed and some terminology altered to reflect chiropractic practice.

All of these codes and guidance documents were developed and approved by the RHC, which includes representation from all jurisdictions. In 2018, the RHC is revising RPS 14 to achieved better alignment to GSR Part 3 (see below on draft RPS C-5).

RPS 14 contains many of the technical requirements which are applied within the jurisdictional regulatory frameworks. The Commonwealth, Queensland, TAS, VIC, NSW and the ACT all adopt a requirement to adhere to RPS 14 as a condition of licences allowing for medical use or possession. South Australia and Western Australia have specific requirements within the local regulations which are broadly consistent with these requirements, except where noted below.

RPS 14 section 3 clearly defines the roles and responsibilities for the responsible person, medical practitioners, operators (medical radiation technologists) and qualified experts (medical physicists) in relation to the safety of individuals undergoing medical treatment or research.

All jurisdictions, other than ARPANSA, assess qualifications, training or experience required for users, including medical radiation practitioners, physicists and radiologists, to deal with medical sources via separate authorisations (use licences). For example, NSW publishes the competence requirements on their website. ARPANSA only regulates a small number of medical sources, and has generic requirements that the licence holder ensure staff are adequately trained and experienced. Additionally, the Australian Health Practitioner Regulatory Agency (AHPRA) protects titles of occupations including medical radiation practitioner, diagnostic radiographer, medical imaging technologist, radiographer, nuclear medicine scientist, nuclear medicine technologist, and radiation therapist. To use a protected title a person must be registered with AHPRA, which involves demonstrating relevant qualifications or competence.

The radiation protection principles of justification, optimisation and limitation are captured in section 2 of RPS14. Medical exposure must be justified and optimised in accordance with specific requirements in the Code. In general, the Code requires a medical radiation procedure to be justified (section 3.1.3) and approved (section 3.1.15), including through referrals. Section 3.2.1c states that a radiation medical practitioner who approves a procedure involving the exposure of a patient to ionising radiation must ensure that the radiation exposures are justified (section 3.2.2) and optimised (section 3.2.5).

RPS 14 (section 3.2.2) defines what the radiation medical practitioner must take into account in determining the net benefit of a medical radiation procedure. RPS 14 allows for procedures to be generically justified by a radiation medical practitioner or by an acknowledged professional college or authority. However, Australia does not have national referral guidelines, or national requirements on the role of the referring medical practitioner. The term 'referrer' is defined in RPS14 to include 'medical practitioner, dentist or other health professional who is entitled to refer individuals to the radiation medical practitioner' but no specific responsibilities or qualifications are outlined as referrers are not licenced by the radiation regulatory bodies. To assist referring medical practitioners in determining the appropriate examination, programs such as Diagnostic Imaging Pathways (DIP), which is widely rolled out in WA, may be used. ARPANSA provides an online short educational module on radiation protection of the patient, targeted at general practitioners to raise awareness of the risks and benefits of medical imaging. This ensures that participating practitioners have been trained in the risk/benefit analysis required for justification. Some jurisdictions, such as Queensland, define which radiation medical practitioners are authorised to request a diagnostic procedure or prescribe a therapeutic procedure.

To assist in the optimisation of patient protection while achieving the desired diagnostic outcome, RPS 14 (section 3.1.8) requires a licence holder to develop a program to compare their patient dose metrics against any established national Diagnostic Reference Levels (DRLs). ARPANSA establishes the national DRLs and maintains a program to allow institutions to submit data for comparison to the DRLs for multi-detector computed tomography and for nuclear medicine. DRLs for additional modalities are planned to be rolled out in the future.

Compliance programs under which an accredited third party tests equipment are a regulatory requirement in all States and Territories. Information is provided on relevant regulators' websites, for example Victoria. Satisfactory compliance test results are either linked to the authorisation requirements or required under licence conditions. Standards are set by the relevant jurisdiction regulatory body, based either on Australian standards, national codes, professional body standards (such as the radiation oncology practice standards), or international guidance. While compliance tests before use are mandated across Australia, the frequency of any periodic tests as well as the scope of the tests varies significantly between jurisdictions. This is further discussed in section 13 of this Summary Report, on national uniformity.

For radiation oncology, a national independent dosimetry program, the Australian Clinical Dosimetry Service (ACDS), was established by ARPANSA under a Memorandum of Understanding with the Department of Health (Commonwealth), and with departmental funding. The ACDS is an ISO 17025 accredited audit service which offers dosimetry audits to meet Australian Radiation Oncology Practice standards, Australian Government funding conditions, and jurisdictional radiation licence requirements. It is now operated by ARPANSA on a fee-for service basis and covers well over 90% of the linear accelerators (linacs) used in Australia.

RPS 14 (section 3.2.2e) requires that in determining the net benefit from a medical radiation procedure, the radiation medical practitioner must take into account the pregnancy status of a female patient of child bearing capacity. RPS 14 (section 3.2.2f) requires that the radiation medical practitioner must take into account the breast-feeding status of a female patient to be administered a radiopharmaceutical if there is the potential for a radiation dose of more than 1 mSv to a breast-fed child.

The radiation medical practitioner (RPS 14 section 3.2.7) must ensure that, where a radiation procedure is likely to result in a radiation dose of more than 1 mSv to an embryo or fetus, reasonable steps are taken immediately before the commencement of the procedure to establish whether the patient is pregnant. For a therapeutic nuclear medicine administration, the pregnancy status of a patient of childbearing capacity must be established with a definitive biochemical test within 24 hours before the commencement of the treatment. Where a pregnancy has been established, the expected dose to the fetus must be estimated and the risks and benefits explained before a procedure takes place (RPS 14 schedule B).

The radiation medical practitioner must take reasonable measures to ensure that any exposure of children is eliminated or minimised when a radiopharmaceutical is administered to a breast-feeding patient (RPS14 section 3.2.9), or a therapeutic radiopharmaceutical is administered to a patient who is providing close care of a child (RPS14 section 3.2.10).

For patient discharged while undergoing treatment with a radioactive implant, or with a therapeutic quantity of radiopharmaceutical, the radiation medical practitioner must, under RPS 14 (section 3.2.6), ensure that the patient, carer or the patient's legal guardian is, before leaving, provided with written information and instructions that address:

a) the risks associated with ionizing radiation exposure to carers and other persons
b) how to restrict exposures to carers and other persons that could result from proximity to the patient, if relevant
c) storage or disposal of any dislodged radioactive sources, if relevant
d) prevention of contamination, if relevant.

Additionally, RPS 4 on *Discharge of Patients Undergoing Treatment with Radioactive Substances* contains specific information related to radiation protection for people interacting with discharged patients. Dose constraints for carers of patients are provided in section 2.1 of RPS 4. All jurisdictions, with the exception of SA, refer to the use of RPS 4 for guidance on dose constraints of carers. SA refers to dose constraints that are specified in an organisation's approved radiation management plan.

All jurisdictions in Australia require, through their legislation or licence conditions, to ensure that all practical measures are taken to minimise the likelihood of an incident, and must report, investigate and implement appropriate controls for any incidents that do occur. Certain incidents are reported to the Australian Radiation Incident Register (ARIR), which is maintained by ARPANSA. The National Directory for Radiation Protection Schedule 13 captures this agreement and provides details on the national incident-reporting framework and defines the type of incidents that requires reporting to the ARIR. Legislation in each jurisdiction requires notification of radiation incidents to the regulatory body, who passes this information on to ARPANSA where relevant.

RPS 14 outlines responsibilities relating to equipment failures and for the investigation and reporting of incidents in sections 3.1.11-3.1.12 and 3.3.10-3.3.11.

In regard to the review of plans, RPS 14 requires the development, documentation, and review of a Radiation Management Plan that addresses work practices and arrangements for protection and safety. Specifically under section 3.1.1 the organisation must ensure that:

a) a Radiation Management Plan that incorporates the components listed in section A1 of Schedule A of RPS 14 is developed, documented, resourced, implemented and regularly reviewed

b) the Radiation Management Plan describes the management and reporting arrangements that enable the radiation medical practitioner and the operator to discharge their obligations under RPS 14

c) all persons affected by the Radiation Management Plan follow and comply with the Radiation Management Plan.

Jurisdictions may have specific requirements for the frequency of review. For example, under Regulation 50 ARPANSA requires reviews to be carried out every three years.

RPS 14 requires records be kept, including the following:

- radiation doses associated with types of medical procedures (3.1.7)
- radiation doses associated with occupational exposure (3.1.9c)
- radiation incidents (3.1.12)
- radiation shielding (3.1.17)
- records of the work performed on radiation producing equipment or equipment containing radioactive source(s) following any repair, maintenance or modification on that equipment (3.1.30)
- equipment faults and corrective maintenance performed (3.1.31b)
- estimates of the expected radiation dose to an embryo or fetus (B1.3).

Revision of RPS 14, draft Code for Radiation Protection in Medical Exposure (RPS C-5)

ARPANSA and the RHC have recently released a public consultation draft of the new *Code for Radiation Protection in Medical Exposure* (RPS C-5). It was released for public comment on 23 February 2018. At the time of preparation of this Summary Report, work was ongoing to resolve the 430 comments received during consultation.

It is expected that RPS C-5 will further enhance the alignment with the requirements of GSR Part 3 and contains explicit references to that document.

RPS C-5 is intended to cover medical exposures involving ionising radiation, including exposure to carers and comforters and to volunteers in medical research, and also including intended, unintended and accidental exposures. It will not apply to dentistry or to chiropractors, where the existing practice-specific codes will continue to apply.

Major changes introduced in RPS C-5 include: requirements to inform the patient, or their legal authorised representative, of the benefits and risks of an intended radiological procedure; including the referrer in the justification process; requiring the use of relevant referral guidelines in justification; extending equipment calibration requirements to all medical uses, not just radiotherapy; changing terminology from qualified expert to medical physicist; and explicitly requiring radiological reviews. Appendix 1 of RPS C-5 indicates the links between the clauses in the code and GSR Part 3.

11.2 Occupational radiation protection

Related to GSR Part 3, Requirements 19-28, paragraphs 3.68 to 3.116, and Requirements 45, paragraphs 4.12-4.19

The structure of authorisations, including licensing and registration, is discussed in section 5 of this report. In general, no person may deal with radiation unless authorised to do so (e.g. in a licence) or an exemption has been granted under the relevant jurisdiction legislation. The responsible person is responsible for safety and has responsibilities that cannot be delegated. In addition, in most jurisdictions, individual sources must be registered with the regulatory body.

ARPANSA published the *Code for Radiation Protection in Planned Exposure Situations*2016 (RPS C-1) in the Radiation Protection Series of publications. This document, along with the Fundamentals for Protection against Ionising Radiation 2014 (RPS F-1), comprise Australia's occupational radiation protection standards. These currently apply to all Commonwealth bodies and they have been agreed to be adopted into the *National Directory for Radiation Protection (NDRP)*. The national adoption of RPS C-1 is still pending and jurisdictions are still in the process of adjusting to the new Code, e.g. as a condition of licence. ARPANSA has implemented RPS C-1 as a condition of licence through the ARPANS Regulations, effective July 2017.

RPS C-1 contains detailed requirements including roles and responsibilities, dose assessment, monitoring and training. For example, section 3.1.24 (b) requires the responsible person to provide a copy of dose records of an occupationally exposed person to that person periodically, on request and on termination of employment. Compliance by workers in section 3.2.3 (f) on employment, provide to the responsible person, or assist the responsible person, to obtain details of their prior occupational radiation exposure, as necessary.

IAEA GSR Part 3 requirement	RPS C-1 section	
Requirement 1	Application of the principles of radiation protection	3.1.2
Requirement 4	Application of the principles of radiation protection, Radiation Management Plan, Information, instruction and training	3.1.1, 3.1.4, 3.1.6, 3.1.8, 3.1.14, 3.2.9
Requirement 5	Radiation Management Plan, Management for protection and safety	3.1.5, 3.1.9-3.1.10
Requirement 7	Management for protection and safety	3.1.11
Requirement 9	Optimisation of protection and safety, Record keeping, Information, instruction and training	3.1.12, 3.1.20-3.1.21, 3.2.10
Requirement 11	Optimisation of protection and safety	3.1.13-3.1.14
Requirement 12	Dose limits	3.1.2(c) and (d)
Requirement 13	Safety assessment	3.1.17-3.1.19
Requirement 14	Record keeping	3.1.22-3.1.23
Requirement 15	Prevention and mitigation of accidents	3.1.15
Requirement 16	Prevention and mitigation of accidents	3.1.16
Requirement 17	Radiation generators and radioactive sources	3.1.25
Requirement 18	Human imaging using radiation for purposes other than medical diagnosis, medical treatment or biomedical research	3.1.26
Requirement 21	Responsibilities of the Responsible Person for the protection of workers	3.2.1-3.2.2
Requirement 22	Compliance by workers	3.2.3
Requirement 23	Cooperation between Responsible Persons	3.2.4
Requirement 24	Application of the principles of radiation protection, Radiation Management Plan	3.1.3, 3.1.7
Requirement 25	Assessment of occupational exposure and workers' health, Record keeping	3.1.24, 3.2.5-3.2.6
Requirement 26	Information, instruction and training	3.2.7-3.2.8, 3.2.10
Requirement 27	Conditions of service	3.2.11
Requirement 28	Special arrangements for protection and safety for female workers and for persons under 16 years of age	3.2.12-3.2.13
Requirement 31	Radioactive waste and discharges	3.3.1-3.3.2
Requirement 32	Monitoring and reporting	3.3.3

Table 10. Comparison of GSR Part 3 and RPS C-1 as provided in the appendix of RPS C-1

In addition to radiation safety requirements, each jurisdiction in Australian has their own workplace health and safety (WHS) legislation. Safework Australia developed Model WHS laws, which have been adopted in all jurisdictions. These requirements include consultation with workers for safety matters, review of control measures, and establishment of safety policies and procedures.

These requirements align well with the radiation safety requirements and provide specific responsibilities. For example:

- the WHS Act (part 2 division 4 section 28 Duties of Workers) states that while at work, a worker must take reasonable care for his or her own health and safety and take reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons

- the RPS C-1, (section 3.2.3: Compliance by Workers) states that the Responsible Person must ensure that each occupationally exposed person in their employ complies, to the extent that the occupationally exposed person is capable, with all reasonable measures to control and assess exposure to radiation in the workplace.

Health surveillance is not specifically required for personnel occupationally exposed to ionising radiation in Australia, with the exception of South Australia. There is a general requirement in the WHS Regulations (Commonwealth, 2016), Chapter 3 Part 3.1, for an employer to identify hazards and manage them using the hierarchy of controls. Health surveillance can form a part of the mitigating controls for a hazard if the risk is considered significant for the employer. IAEA draft document DS 453 details requirement health surveillance of occupational exposed workers and ARPANSA will consider incorporating the requirements of this document once published.

ARPANSA operates and maintains the Australian National Radiation Dose Register (ANRDR). Initially established for the uranium industry in 2010 the ANRDR has been expanded to cover other organisations and industries. In July 2017 the implementation of RPS C-1 saw the submission of dose records to the ANRDR from Commonwealth licence holders become a licence condition. ARPANSA has also recently been engaging with the medical sector in Australia for their submission of dose records to the ANRDR with one major hospital having started submissions. Currently the ANRDR holds dose records for over 44 000 individuals.

Given the multi-jurisdictional nature of Australia ARPANSA continues to work with jurisdictional regulators to encourage them to implement RPS C-1 and make the submission of dose records from their licence holders to the ANRDR a licence condition.

ARPANSA is working to ensure that the ANRDR meets the needs of all stakeholders so that it can be a useful tool for jurisdictional regulators, submitting organisations and workers. The provision of ANRDR access to jurisdictional regulators is intended to allow them to review dose records for organisations submitting within their jurisdiction to compare industry, workgroup or individual exposures with national averages and maximums. Changes to the current organisational access is proposed to ensure that the ANRDR captures all relevant dosimetry information and that the ANRDR can be used as an acceptable record management system for an organisations dose records. There are also plans in place to provide workers with direct online access to their dose records to align the system with current societal expectations.

ARPANSA has also been engaged internationally with the IAEA through a practical arrangements agreement that has seen APRANSA take a leading role in promoting best practice occupational radiation protection within the Australasian region. This has seen ARPANSA provide resources for the development of guidance, delivery of training, auditing and advice within the region over the last four years. Examples include; hosting an IAEA workshop for the development and maintenance of national dose registers in May 2018; providing staff for an IAEA expert mission for the development of a national dose register in the United Arab Emirates in February 2018 and providing an expert for the delivery of training in occupational radiation protection in Japan in October 2017. An ongoing commitment for continuing work in occupational radiation protection has been recently signed between ARPANSA and the IAEA.

11.3 Control of discharges, materials for clearance, and existing exposure situations; environmental monitoring for public radiation protection

Control of discharges, materials for clearance

Related to GSR Part 3 Requirement 8, paragraphs 3.10-3.12,

The *National Directory for Radiation Protection (NDRP)* establishes that disposal can occur without regulatory approval provided they occur in accordance with Schedule 14 'Requirements and limits for the disposal of radioactive waste by the user', by sewer, air or landfill. These requirements were published in June 2017 and are to be adopted by jurisdictions, but have not yet been adopted in all jurisdictions, including the Commonwealth. These limits are based on potential exposure scenarios as described in the document. This form of disposal is to apply without the need for authorisation or notification to the regulatory body. When revising the NDRP and promulgating the 2nd edition of the NDRP, the RHC decided to re-publish Schedule 14 as a stand-alone *Code for the Disposal of Radioactive Waste by the User*, to be published as RPS C-6.

Additionally, the *Code for Disposal Facilities for Solid Radioactive Waste* (RPS C-3) is in an advanced stage of draft and expected to be published in the near future. It is ARPANSA's intention to make both RPS C-3 and RPS C-6, once they are published, mandatory licence conditions and as such listed in regulation 48.

ARPANSA exempt dealings and exemption limits are established in the ARPANS Regulations (schedule 2), additionally a specific exemption may be applied for (regulation 37-38). No specific clearance levels are established in regulation. Further exemptions are listed in the 2nd edition of the NDRP, which also refers to GSR Part 3 as regards clearance levels.

Related to GSR Part 3 Requirements 29, 32, 33,

Requirements for regulation of public exposure have been established in *the Code for Radiation Protection in Planned Exposure Situations* (2016) (RPS C-1). Complying with this code is a condition of licence for all licences issued under the ARPANS Act.

Dose limits for public exposure are established in the relevant jurisdictional legislation, including the Commonwealth (regulation 59) and in RPS C-1 (Schedule B). These include 1 mSv in a year for effective dose, with an annual equivalent dose to the lens of the eye of 15 mSv and 50 mSv for skin.

Where an application is received requesting authorisation to discharge above the exempt values, these are assessed by the regulatory body on a case by case basis. This can be in the form of a licence allowing discharge, or the granting of a specific exemption.

ARPANSA has granted an airborne discharge authorisation to ANSTO based upon an assessed dose to a hypothetical critical group of individuals. The objective for radiation dose to a member of the public due to airborne radioactive discharges from all conducts and dealings is 20 microsieverts effective dose per year. To assist in keeping these doses as low as reasonably achievable the doses are monitored through discharge notification levels and reported to ARPANSA. The quarterly notification level is set at 50 per cent of the annual level, and a four weekly notification level is set at 20 per cent of the annual level.

The discharge of liquid wastes is managed through individual agreements with the local authority for waterways and sewers, such as NSW trade waste agreements. The waste discharged must comply with drinking water standards. The drinking water reference activity concentrations correspond to an annual

constraint of 0.1 mSv/year and are based on the methodology specified in the World Health Organisation's (WHO) *Guidelines for Drinking Water Quality (2004)* and using the conversion factors specified in the International Atomic Energy Agency *International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources Safety Series No. 115 (1996*).

The holder of an ARPANSA licence must ensure, under Regulation 58(4), that radiation protection and safety relating to the licence are optimised in order to ensure that the doses, the number of people exposed and the likelihood of incurring the exposure are as low as reasonably achievable after taking into account economic and societal factors.

Under the *Code for Radiation Protection in Planned Exposure Situations*, RPS C-1 (section 2.5), the Responsible Person must ensure that:

(a) a monitoring program, sufficient to verify and demonstrate compliance with the authorisation, is implemented to confirm that public exposure due to any radiation source within the practice is adequately assessed

(b) the monitoring program specified in sub-clause (a) includes monitoring of, as appropriate:
  (i) external exposure due to such sources
  (ii) discharges
  (iii) radioactivity in the environment
  (iv) other parameters important for the assessment of public exposure

(c) appropriate records are maintained of:
  (i) the results of the monitoring program
  (ii) estimated doses to members of the public

(d) the results of the monitoring program are reported or made available to the relevant regulatory authority at approved intervals, including, as applicable:
  (i) the levels and composition of discharges
  (ii) dose rates at the site boundary and in premises open to members of the public
  (iii) results of environmental monitoring
  (iv) retrospective assessments of doses to the representative person

(e) any levels exceeding the operational limits and conditions relating to public and occupational exposure are reported promptly to the relevant regulatory authority in accordance with reporting criteria established by the relevant regulatory authority

(f) any significant increase in dose rate or concentrations of radionuclides in the environment that could be attributed to the authorised practice is reported promptly to the relevant regulatory authority in accordance with reporting criteria established by the relevant regulatory authority

(g) a capability is maintained to conduct monitoring:
  (i) in an emergency
  (ii) in the event of an unexpected increase in radiation levels, or
  (iii) of concentrations of radionuclides in the environment due to an accident or other unusual event attributed to the authorised radiation source or facility

(h) the adequacy of the assumptions made for the assessment of public exposure and the assessment for radiological environmental impacts is verified by a qualified expert

(i) results from radiation source monitoring and environmental monitoring programs and assessments of doses from public exposure are made available on request, as appropriate.

ARPANSA does not make specific provision for independent monitoring of discharges. However, ARPANSA requires regular reporting from licence holders, which may be verified as needed. ARPANSA has verified environmental measurements provided by licence holders through its own laboratories when required. ARPANSA has the capacity to perform monitoring where the need is identified, typically as part of a scientific study rather than for regulatory compliance monitoring.

Consumer products that contain radioactive material of greater than the exemption limit are subject to regulatory control. For these practices, licensing or exceptions would be required, and as such the regulator would ensure that consumer products are not made available to the public unless their use by members of the public has been justified, and either their use has been exempted or their provision to the public has been authorized.

Existing and chronic exposure

Related to GSR Part 3 Requirements 47-52, paragraphs 5.2-5.33,

The Guide for Radiation Protection in Existing Exposure Situations (RPS G-2), jointly developed and approved by the Radiation Health Committee, establishes the framework to ensure existing exposure situations, when identified, can be managed for the purpose of protection and safety, and so that appropriate reference levels can be established.

Guidance on existing exposure situations

RPS G-2, section 3.2.4 provides for:

- the identification of those persons or organisations responsible for the contamination of areas and those responsible for financing the remediation program, and the determination of appropriate arrangements for alternative sources of funding if such persons or organisations are no longer present or are unable to meet their liabilities and be found in section 3 clause 3.2.4(a)
- the designation of persons or organisations responsible for planning, implementing and verifying the results of remedial actions can be found in section 3 clause 3.2.4 (b)
- the establishment of any restrictions on the use of or access to the areas concerned before, during and, if necessary, after remediation can be found in section 3 clause 3.2.4 (c)
- an appropriate system for maintaining, retrieval and amendment of records that cover the nature and the extent of contamination; the decisions made before, during and after remediation; and information on verification of the results of remedial actions, including the results of all monitoring programs after completion of the remedial actions can be found in section 3 clause 3.2.4 (d).

Remediation of existing exposure situations

An example of ARPANSA regulatory oversight of remediation and control of a legacy site is the South Alligator River Valley in Kakadu National Park in the Northern Territory, which was the target of rehabilitation work.

Government uranium mining operations in the 1960s occurred at 13 sites in this region. There were no formal environmental regulations throughout this period and no requirement for complete rehabilitation of

any of these sites. Consequently, they were generally abandoned, including a small mill and solvent extraction plant, contaminated process ponds, roads and tracks as well as open cut mines and mineshafts. Since operations ceased, several phased rehabilitation projects occurred in the late 1980s and two projects were completed in 1992 and 2000. These produced material which was stored for disposal. In 2006, the Commonwealth Government provided $7.4 m to Parks Australia North to clean up all remaining sites within the South Alligator River Valley to an acceptable standard.

The South Alligator Containment Facility (SACF) was purpose built in 2009 to encapsulate various waste from abandoned uranium mines in the region. The CEO of ARPANSA granted a licence to possess or control the South Alligator Disposal Facility. Monitoring of the SACF is undertaken via collection of data from one automatic weather station and three soil monitoring stations equipped with an extensive array of sensors throughout the facility profile. These automatically collected data is supplemented with other manually collected information such as ^{222}Rn flux densities plus water chemistry and seepage of surrounding ground waters. The purpose of the collection and interpretation of all these data is to gain an understanding of the facility's behaviour in the context of the goals and objectives of the facility, and to guide annual operational management activities.

Another example is the remediation and ongoing oversight of the former nuclear weapons test site at Maralinga in South Australia. Between 1952 and 1963 the Maralinga Lands were used by the UK for the testing and development of nuclear weapons. The UK made three attempts to clean up Maralinga but only the last was intended to leave the site in a state where no further security control would be necessary. Following concerns about the level of contamination and a subsequent Royal Commission into the matter in 1985, the Maralinga Rehabilitation Technical Advisory Committee was established in 1993 to oversee the Australian Government rehabilitation of the Maralinga test site.

For the rehabilitation of Maralinga, a 'reference' annual committed effective dose (which can now be referred to as a reference level) of 5 mSv per year was agreed upon with interested parties. Following the successful rehabilitation, dose assessments have shown that most of the contaminated areas at Maralinga fall well within the clean-up standards applied for unrestricted land use, meaning that in most areas activities and land uses such as hunting, mining exploration and construction could proceed. There are still restrictions on permanent occupancy within a 'restricted land-use' (non-residential) boundary surrounding Taranaki, a former test-site at Maralinga. These restrictions are precautionary in nature and are in place as control measures designed to contain any remaining contamination at the site and to discourage accidental intrusion into the burial trenches.

In November 2009 the Australian and South Australian Governments and Maralinga Tjarutja (the traditional owners of the land) signed the Maralinga Nuclear Test Site Handback Deed, which gave effect to the return of the test site and Maralinga Village to Maralinga traditional owners. ARPANSA continues to provide information, advice and environmental monitoring through the Maralinga Land and Environment Management Plan, including completing regular radiological surveys and dose assessments. Maralinga is now licensed by the South Australian government.

ARPANSA regulates a former disposal facility known as the Little Forest Legacy Site (LFLS) which is maintained by ANSTO. The LFLS was originally constructed as a disposal facility, but was first licensed by ARPANSA in 2015 under a possess or control licence as a nuclear waste storage facility.

The facility was established by the former Australian Atomic Energy Commission for the near surface burial of low level wastes. The facility was operational between 1960 and 1968. During this time, a number of shallow trenches were excavated and about 1600 cubic metres of material was buried. The material

consisted of equipment and waste contaminated with radioactive substances of low activity, effluent sludge, chemicals and beryllium. After emplacement of the waste, a one metre thick layer of local clay-rich soil was used to cover the waste.

The licence was then reissued in November 2016 as a possess or control licence for a prescribed legacy site which was a new category of licence introduced into the ARPANS Act and Regulations to cover legacy sites. A licence condition was imposed on ANSTO to produce a medium and long term plan for the management of the site, including potential remediation. The timeline for production of this plan was recently extended to December 2019, with interim progress reports due at six monthly intervals.

ARPANSA undertakes a scheduled inspection programme at Little Forest Legacy Site with 3 sites visits and one inspection having been undertaken since 2016. Annual reports are submitted to ARPANSA by ANSTO providing relevant information such as integrity of the containment cover, results of groundwater analysis etc.

Radon exposure to the public

Information on exposure due to radon is available on the ARPANSA website. A national reference level for radon of approximately 10 mSv per year effective dose, corresponding to an annual residential indoor radon concentration of approximately 200 Bq/m^3, is in place in Australia for all jurisdictions.

A nationwide survey was first published in a technical report by ARPANSA's predecessor organisation, the Australian Radiation Laboratory, in 1990. A total of 10,000 dwellings were selected from a random sample taken from the electoral districts in each State or Territory. Subsequently approximately 3,900 dosimeters were sent to those responding to the invitation and the monitors were exposed for a period of 12 months. Approximately 3,400 monitors were returned and analysed. Averages were determined by postcode, State and Territory and for Australia. This radon map is available online.

From this data, an overall average for Australian homes of 11 Bq/m^3 was determined and that an estimated one in a thousand of Australian homes could have levels of radon exceeding 200 Bq/m^3, the level where remedial actions should be considered.

It is ARPANSA's judgement, on the basis of information available, that a national action plan to control public exposure to radon indoors is not justified in Australia at this time. ARPANSA is presently undertaking studies to characterise possible radon prone areas and the national radon protection strategy is currently under development by ARPANSA. It is anticipated that the strategy will state that a national action plan is not justified due to the low average level of radon in Australian homes.

11.4 Conclusions and actions

Australia generally meets the expectations of the IAEA safety standards in medical, occupational, and existing exposure situations. However, some areas for improvement have been identified.

Medical exposure

Across Australia, there is a nationally recognised code for medical exposures, RPS14, that has been endorsed by all States and Territories. Adherence with the code is a legal requirement in all but two jurisdictions. Additionally, a new draft *Code for Radiation Protection in Medical Exposure* (RPS C-5) is currently in advanced stages of development, which will further enhance the alignment with the requirements of GSR Part3. Within RPS14 the roles and responsibilities of the Referring medical practitioner/Referrer are not defined, nor are there detailed referral requirements such as referral guidelines. While the referrer is often not within the scope of radiation safety regulatory bodies functions, some jurisdictions apply restrictions on professions or individuals who can issue a valid referral.

- An action item has been identified which aims at strengthening uniformity in referral guidelines, which will be part of promulgation of the draft Medical Code, to be published as RPS C-5. See Action Plan item 18)

ARPANSA has established National Diagnostic Reference levels for multi-detector CT and nuclear medicine procedures. This includes a system that allows institutions to establish their facility reference levels for CT and compare these with other institutions across Australia.

- DRLs for image-guided interventional procedures are being developed and the efforts to expand DRL coverage of other modalities should continue to be pursued. See Action Plan item 19**Error! Reference source not found.**).

A lack of national uniformity for authorisations, testing and design of medical equipment may negatively affect the mobility of business or professionals across Australia. For example, a similar practice in two different jurisdictions may have differing requirements on shielding, or the use of safety devices such as foot switch accidental activation protection. Additionally, there is no national uniformity for the responsibilities of the referring medical practitioner or generic justification guidelines.

Occupational exposure

Australia has strong harmonised workplace health and safety legislation for the protection of all workers. Radiation protection requirements set out in the new *Code for Radiation Protection in Planned Exposure Situations* (2016) (RPS C-1), is adapted from and contains specific reference to the GSR Part 3 requirements.

- ARPANSA does not require mandatory health surveillance for radiation workers, or provide specific guidance on this topic. However, one jurisdiction (South Australia) does have requirements for uranium mining workers. (See action plan 20).

Control of discharges, materials for clearance, and existing exposures situation

Australia has in place a guide on existing exposure situations based on GSR Part 3 requirements. This guide has been agreed by all jurisdictions. ARPANSA has developed further guidance for stakeholders on implementation of the existing exposure guide. Australia has developed national guidance on the transition from an emergency situation to an existing exposure situation. Australia was one of the first Member States to do this.

- The national radon protection strategy is currently under development by ARPANSA and is expected to state that a national action plan is not justified. Additionally, ARPANSA is presently undertaking studies to characterise possible radon prone areas. (See action plan 17).

There are varying standards of regulation surrounding remediated sites and controlling existing exposure situations. National uniformity is further discussed in section 13.

Environmental monitoring for public radiation protection

- While licence holders are required to have environmental monitoring programs as applicable (e.g. ANSTO), ARPANSA does not provide for an independent monitoring programme of and assessment of public doses due to authorised facilities or activities. Therefore, these results are also not made publicly available (See action plan 21).

However, ARPANSA is establishing an Australian radiation monitoring network related to the visit of nuclear powered warships. The real-time data generated by this system will be accessible to the public via an interactive chart that will be available on our website once the network is installed.

12. Interface with nuclear security

This section focuses on Commonwealth arrangements.

12.1 Legal basis

Related to GSR Part 1 (Rev. 1): Requirement 12, paragraph 2.39

ARPANSA is the competent authority to ensure the safety and control of radioactive material for the Commonwealth, while jurisdictional regulatory bodies are responsible for their jurisdictions across Australia. The Australian Safeguards and Non-proliferation Office (ASNO) is the competent authority for ensuring Australia's compliance with the Comprehensive Safeguards Agreement and Additional Protocol with the IAEA, and with the amended Convention on the Physical Protection of Nuclear Material. This is done through the accounting and control of nuclear material and the regulation of physical protection (nuclear security) for all jurisdictions. These authorities have separated functions though separate Acts (see section 1). There is an information sharing arrangement in place under a memorandum of understanding (MoU) between ASNO and ARPANSA. Information is extensively shared between ARPANSA and other jurisdictions' regulatory bodies, including through the Radiation Health Committee.

The Australian Federal Police and local emergency response agencies generally have roles defined through the emergency plans (see section 9), or transport plans (see section 5.6, 6.6, 9.6) associated with specific tasks or scenarios. The Australian Government Crisis Management Framework recognises that emergency response organisations require integration into multidisciplinary teams for safety- and security-initiated events.

12.2 Regulatory oversight activities

Related to GSR Part 1 (Rev. 1): Requirement 12, paragraphs 2.39–2.40

Under the ARPANS Act, security is considered incidental under the objectives of the Act, and so does not explicitly require interfaces between safety and security to be considered. The ARPANSA website lists international best practice documentation including NSS-13, NSS-14, NSS-15 and IAEA-TECDOC-1801 *Management of the Interface between Nuclear Safety and Security for Research Reactors*. All of these documents refer to interfaces between safety and security, are promoted by ARPANSA as best practice, and may be considered during application and review.

ARPANSA has also listed GSR Part 7 as international best practice and its requirements are considered in regulatory decisions and guidance. This includes emergency response arrangements for licence holders.

As part of the inspection program, Performance Objectives and Criteria (PO&C) Baseline Module (BM) 6.3 states: 'The organisation has effective security management arrangements that are supported by a good security culture. An integrated approach is taken to Safety and Security'. This is further expanded upon under BM 6.3.4 which states: 'Safety and security measures are developed so that they do not compromise each other. Safety and security are seen as complimentary and processes are designed so that measures for one complement the other'.

Similarly, Paragraph 18 of the compliance code attached to ANSTO's permit to possess nuclear material, granted by ASNO under the Safeguards Act, states that 'The Permit Holder shall manage the nuclear security interface with nuclear safety and nuclear material accountancy and control arrangements in a manner to ensure that they do not adversely affect each other and to the degree possible, they are mutually supportive'.

12.3 Interface among authorities

Related to GSR Part 1 (Rev. 1): Requirement 12, paragraphs 2.39–2.40

ARPANSA and ASNO have jointly developed the regulatory guide Periodic Safety and Security Review of Research Reactors (PSSR), which specifically requires consideration of the interfaces between safety and security when conducting a periodic review. Periodic reviews are usually required every 10 years or when there is a significant change in the safety and/or nuclear security environment.

ARPANSA and ASNO have established a Joint Physical Protection and Security Working Group where there are shared responsibilities and any issues with the interfaces between safety and nuclear security can be resolved.

Additionally, co-operative meetings are held on security issues, on an as need basis. For example, at a recent meeting in early 2018 ARPANSA met with the Australian Federal Police (AFP), ASNO and ANSTO to discuss protective security arrangements at the Lucas Heights Science and Technology Centre.

12.4 Conclusions and actions

Integration of safety and security is explicitly covered in regulatory guidance (such as PSSR documents) and the ARPANS inspection program (PO&Cs). Additionally, the primary nuclear regulators ASNO and ARPANSA have regular joint meetings with affected parties, including licence holders, and exchange information under a MoU.

While a strict legal basis is not apparent for the initiatives that are being carried out to ensure integration of safety and security, Australia's requirements are significantly integrated through a variety of mechanisms. These functions are integrated in a similar manner to all other areas such as transport, or disposal. As such, the provisions for special legal requirements to ensure integration would have limited benefit.

13. National uniformity

This section includes responses form the regulatory bodies of all jurisdictions. It provides for a discussion on areas where regulatory bodies have implemented different approaches, providing a number of examples of challenges and issues experienced in establishing and implementing a national consistent legal framework for radiation protection in Australia. The material supports a discussion on matters that broadly relate to 'uniformity'. The section does not generate items for the Action Plan per se, and there is no corresponding IRRS module. However, a number of the actions identified in the modules are impacted by differences in jurisdictional approaches, or require a nationally uniform response.

As mentioned in the Background to this Summary Report, Australia has a federal system of government that encompasses nine jurisdictions, being the Commonwealth (the national-level Australian Government), the six States and two self-governing Territories. The States and Territories vary significantly in population, land area, and economic activities, which affects priorities and resourcing levels within a jurisdiction. A summary of the population and land area of each State and Territory is provided below:

State/Territory	Population 2017 (million)	% of Australian population	Land area (million km^2)	% of Australian land area
Australian Capital Territory	0.4	2%	<0.1	<1%
New South Wales	7.8	32%	0.8	10%
Northern Territory	0.2	1%	1.4	18%
Queensland	4.9	20%	1.7	23%
South Australia	1.7	7%	1.0	13%
Tasmania	0.5	2%	0.1	1%
Victoria	6.3	26%	0.2	3%
Western Australia	2.6	10%	2.5	33%
Australia (rounded)	25 million	-	7.7 million km^2	-

Table 11. Comparison of Australian States and Territories

The Commonwealth may only exercise powers given to it under the Australian Constitution or though agreements entered into with States. Each State and the Commonwealth has its own sovereign parliament. The self-governing territories, namely, the Northern Territory and the Australian Government Territory, have legislative assemblies with limited law making powers but these can be overridden by the Australian Parliament, which can also make laws for the Territories.

All nine jurisdictions have their own radiation protection legislation and regulatory bodies. This may create differences in regulatory requirements and implementation across jurisdictions, leading to inconsistencies such as those reported under the RHC initiative *report a national uniformity issue*.

One of the functions of the Commonwealth regulator, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), is to promote national uniformity, which is enshrined in the *Australian Radiation Protection and Nuclear Safety Act 1998* (the ARPANS Act). Lack of national uniformity or inconsistency in the implementation of radiation protection legislation can adversely impact the effectiveness and efficiency

of the administration of safety of radiation practices across jurisdictions. In particular, lack of national uniformity in licensing, registration or exemption provisions for different occupations and radiation sources may pose difficulties for users operating across jurisdictions or relocating from one jurisdiction to another. If this occurs, it will result in higher costs being incurred to businesses, end users, and ultimately to the community.

Australia has made a consistent, yet gradual approach to addressing national uniformity. The principal body that addresses national uniformity is the Radiation Health Committee (RHC). The functions and membership of the RHC is set out in the ARPANS Act, and discussed in section 1.4 of this Summary Report. One of the key functions is 'to develop policies and to prepare draft publications for the promotion of national uniform standards of radiation protection' (section 23(1) of the ARPANS Act). The RHC is comprised of representatives of each jurisdiction, who must be 'radiation control officers', a senior position in a regulatory body. The RHC, through ARPANSA, publishes national codes and guides and agrees on national implementation of regulatory elements as outlined in the National Directory for Radiation Protection. Note that the first edition of the NDRP (RPS 6), including amendment 7, is still in force) but is intended to be superseded by the 2nd edition that was approved by the RHC in July 2018.

In late 2016, the RHC agreed to aspire towards 'a seamless regulatory experience for the safe use of radiation'. The aim is to:

- enable individuals and businesses conducting radiation practices or using radiation sources across Australia to do so seamlessly with no barriers to the transfer of their authorisations
- facilitate the adoption of agreed national radiation protection codes and standards in a consistent manner in all jurisdictions
- work towards a national register of radiation practices and sources, and inspection and incident database.

A number of options were explored by the RHC, which were outlined in an RHC Options Paper – provided in the reference material. The paper considered several options, including a more proactive implementation of the NDRP, model legislation (identical radiation legislation in each jurisdiction), and single legislation (one legislation for the whole country administered by ARPANSA and implemented by every jurisdiction). RHC resolved to adopt the first option of proactively implementing the NDRP, while working towards model or single legislation.

The Commonwealth Government, through the Department of Health, is pursuing a similar initiative, so far mainly in consultation with other Commonwealth departments under the terms of an Interdepartmental Committee (IDC). ARPANSA provides technical advice to the IDC and the RHC has been informed of the initiative. This issues paper has many similarities with the paper developed by the RHC, but has not been provided as a reference for the IRRS team at this time.

The Radiation Regulators' Network (RRN) has been established to facilitate operational discussions on regulatory issues affecting all jurisdictions, for example, discussing and arriving at a possible national position on the authorisation of new radiation equipment and the development of a single national set of competency requirements for the issue of user licences to medical radiation practitioners and industrial radiographers. The RRN is not administrated through the ARPANS Act. However, several members of RHC sit on the RRN.

13.1 Authorisations – licencing, registrations, exemptions

Related to GSR Part 1 (Rev. 1): Requirement 1, 2

Authorisations issued in Australian jurisdictions, which must be applied for and granted prior to dealing with a radiation source, may include:

- user licences (allowing an individual to deal with radiation sources)
- possession licences (allowing a corporation or individual to own or control sources)
- registration (each individual equipment or place where radioactive material is used)
- management licences (a combination of the above authorisations). For example, a management licence in TAS can cover the use and possession of a number of sources. This means, a dentist may hold a licence which allow them to own and use 4 dental X-ray apparatus, which are listed on the licence, each additional dentist at the practice will also hold a use licence. In TAS, a management licence for supply or repair may authorise multiple persons at a business.

	NSW	VIC	TAS	SA	QLD	ACT	NT	WA	Commonwealth
Management licence	✓	✓	✓	#	×	×	×	ϕ	✓
Possession licence	*	*	*	✓	✓	✓	✓	ϕ	*
Equipment/place registration	*	*	*	✓	✓	✓	✓	ϕ	× Notification only
User licensing	✓	✓	✓*	✓	✓	✓	✓	✓	×

* Captured under management licence (e.g. individually listed on licence)

ϕ In WA, registrations may include possession and management licence requirements.

\# In SA, licences associated with mining are considered 'management licences' these are *Licence to carry out mining and mineral processing*, *Licence to test for developmental purposes* and a *Facilities licence*.

Table 12. Summary of authorisation types

In accordance with a graded approach, certain dealings with radiation sources are exempted in different jurisdictions. For example, use licences are not required for baggage scanner (X-ray apparatus) in TAS or QLD, or for the use of intra-oral radiography by dentists in NSW and WA. However, other jurisdictions require these persons to hold a licence.

The differences among jurisdictions' legislation and their administration result in some inconsistencies in terms of the licensing requirements and can add complexity that makes it harder for businesses, practices and individuals to move between jurisdictions or establish themselves in a new jurisdiction. For example, an industrial radiographer who owns practices in one jurisdiction, and wishes to expand their business to a new jurisdiction, will need to become familiar with the requirements and may not be able to replicate the same setup used in the first jurisdiction.

To address this issue, the RHC has prepared the Regulatory expectations for users of radiation sources seeking to obtain authorisations in more than one jurisdiction. This statement was issued by the RHC following endorsement by a majority of the regulatory bodies. The document sets out what applicants can expect when seeking authorisations (licences or registrations) for the same activity in multiple jurisdictions.

Every jurisdiction also has a *Mutual Recognition Act 1992*, which allows for, among other things, the recognition of an existing user licence of an equivalent occupation while applying for authorisation in a second jurisdiction. See section 13.9

Graded approach

Authorisations are in some cases graded differently by jurisdictions, and there is no national agreement on what constitutes a high priority source or facility.

For example, NSW categorises sources into four groups (A-D), while ARPANSA categorises sources into three groups (schedule 3C of the ARPANS Regulations), split into six regulatory priority groups. NSW classifies sealed sources based on security category (D-value), while ARPANSA bases its categorisation on multiples of the exemption limits (ARPANS Act). While there is broad consistency in low risk sources such as dental X-ray, and high risk sources used in industrial radiography, some source types do not align. For example, the NSW Group B contains ARPANSA lowest (Group 1) and highest (Group 3) priority group sources.

Source type	NSW licence group	ARPANSA group (regulatory priority)
Dental	Group A	Group 1
Mobile medical	Group B	Group 1
Fixed medical	Group B	Group 2
Fixed gauges (Cat 4)	Group B	Group 2
Radiotherapy	Group B	Group 3
Industrial radiography	Group C	Group 3

Table 13. Categorisation of radiation sources examples

13.2 Scope of regulation

Related to GSR Part 1 (Rev. 1): Requirements 23

The types of sources covered by regulatory requirements vary across jurisdictions. In addition to exemptions, some sources are explicitly covered only by some jurisdictions. For example, jurisdictions independently introduced regulation of cosmetic tanning beds (solarium), followed by jurisdictions banning the practice. This was done with national consultation but was not done as part of a national strategy. An example for laser/IPL is given below.

Example: Regulation of lasers and non-ionising radiation sources

There is no national agreement to regulate lasers or intense pulsed light (IPL) sources. However, four jurisdictions currently regulate some types of lasers.

Jurisdiction	Medical lasers	Cosmetic laser	Industrial laser	Laser pointer	IPL
ARPANSA	✓	✓	✓	✓	×
TAS	✓	✓	✓	✓	✓
WA	✓	✓	✓	*	×
QLD	✓	✓	*	*	×
ACT, NSW, VIC, SA, NT	×	×	*	*	×

* Industrial and handheld lasers are also regulated under the Work Health and Safety legislation, and weapons restrictions may apply for laser pointers of a certain power. Under the Radiation Safety Act 1999, Queensland regulates class 4 lasers designed for use on persons.

Table 14. Current regulation of lasers

The RHC, through ARPANSA, ran a survey in 2012 to consider the best regulation options for laser and IPL, especially in the cosmetic industry. ARPANSA prepared a Regulatory Impact Statement (RIS), Intense Pulsed Light sources [IPLs] and Lasers for Cosmetic or Beauty Therapy consultation draft in May 2015. A technical paper (TR177) was released in 2017 on the analysis of the consultation. RHC considered there is insufficient information to warrant a decision. Therefore, there is no national agreement on the regulation of lasers and IPL.

13.3 Competency requirements for radiation occupations/service providers

Related to GSR Part 1 (Rev. 1): Requirement 11

There is limited agreement on national competencies such as the level of qualification, training and experience required to deal with radiation sources, or to be a Radiation Safety Officer.

Most jurisdictions maintain a list on their website of approved qualification and training (e.g. accreditation or registration with professional bodies, tertiary qualifications or approved courses) which are considered sufficient to obtain a specific type of licence.

While there is broad consensus on many common occupations, there are differences which can affect the eligibility of applicants. Theoretically, under the *Mutual Recognition Act 1992* (see section 13.9) such an applicant could apply for and receive a licence in a jurisdiction with less stringent requirements, then apply under mutual recognition and receive a licence in the second jurisdiction. As such, these differences do not limit persons from obtaining a licence but add additional hurdles. In recognition of this, some jurisdictions (e.g. ACT) state on their website that they accept applications where the applicant can demonstrate eligibility in any jurisdiction.

Occupation	QLD	NSW	VIC
Dentist	*[fast track applications]* Recognised Degree (e.g. BDS), and registered as a Dentist with the Australian Health Practitioner Regulation Agency (AHPRA).	Exempt for intraoral – for OPG registered as a dentist with the Australian Health Practitioner Regulation Agency (AHPRA).	Must be registered as a dentist with the Australian Health Practitioner Regulation Agency (AHPRA).
Dental assistant	*[fast track applications]* Certificate IV in Dental Assisting (Radiography Specialisation)	Certificate IV in Dental Assisting (HTL43012)	Certificate IV in Dental Assisting (HTL43012)
Dental (CBCT)	*[fast track applications]* Registered dentist holding a certificate of Proficiency in dental CBCT issued by an oral and maxillofacial radiologist approved by Radiation Health	Dentists, Dental hygienists/therapists/ assistants/nurses (Above **and**) training course (1 listed) **or** manufacturer, **or** in-house training by licenced person.	Dentists, dental hygienists/therapists/ assistants/nurses (Above **and**) training course (3 listed) **and** applications training (12 listed)
Industrial radiography	• Approved course in radiation safety • Log book of 300 supervised hours (by a licensed person) • Statement of level of competency	Training course (10 listed)	Training course (5 listed)
Portable density/moisture gauges	• Approved course in radiation safety • Log book of 20 supervised hours (by a licensed person) • Provision of Certificate of Competency from an approved person	Training course (18 listed)	Training course (3 listed)

Table 15. Examples of competency requirements

13.4 Adoption of codes

Related to GSR Part 1 (Rev. 1): Requirements 32

The process to adopt codes in Australia further highlights challenges in national uniformity. Generally, RHC will draft a code on a particular issue, with assistance from ARPANSA and generally building on 'standards' and risk assessments published by the IAEA, WHO, ICRP, UNSCEAR and others, as applicable. The drafting process includes public consultation hosted on the ARPANSA website. Following RHC approval and recommendation from the Radiation Health and Advisory Council to adopt the Code, ARPANSA publishes it on its website and steps are taken to include the Code in Schedule 11 of the NDRP. RHC has agreed that once a Code is listed in Schedule 11, all jurisdictions will take steps to give it legal effect either through amendment to legislation or implementation as a licence condition.

Currently the listing of a code in Schedule 11 of the NDRP can be significantly delayed as any amendment to the NDRP must be approved by the Council of Australian Governments' (COAG) Health Council, which comprises the Health Ministers of every jurisdiction. The amendment process can take up to 18 months. To rectify this situation, as part of the approval process for the 2nd edition of the NDRP, it will be proposed that Ministers devolve the authority to approve most amendments to the NDRP to the RHC.

While formally the Codes listed in the NDRP should be adopted in each jurisdiction, there may be delays and some variation in how the Codes are implemented. For example, the WA Radiological Council (Council) actively applies the requirements of several ARPANSA Codes of Practice relevant to radiation exposure in medical situations. However, whilst the Council has agreed to adopt the Medical Code (RPS 14), the requirement to comply with RPS 14 has not yet been adopted into the Regulations and thus some requirements of this Code are not legislated in WA. A condition of registration that requires adherence to RPS 14 has been drafted and approved by the Council, but has not yet been applied to registrations. However, some specific licences have a condition applied requiring adherence with RPS14.

Codes may be subject to the preparation of Regulatory Impact Statements (RIS) if the Office of Best Practice Regulation (OBPR; see section 9.1) decides that a RIS is necessary because of the impact and cost burden of the code on stakeholders. Even where the OBPR decides that a RIS is not necessary that does not mean that the decision must be accepted by every State and Territory. A State or Territory may require a RIS before a code is implemented in its jurisdiction. This disconnect between the jurisdictional requirements on the need for a RIS can make it difficult to adopt codes into local legislation. Furthermore, because consultation is to be undertaken at the jurisdictional level, there is the expectation that changes would be made to account for any public comment received, which may lead to inconsistencies across jurisdictions.

Codes, such as the new *Code for Radiation Protection in Planned Exposure Situations* (2016) (RPS C-1), contain requirements which are open to interpretation. This means that implementation of requirements by each jurisdiction may differ in practice. For example, RPS C-1 requires that radiation management plans be reviewed. For ARPANSA, the mandatory review period is set at three years (regulation 50). However, requirements in other jurisdictions range from annual to five yearly review, or there is no fixed requirement. The interpretation and implementation of the Planned Exposure Code is currently a topic for discussion within the RRN.

New technologies and emerging practices

New technologies and emerging practices can arise before relevant codes address the issue. This may cause jurisdictions to implement requirements that are specific to their jurisdiction, which subsequently makes it harder to achieve national uniformity.

For example, cone-beam computed tomography (CBCT) dental equipment increased rapidly in Australia due to the availability of low cost equipment and a high rate of charge through Medicare (government subsidised health care). However, regulatory bodies in Australia captured these units differently with some jurisdictions applying orthopantomogram (OPG) equipment standards while some applied CT standards. Operator requirements are also not consistent with some jurisdictions limiting their use to qualified dentists while other jurisdictions accept dental assistants with manufacturer provided applications training (see section 13.3).

The use of lasers and intense pulsed light in the health and cosmetic industries is another example of an emerging technology that has established itself in the mainstream, but is not yet subject to consistent national requirements or regulation.

13.5 Radiation source compliance testing programs

Related to GSR Part 1 (Rev. 1): Requirements 29

Compliance tests are performed on sources to confirm that they are operating in accordance with agreed requirements. They typically focus on operational factors such as radiation output, but can include signage or operational considerations such as quality assurance activities. Additionally, some jurisdictions, such as TAS and QLD require testing of certain premises or places.

Each jurisdiction has its own set of compliance standards. These differences include:

- standards to be tested against
- frequency of tests
- which sources need testing.

Tests from one jurisdiction are not formally recognised in other jurisdictions, which hinders the seamless transfer of equipment. Generally, if a source moves from one jurisdiction to another, even if it is within the testing frequency of the States, the original test is not recognised and a test in the new jurisdiction will need to be performed. This is an issue for portable sources such as medical screening programs, which are delivered across Australia using sources in mobile vans. These services often need to be tested and authorised in multiple jurisdictions which introduces a financial burden.

Description	NSW	VIC	QLD
Timer Accuracy	The accuracy of the timer controls must be within ±5% or ± one pulse of the indicated time, whichever is greater. The coefficient of variation of at least three consecutive measurements at the same timer setting must not exceed 0.05.	The exposure timer accuracy for timer settings across a clinical range must be within: • ±10% of the indicated value for exposure times greater than or equal to 0.1 seconds* • ±20% ± 1 pulse of the indicated value for exposure times less than 0.1 seconds*.	The measured irradiation time must be within: • ±10% percent of the indicated value for irradiation times 100 milliseconds or greater • ±20 percent of the indicated value for irradiation times less than 100 milliseconds. Measurements should be performed at approximately 70 kVp and 100 mA using at least 5 irradiation time settings.
KVP Accuracy	The kVp accuracy for kVp settings across the clinical range must be within ± 5% of the measured value. The coefficient of variation of at least five consecutive measurements at the same kVp setting must not exceed 0.02.	kVp settings across the clinical range must not exceed ±5% or 5kVp, whichever is greater of the indicated value.	The measured kVp: • should be within ± (5 percent + 1 kVp) of the indicated value • must be within ±10 percent of the indicated value.

Table 16. Differences in standards, examples from plain film (medical) radiography testing requirements

Some requirements on equipment apply only in certain jurisdictions, such as a guard on footswitches to prevent accidental activation. This can affect the sale of equipment across borders. Additionally, for medical apparatus, only TGA registered devices can legally be sold in Australia. TGA have agreements with EU which means IEC Standards typically apply. Any local variation in technical requirements that differ from TGA registration (IEC) requirements could cause issues.

Requirement	NSW	VIC	QLD	ACT, SA
Plain film radiographic	5 yearly	2 yearly	3 yearly	Testing is only required after new installation or significant repair.
Fluoroscopic	2 yearly	2 yearly	12 months	
CT	2 yearly	12 months	12 months	

Table 17. Testing frequency, examples

Description	VIC	NSW	QLD	WA
Dental apparatus	✓	✓	✓	✓
Baggage Scanners	×	✓	✓	✓
Indusial (fixed) gauges	×	✓	✓	✓
Non Destructive Testing (Industrial Radiography) apparatus	×	×	✓	×
Premises for unsealed Radioactive material (Laboratory)	×	×	✓	×

Table 18. The types of apparatus/premises to be tested, examples

One jurisdiction (WA), concluded that in order to maintain oversight with reduced resources, the compliance testing program could be extended to include activities usually associated with security enhanced sources, such as borehole logging and industrial radiography, or those activities with high numbers of users and sources, such as portable density/moisture gauges.

13.6 Shielding and design requirements

Related to GSR Part 1 (Rev. 1): Requirements 24

Each jurisdiction sets requirements on shielding and design.

Several jurisdictions have radiation shielding guidance or requirement documents that are publicly available, including:

- NSW: Radiation Guideline 7 - Radiation shielding design assessment and verification requirements
- TAS: Standard for Radiation Place for radiation Apparatus - X-ray [RPA0501]
- QLD: Radiation Safety Standard PR100:2010 Standard for Premises – Ionising Radiation Sources
- WA: Structural Radiation Protection Guidance Notes.

The underpinning reference documents include the National Council on Radiation Protection and Measurements (NCRP) Report No. 147 - Structural shielding design for medical X-ray imaging facilities (2004) and the Australian Standard AS 2243.4 Safety in laboratories – Part 4: Ionizing radiations.

An example of the variations between jurisdictions is in the design constraint, which is the level to which shielding is designed. For example when calculating the shielding required for a diagnostic X-ray apparatus. This level is set below the occupational and public exposure limits.

Design constraint, examples

Description	NSW	NT	QLD	WA
Occupational design constraint	100 µSv per week (should)	Less than 0.1 mSv per week (fraction of 5mSv per year) for controlled areas	40 µSv per week in occupational areas outside of the radiation source room or behind protective barriers (e.g. at operator consoles).	10% of the effective dose limit (2mSv per year)
Member of Public design constraint	20 µSv per week (must)	Less than 0.02mSv per week (fraction of 1mSv per year) for uncontrolled areas	10 µSv per week (in any area able to be accessed by members of the public)	50% of the public effective dose limit (0.5 mSv per year)

Signage requirements, examples

State	Requirement	Implementation method
TAS	All entrances to individual rooms or areas where a radiation apparatus - X-ray is to be usually or primarily used must bear a radiation warning sign. This sign must consist of a trefoil, in black on a yellow background, with an appropriate warning. Signs must be in compliance with the requirements of Australian Standard AS 1319-1994 Safety signs for the occupational environment.	Premises standard compliance with which is assessed by authorised persons.
VIC	*Dependent on source type, for medical applications:* Each entrance to the radiation source room must display a conspicuous radiation warning sign which contains the following information: • radiation warning symbol (trefoil) • words to the effect of 'caution – X-rays'. The symbol and lettering must be black on a yellow background. Note: This requirement does not apply to: a) radiation source rooms in which only intra-oral dental diagnostic radiography equipment is used or b) rooms that can only be accessed from the radiation source room or c) entrances to the radiation source room where a person must, prior to entering the room, pass through a control area, provided that a radiation warning sign is placed at the outside entrance to the control area.	Licence holder responsibilities (condition of licence)

State	Requirement	Implementation method
NSW	*Dependant on source type, for fluoroscopy:* A radiation warning sign complying with Schedule 5 of the Regulation must be displayed on the outside of the entry doors to any room: a) in which a fixed apparatus is installed or b) designated as the room in which a mobile or portable apparatus is permanently used. A radiation warning light must be positioned at the entry doors to all rooms, except in the case of 1.4.1 (b) or where a CRE has determined that not to do so would not pose a risk to the safety of any person. Where a radiation warning light is provided, it must light whenever the X-ray tube is placed in the preparation mode before exposure and when fluoroscopy is in progress. The light must remain illuminated for the duration of the exposure and must bear the words 'X-RAYS—DO NOT ENTER' or similar. Immediate illumination must be ensured.	Regulation, compliance checked during compliance testing.

13.7 Identification and security checking for security enhanced sources

Related to GSR Part 1 (Rev. 1): Requirements 23 and 24

In response to a recommendation of the Council of Australian Governments' CBRN Security Strategy, ARPANSA published the *Code of Practice for the Security of Radioactive Sources* (RPS 11) in 2007, which jurisdictions agreed to adopt in their regulatory framework. The Code stated that a person responsible for a security enhanced source as defined in the Code should undergo a security background check including an Australian Security Intelligence Organisation (ASIO), and security assessment and criminal history checks by the Australian Federal Police (AFP) and all State and Territory police services.

ARPANSA subsequently (2010 - 2011) drafted several iterations of a Security Background Checking Framework which was reviewed, with concerns and issues raised by several jurisdiction and statutory bodies including NSW Environment Protection Authority, Australian Security Intelligence Organisation and the Department of the Prime Minister and Cabinet. One of the principal objections raised was that the framework was predicated on each State and Territory (and the Commonwealth) implementing their own radiation security background checking schemes.

The RHC proposed that national scheme for security checking operated by Auscheck may be suitable for the purpose. Auscheck is a Commonwealth body that performs backgrounds checks nationally for aviation, maritime and health security regimes. It has existing arrangements and relations with all relevant police and security organisations. An RHC working group including ARPANSA is continuing to liaise with Auscheck regarding the legislative framework for implementation.

13.8 National information and databases

Related to GSR Part 1 (Rev. 1): Requirements 35

Jurisdictionally based regulation has led to a lack of national registers or databases of, e.g., radiation sources or of those assessed to be competent to use those sources. There is no national register of places

in which radiation practices are authorised to be conducted nor is there a national register of the people and organisations authorised to conduct radiation practices. In other areas, national databases have been established or are under establishment. Some examples of information-databases are given below.

Public registers

Some jurisdictions are required under their legislation to maintain public registers (such as NSW and QLD) which discloses the licence, the type of dealings permitted, and status of the authorisation. Other jurisdictions (such as ACT) have specific provisions requiring the protection of such information within their Act.

Transport and storage of security enhanced sources

Under the *Code of Practice for the Security of Radioactive Sources* 2007 (RPS 11), each security enhanced source requires a Source Transport Security Plan to be prepared. This plan demonstrates how the Responsible Person will satisfy the requirements of RPS 11, and includes information such as the shipping routes and potential incident response scenarios.

These considerations are an important part of transport arrangements as a poor choice of transport route could increase the likelihood of mechanical failure or accidents. Transport routes can cover multiple jurisdictions and be thousands of kilometres long which makes maintaining knowledge of all possible routes difficult. For example, shipments from Brisbane (QLD) to Melbourne (VIC) would cover more than 1,500km and pass through NSW.

Under RPS 11 (section 5.1) the Source Transport Security Plan must be provided to the relevant regulatory body either 7 calendar days in advance of the shipment of security enhanced sources, or for Category 2 or 3 sources where frequent shipment will occur, at least 7 calendar days in advance of the first shipment.

As such, each regulator should be aware of the sources that are stored or transported in their jurisdiction. However, this information is not currently logged or shared through any national systems. While the wider sharing of this information may enhance the response capabilities and aid in the effective oversight of transport arrangements, this information is not in a form that is conducive to wider distribution.

Australian Radiation Incident Register

The regulatory bodies report incidents to a central register managed by ARPANSA, the Australian Radiation Incident Register (ARIR). ARPANSA analyses the accumulated incident data to identify lessons and contributing causes. ARPANSA, in consultation with the jurisdictions, professional organisations, and experts, prepares an annual report published on the ARPANSA website.

The register and the report provide an effective platform to analyse submitted incidents and through the report share learnings with the community. This information could be more effectively targeted, shared and promoted if reports where made directly into the ARIR by the end user. This would require a redesign of the database and web system, but may save regulatory time and promote national uniformity through a uniform system for the collection, review, and assessment of radiation incidents.

13.9 Moving between jurisdictions

Differences in radiation legislation and regulatory policy among the nine jurisdictions can sometimes prove problematic for users of radiation sources operating in more than one jurisdiction. This includes

requirements to hold multiple licences with potentially differing requirements on competency, reporting and documentation required to be submitted (e.g. Radiation Management plans). To reduce the likely burden on users, ARPANSA with the radiation regulatory bodies of NSW, NT, QLD, SA, TAS and VIC have endorsed the Regulatory expectations for users of radiation sources seeking to obtain authorisations in more than one jurisdiction. The document sets out what applicants can expect when seeking authorisations (licences or registrations) for the same activity in multiple jurisdictions. It endeavours to further the objectives of nationally uniform radiation protection outcomes, and to minimise unnecessary regulatory burden.

Every jurisdiction has a Mutual Recognition Act and Trans-Tasman Mutual Recognition Act. These Acts set out certain rights for individuals seeking an occupational licence or registration in a state or territory on the basis that they are already licensed or registered for an 'equivalent occupation' in another state, territory or New Zealand. Essentially, once a mutual recognition licence application is lodged, an eligible person is deemed to hold a licence until the second jurisdiction makes a licence determination. The Acts also limit the jurisdictional regulatory body in the things they may consider, such as qualifications of the applicant as the first jurisdiction has already assessed this. More details are available on the NSW EPA 'Guideline for the Operation of the Mutual Recognition Legislation for Licensing and Accreditation under the Radiation Control Act 1990' and by the commonwealth government.

Appendix A – Reference documents

This list is not an exhaustive list of all documents referenced in the summary report. Documents that do not have links to a website may not be publicly available. Other documents are still in a draft form and have not been published. These documents have been included as part of the advance reference material and uploaded to the SharePoint site.

Codes and guidance documents

Radiation Protection Series:

RPS F-1	Fundamentals for Protection Against Ionising Radiation (2014)
RPS C-1	*Code for Radiation Protection in Planned Exposure Situations (2016), Planned Exposure Code*
RPS C-2	*Code for the Safe Transport of Radioactive Material (2014)*
RPS No. 3	*Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz (2002)*
RPS No. 5	*Code of Practice and Safety Guide for Portable Density/Moisture Gauges Containing Radioactive Sources (2004)*
RPS No. 8	*Code of Practice for the Exposure of Humans to Ionizing Radiation for Research Purposes (2005)*
RPS No. 9	*Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005)* **Associated safety guide:** RPS 9.1 - *Safety Guide for Monitoring, Assessing and Recording Occupational Radiation Doses in Mining and Mineral Processing (2011)*
RPS No. 10	*Code of Practice and Safety Guide for Radiation Protection in Dentistry (2005)*
RPS No. 11	*Code of Practice for the Security of Radioactive Sources (2007)*
RPS No. 12	*Radiation Protection Standard for Occupational Exposure to Ultraviolet Radiation (2006)*
RPS No. 13	*Code of Practice and Safety Guide for Safe Use of Fixed Radiation Gauges (2007)*
RPS No. 14	*Code of Practice for Radiation Protection in the Medical Applications of Ionizing Radiation (2008)* **Associated safety guides:** RPS 14.1 - *Safety Guide for Radiation Protection in Diagnostic and Interventional Radiology (2008)* RPS 14.2 - *Safety Guide for Radiation Protection in Nuclear Medicine (2008)* RPS 14.3 - *Safety Guide for Radiation Protection in Radiotherapy*
RPS No. 17	*Code of Practice and Safety Guide for Radiation Protection in Veterinary Medicine (2009)*
RPS No. 19	*Code of Practice for Radiation Protection in the Application of Ionizing Radiation by Chiropractors (2009)*

Safety guides:

RPS G-1 *Guide for Radiation Protection of the Environment (2015)*

RPS G-2 *Guide for Radiation Protection in Existing Exposure Situations (2017)*

RPS 4 *Recommendations for the Discharge of Patients Undergoing Treatment with Radioactive Substances (2002)*

RPS 7 *Recommendations for Intervention in Emergency Situations Involving Radiation Exposure (2004)*

RPS 15 *Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM) (2008)*

RPS 16 *Safety Guide for the Predisposal Management of Radioactive Waste (2008)*

RPS 18 *Safety Guide for the Use of Radiation in Schools (2012)*

RPS 20 *Safety Guide for Classification of Radioactive Waste (2010)*

Other publications:

RPS 6 *National Directory for Radiation Protection (NDRP) June 2017*

Radiation Health Series publications

Regulatory Guides (for ARPANSA Licence Holders and Applicants)

Holistic Safety Guidelines

Policy and procedures published online:

- Licensing & Assessment Manual [REG-LA-MAN-240]
- Compliance & Enforcement Manual [REG-COM-MAN-270]
- Inspection Manual [REG-INS-MAN-280]

Key documents provided as part of the submission (not public documents):

- Draft National Directory for Radiation Protection Version 2
- RHC Options Paper for National Uniformity
- Work Health and Safety Management Manual (WHS Management Manual)
- Work Health and Safety Objectives and Targets Procedure
- Compliance Framework
- Procedure for Managing Differing Professional Opinions
- Documentation Management Procedure

Legislation (Commonwealth)

National Radioactive Waste Management Act 2012

Environment Protection and Biodiversity Conservation Act 1999

Australian Nuclear Science and Technology Organisation Act 1987

Nuclear Non-Proliferation (Safeguards) Act 1987

Legislation (ARPANSA)

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

Australian Radiation Protection and Nuclear Safety Regulations 1999

Australian Radiation Protection and Nuclear Safety (Licence Charges) Act 1998

Australian Radiation Protection and Nuclear Safety (Licence Charges) Regulations 2000

Australian Radiation Protection and Nuclear Safety (Consequential Amendments) Act 1998

Legislation (State and Territory)

Collectively, with the ARPANS legislation above, these are referred to as 'relevant jurisdiction legislation' in this document.

Australian Capital Territory (ACT)	Radiation Protection Act 2006
	Radiation Protection Regulation 2007
New South Wales (NSW)	Radiation Control Act 1990
	Radiation Control Regulation 2013
Northern Territory (NT)	Radiation Protection Act - NT Legislation
	Radiation Protection Regulations
Queensland (QLD)	Radiation Safety Act 1999
	Radiation Safety Regulation 2010
South Australia (SA)	Radiation Protection and Control Act 1982
	Radiation Protection and Control (Ionising Radiation) Regulations 2015
	Radiation Protection and Control (Transport of Radioactive Substances) Regulations 2003
Tasmania (TAS)	Radiation Protection Act 2005
	Radiation Protection Regulations 2016
Victoria (VIC)	Radiation Act 2005
	Radiation Regulations 2017
Western Australia	Radiation Safety Act 1975
	Radiation Safety (General) Regulations 1983
	Radiation Safety (Qualifications) Regulations 1980
	Radiation Safety (Transport of Radioactive Substances) Regulations 2002
	Nuclear Waste Storage and Transportation (Prohibition) Act 1999

Defined terms and abbreviations

ARPANSA – Australian Radiation Protection and Nuclear Safety Agency, the radiation safety regulator for the Commonwealth government use of radiation sources.

Apparatus, or controlled apparatus, (radiation generators) refers to a device that may emit radiation.

Authorisation - a written permission granted by the Authority for an operating organisation to perform specified practices. The form of an authorisation can include a licence, registration, or accreditation

ASNO - Australian Safeguards and Non-proliferation Office - Commonwealth body responsible for nuclear safeguards and security, and obligations related to non-proliferation.

ANSTO – Australian Nuclear Science and Technology Office - Commonwealth nuclear organisation which operates the OPAL reactor, produces nuclear medicine and supports government nuclear initiatives.

COAG - The Council of Australian Governments - the peak intergovernmental forum in Australia. Its role is to manage matters of national significance or matters that need co-ordinated action by all Australian governments.

Commonwealth Government (also referred to as the Australian Government, the Commonwealth Government, or the Federal Government) - the government of the Commonwealth of Australia, a federal parliamentary constitutional monarchy. It is separate and independent from *State governments*.

Controlled material - radioactive material that is captured under the relevant jurisdiction legislation, and includes sealed sources and unsealed material.

Jurisdiction regulatory body – one of the radiation safety regulatory bodies including federal, State and Territory bodies. That is, ARPANSA, Australian Capital Territory Health Protection Service and Radiation Council, Northern Territory Radiation Protection Section, Queensland Radiation Health Unit, Tasmanian Radiation Protection Unit, Victorian Radiation Safety Section, Western Australia Radiological Council, South Australian Environment Protection Authority and NSW Environment Protection Authority.

Licence - an authorisation granted by the Authority allowing a person to carry out a practice involving radiation.

Licence Holder - the holder of an authorisation by ARPANSA issued under section 33 or 34.

National Code, National Guide – A document which is intended for adoption within jurisdictions across Australia. This includes the Radiation Protection Series.

Nuclear installation - a nuclear fuel fabrication plant, nuclear reactor (including critical and subcritical assemblies), research reactor, nuclear power plant, spent fuel storage facility, enrichment plant or reprocessing facility.

Nuclear Safety Committee (NSC) - one of the three advisory bodies to the CEO of ARPANSA established under the ARPANS Act. The NSC advises the CEO and the RHSAC on matters relating to nuclear safety and the safety of controlled facilities, including developing and assessing the effectiveness of standards, codes, practices and procedures.

Performance Objectives and Criteria (PO&C) – the set of criteria which underpin the ARPANSA inspection processes. They include eight functional areas (e.g. security) and three cross-cutting areas (e.g. Safety Culture).

Permitted persons - persons who are neither Commonwealth nor Commonwealth contractors, who are engage in dealings using the facilities, sources, or apparatus licensed by the CEO of ARPANSA. For example, researchers who undertake a study under an arrangement with a Commonwealth agency that is licensed by ARPANSA.

Radiation Heath Committee (RHC) – One of the three advisory bodies to the CEO of ARPANSA established under the ARPANS Act. The RHC advises the CEO and the RHSAC on matters relating to radiation protection, including formulating draft national policies, codes and standards for the promotion of uniform national standards of radiation protection for consideration by the Commonwealth, states and territories.

Radiation Health and Safety Advisory Council (RHSAC) - one of the three advisory bodies to the CEO of ARPANSA established under the ARPANS Act. The RHSAC advises the CEO on emerging issues and matters of major public concern relating to radiation protection and nuclear safety.

Registration - an authorisation by the Authority for a radiation apparatus or sealed source apparatus, or a premises, in which radiation sources are used.

Regulatory Guide – a guidance document published by ARPANSA for ARPANSA Licence holders or applicants. Separate from *national guide*.

Relevant jurisdiction legislation – the applicable radiation safety legislation of the jurisdiction in question. These are listed in the previous section.

Sealed source - radioactive material that is permanently sealed in a capsule or closely bound and in solid form.

Source (Radiation Source) – Radioactive material or apparatus, which may be subject to regulatory control.

State Government – Is the government of one of the sovereign States, distinct from *Commonwealth Government*.

Unsealed material - radioactive material other than in a sealed source.

State and Territory the six states - New South Wales (NSW), South Australia (SA), Queensland (QLD), Tasmania (TAS), Victoria (VIC), Western Australia (WA) - and two independent territories - Australian Capital Territory(ACT), Northern Territory (NT).

Action plan

This section focuses on the Commonwealth, in particular the Australian Radiation Protection and Nuclear Safety Agency. Issues which affect national uniformity and may require a multi-jurisdictional approach are highlighted in green below.

The Action Plan lists proposed actions to be taken to improve alignment with the IAEA safety standards, as relevant in the Australian context. The Action Plan should be considered a draft, which will be finalised subsequent to receiving the IRRS report. However, some of the actions are already ongoing.

Action number	Short description		
1.	**National policy and strategy [national uniformity]**		
IRRS module number	1	**Summary report section**	1.1; 13
IAEA safety standard requirement(s)	**GSR Part 1 (Rev. 1) - Requirement 1: National policy and strategy for safety** The government shall establish a national policy and strategy for safety, the implementation of which shall be subject to a graded approach in accordance with national circumstances and with the radiation risks associated with facilities and activities, to achieve the fundamental safety objective and to apply the fundamental safety principles established in the Safety Fundamentals. 2.3 National policy and strategy for safety shall express a long term commitment to safety. The national policy shall be promulgated as a statement of the government's intent. The strategy shall set out the mechanisms for implementing the national policy. **GSR Part 1 (Rev. 1) – Requirement 2: Establishment of a framework for safety** 2.5 The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following: [2.5 (1) to 2.5 (19) of GSR Part 1 list the elements of a framework for safety]		
Context	Across Australia, there is no single document with a national policy and strategy for safety. However, the elements of the national policy are largely described in jurisdiction and Commonwealth documentation, including the NDRP. Nevertheless, despite having strong networks in place and 20 years of experience of operating under the ARPANS Act, and a legislative directive to promote national uniformity, and of jurisdictional collaboration in the Radiation Health Committee, significant variation remains.		

	This action has synergies with recommendation 2 'Undertake an analysis of policies related to the International Health Regulations (2005) (IHR) to identify gaps and potential overlap in existing policies.' from the WHO Joint External Evaluation (JEE) Mission that was made in relation to the core competency 'National Legislation, Policy and Financing'. The scope of a national policy and strategy for safety and the recommendation by the JEE Mission have significant overlap.
Action to perform	ARPANSA to initiate and promote, in collaboration with the RHC and the Commonwealth Department of Health, actions aimed at drafting a national policy and strategy for safety, and to strengthen a uniform framework for safety and health protection to be included in the National Directory for Radiation Protection, or be otherwise reflected in the legal framework in Australia.
Deadline	Actions have commenced and will be ongoing with a number of milestones over a 3-5 year time frame
Organisation/person responsible	ARPANSA/RHC/Commonwealth Department of Health (e.g. in relation to JEE recommendations)

Action number	Short description		
2.	**Exemption and clearance levels [national uniformity]**		
IRRS module number	1	**Summary report section**	1.1; 11.3; 13.1
IAEA safety standard requirement(s)	**GSR Part 1 (Rev. 1) - Requirement 2: Establishment of a framework for safety** 2.5 The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following: [...] (17) The criteria for release from regulatory control **GSR Part 3 - Requirement 8: Exemption and clearance:** 3.12 The regulatory body shall approve which sources, including materials and objects, within notified or authorized practices may be cleared from regulatory control, using as the basis for such approval the criteria for clearance specified in Schedule I or any clearance levels specified by the regulatory body on the basis of these criteria. By means of this approval, the regulatory body shall ensure that sources that have been cleared from regulatory control do not again become subject to the requirements for notification, registration or licensing unless it so specifies.		
Context	Across Australia, there are no unified/agreed exemption and clearance levels. For example, there are no exemptions on import and there are variations in the exemption levels between States. Jurisdictions typically determine clearance levels only upon application.		
Action to perform	The draft NDRP 2nd Edition is proposing to incorporate by reference Schedule I of GSR Part 3, which, when implemented, will require all jurisdictions to incorporate the provisions in GSR Part 3 for exemptions and clearance into their legal and regulatory frameworks. ARPANSA to facilitate the national adoption of the exemption and clearance levels as part of its function to promote national uniformity. ARPANSA to propose that the ARPANS Regulations be amended to give effect to provisions for clearance outlined in GSR Part 3.		
Deadline	Mid 2020		
Organisation/person responsible	RHC/ARPANSA		

Action number	Short description		
3.	**Decommissioning requirements**		
IRRS module number	1, 5a	**Summary report section**	1.1; 5.5; 1.7
IAEA safety standard requirement(s)	**GSR Part 6 - Requirement 4: Responsibilities of the government for decommissioning** The government shall establish and maintain a governmental, legal and regulatory framework within which all aspects of decommissioning, including management of the resulting radioactive waste, can be planned and carried out safely. This framework shall include a clear allocation of responsibilities, provision of independent regulatory functions, and requirements in respect of financial assurance for decommissioning. **GSR Part 6 - Requirement 5: Responsibilities of the regulatory body for decommissioning** The regulatory body shall regulate all aspects of decommissioning throughout all stages of the facility's lifetime, from initial planning for decommissioning during the siting and design of the facility, to the completion of decommissioning actions and the termination of authorization for decommissioning. The regulatory body shall establish the safety requirements for decommissioning, including requirements for management of the resulting radioactive waste, and shall adopt associated regulations and guides. The regulatory body shall also take actions to ensure that the regulatory requirements are met.		
Context	Decommissioning and the management of associated waste should be recognised elements of a facility life cycle and should therefore be considered in the early planning stage.		
Action to perform	• Following publication of the Regulatory Guide *Decommissioning of Controlled Facilities*, update the Regulatory Guide *Plans and Arrangements for Managing Safety* and review the Performance Objectives and Criteria (PO&C) to reflect the content of the decommissioning guide. • Include *Decommissioning Plan* under 'General information', and Safety Analysis Report under 'Authorisation for decommissioning a controlled facility'; in Schedule 3 Part 1 of the ARPANS Regulations (Information that may be requested by the CEO). • Promote formal mechanisms to ensure funds for decommissioning are set aside at the commencement of major nuclear projects.		
Deadline	Mid 2020		
Organisation/person responsible	ARPANSA		

Action number	Short description		
4.	**Human resource plan**		
IRRS module number	1; 3; 4	**Summary report section**	1.8; 3.2; **3.3Error! Reference source not found.**; 4.4
IAEA safety standard requirement(s)	**GSR Part 3 - Requirement 17: Effective independence in the performance of regulatory functions** 4.8 To maintain the effective independence of the regulatory body, special consideration shall be given when new staff members are recruited from authorized parties, and the independence of the regulatory body, regulatory aspects and safety considerations shall be emphasized in their training. The regulatory body shall ensure that its staff operate professionally and within its remit in relation to safety. **GSR Part 3 - Requirement 18: Staffing and competence of the regulatory body** 4.11 The regulatory body has to have appropriately qualified and competent staff. A human resources plan shall be developed that states the number of staff necessary and the essential knowledge, skills and abilities for them to perform all the necessary regulatory functions.		
Context	ARPANSA is currently developing a system to ensure that its regulatory functions including staffing and competence and other resourcing is consistent with the requirements of ISO:17020:2012 *Conformity assessment – Requirements for operation of various types of bodies performing inspection.* This includes a Qualification Card system to check-off when a person employed as a regulatory officer meets minimum competency standards to become an authorised Inspector. ARPANSA currently identifies core competencies for Inspectors and this is taken into account in the recruitment and personnel development processes, and is underway to establish resource plans. Recruits are hired with pre-existing competencies which are then supplemented with on-the-job and other training that allows them to fully participate in the regulatory business. The action should also consider the particular issues surrounding recruitment and training of staff from licence holders, as well as other factors that contribute to the integrity of the regulatory activities. There are cross-linkages between this action item and the actions resulting from the Joint External Evaluation of Core Competencies under the World Health Regulations (WHO), referred to in action item 1.		
Action to perform	A formal human resource plan is under development and will contribute to, and be informed by, the ISO 17020 project, which takes into account at least the factors mentioned above under 'Context' and is integrated with the ARPANSA-wide arrangements for managing the Agency's human capital.		
Deadline	End 2019		

Action number	Short description
Organisation/person responsible	ARPANSA

Action number	Short description		
5.	**Accreditation competencies**		
IRRS module number	6	**Summary report section**	1.9; 13
IAEA safety standard requirement(s)	**GSR Part 1 - Requirement 13: Provision of technical services** 2.41 Technical services do not necessarily have to be provided by the government. However, if no suitable commercial or non-governmental provider of the necessary technical services is available, the government may have to make provision for the availability of such services. The regulatory body shall authorize technical services that may have significance for safety, as appropriate.		
Context	Across Australian jurisdictions, there is no agreed and uniform requirements for accreditation for performing technical services, including mandatory qualifications or service providers (e.g. dosimetry or testing, or any other service or profession); these could be established through the RHC. Criteria could be based on international and national standards, and other reference documentation.		
Action to perform	ARPANSA to initiate and support the identification of competencies and suitable means for accreditation, or similar approval, in collaboration with jurisdictions, professional bodies and key stakeholders. These accreditation competencies following agreement by jurisdictions, should be listed in the NDRP.		
Deadline	Part of business as usual, but a first set of competencies should be agreed prior to the end of 2020.		
Organisation/person responsible	RHC/ARPANSA		

Action number	Short description		
6.	**National sealed source register [national uniformity]**		
IRRS module number	2; 10	**Summary report section**	2.1; 10.5
IAEA safety standard requirement(s)	***GSR 7 Requirement 4 – Hazard Assessment*** *The government shall ensure that a hazard assessment is performed to provide a basis for a graded approach in preparedness and response for a nuclear or radiological emergency (4.18, 4.21, 4.22)* ***GSR Part 1 (Rev. 1): Requirement 14 - International obligations and arrangements for international cooperation and assistance*** 3.2 The features of the global safety regime include: [...] (b) Codes of conduct that promote the adoption of good practices in the relevant facilities and activities.		
Context	Australia is experiencing challenges in meeting the intent to fully implement the Code of Conduct for safety and security or radioactive sources in relation to establishing and maintaining a National Sealed Source Register (NSSR). Despite previously establishing the NSSR, the RHC decided in 2016 to abandon the NSSR and revert to utilising a network of jurisdictional registers. This decision was challenged when Australia received a follow up IAEA IPPAS Mission in 2017. It was that Australia (ARPANSA) establish a national register of sources to improve arrangements for an accurate and real-time national radioactive source register as the arrangements were not meeting the intent of the Code of Conduct for safety and security of radioactive sources (SSRS). In 2017 when Australia received a Joint External Evaluation (JEE) of International Health Regulation Core Capacities of Australia a similar recommendation was received. The JEE recommendation stated that Australia (all jurisdictions) should *Conduct a national hazard assessment, to include creating an inventory of radiation sources.* ARPANSA has been tasked with leading the implementation of this action, in cooperation with the RHC. This action is already captured in the NAPHS, but work is yet to commence.		
Action to perform	ARPANSA and the RHC to establish arrangements (i.e. NSSR) for accurate storage and retrieval of information on radioactive sources to meet the expectations of the code of conduct for SSRS and strengthen the linkage between safety and security and threat prevention.		
Deadline	2022		
Organisation/person responsible	ARPANSA/RHC and JEE NAPHS stakeholders		

Action number	Short description		
7.	**Sharing of international and national experience [national uniformity]**		
IRRS module number	1; 2; 11d	**Summary report section**	1.2; 2, 5
IAEA safety standard requirement(s)	**GSR Part 1 - Requirement 15: Sharing of operating experience and regulatory experience** The regulatory body shall make arrangements for analysis to be carried out to identify lessons to be learned from operating experience and regulatory experience, including experience in other States, and for the dissemination of the lessons learned and for their use by authorized parties, the regulatory body and other relevant authorities.		
Context	ARPANSA shares outcomes from national and international meetings and registers to Australian regulators/operators on an ad-hoc basis through the Radiation Health Committee (RHC), conferences and peak professional bodies. There is no single point or method of contact for reporting and receiving information, and currently no formal system for sharing this type of information across the organisation and with the other Australian jurisdictions.		
Action to perform	Establish and implement a formal system for sharing relevant international information (including registers) to a broader audience including the States and Territories. This may include the expanded use of the Radiation Regulators' Network (RRN) and the RHC. Identify opportunities to further utilise and share non-Commonwealth expertise in international and national forums. This also includes the existing projects for the dissemination of ARIR and ANRDR registers, and enhancements of the registers to increase the use of these resources.		
Deadline	Mid 2022		
Organisation/person responsible	ARPANSA to lead with participation of RHC		

Action number	Short description		
8.	**Safety records**		
IRRS module number	3	**Summary report section**	3.7
IAEA safety standard requirement(s)	**GSR Part 1 - Requirement 35: Safety related records** 4.63 The regulatory body shall make provision for establishing and maintaining the following main registers and inventories: • [...] • Records relating to the safety of facilities and activities; • Records that might be necessary for the shutdown and decommissioning (or closure) of facilities; • [...]		
Context	ARPANSA specifies a number of records that must be maintained by the licence holder, including within the Regulatory Guide *Plans and Arrangements for Managing Safety*. However, this does not currently include is currently explicit requirement on facility safety documentation including engineering plant, design variations, operations logs, which may in particular be required to make informed regulatory decisions in the decommissioning state of major facilities.		
Action to perform	To ensure records are maintained, the Regulatory Guide *Plans and Arrangements for Managing Safety* should be updated to include documents relating to safety of plant, equipment and operation for the purpose of past, present and future operations, including decommissioning and disposal.		
Deadline	Following the approval of the draft decommissioning guide.		
Organisation/person responsible	ARPANSA		

Action number	Short description		
9.	**Integrated Management System**		
IRRS module number	4	**Summary report section**	4
IAEA safety standard requirement(s)	GSR Part 2 - Requirement 6: Integration of the management system The management system shall integrate its elements, including safety, health, environmental, security, quality, human-and-organizational-factor, societal and economic elements, so that safety is not compromised. 4.9. The management system shall be applied to achieve goals safely, to enhance safety and to foster a strong safety culture by: (a) bringing together in a coherent manner all the necessary elements for safely managing the organization and its activities (b) describing the arrangements made for management of the organization and its activities (c) describing the planned and systematic actions necessary to provide confidence that all requirements are met (d) ensuring that safety is taken into account in decision making and is not compromised by any decisions taken.		
Context	ARPANSA is developing an integrated management system. Documented procedures, policies and record management practices are in place to allow the regulator to effectively discharge their functions. However, the management system does not integrate completely across the agency and across all functional objectives. Additionally, reporting and analytical functionality is limited which impacts on ARPANSA's ability to effectively review licence holder operations.		
Action to perform	Continue to develop the IMS project.		
Deadline	Continuous improvement post-IRRS		
Organisation/person responsible	ARPANSA		

Action number	Short description		
10.	**Regulatory information management**		
IRRS module number	4	**Summary report section**	4
IAEA safety standard requirement(s)	**GSR Part 1 - Requirement 26: Graded approach to review and assessment of a facility or an activity** 4.46. For an integrated safety assessment, the regulatory body shall first organize the results obtained in a systematic manner. It shall then identify trends and conclusions drawn from inspections, from reviews and assessments for operating facilities, and from the conduct of activities where relevant. Feedback information shall be provided to the authorized party. This integrated safety assessment shall be repeated periodically, with account taken of the radiation risks associated with the facility or activity, in accordance with a graded approach. **GSR Part 2 - Requirement 13: Measurement, assessment and improvement of the management system** 6.7. The management system shall include evaluation and timely use of the following: (a) Lessons from experience gained and from events that have occurred, both within the organization and outside the organization, and lessons from identifying the causes of events; (b) Technical advances and results of research and development; (c) Lessons from identifying good practices.		
Context	While the current system acts as a store of this information, it has limited reporting functionality and is not integrated into operational methods. An enhanced system would help to improve quality and ensure decisions are effectively and efficiently made based on the analysis of data and information.		
Action to perform	ARPANSA is investigating options to enhance the current system for the management of regulatory information associated with licence holders and regulatory activities. This includes applications, licences, inspections, enforcement records. ARPANSA has commenced the project planning phase and is consulting with stakeholders including licence holders and regulatory staff. A scope of work has been drafted which will be finalised when funding is allocated.		
Deadline	As part of operational activities and improvement measures.		
Organisation/person responsible	ARPANSA		

Action number	Short description		
11.	**Safety culture assessments**		
IRRS module number	4	**Summary report section**	4.6
IAEA safety standard requirement(s)	**GSR Part 2 - Requirement 14: Measurement, assessment and improvement of leadership for safety and of safety culture** 6.9 Senior management shall ensure that self-assessment of leadership for safety and of safety culture includes assessment at all organizational levels and for all functions in the organization. Senior management shall ensure that such self-assessment makes use of recognized experts in the assessment of leadership and of safety culture. 6.10. Senior management shall ensure that an independent assessment of leadership for safety and of safety culture is conducted for enhancement of the organizational culture for safety (i.e. the organizational culture as it relates to safety and as it fosters a strong safety culture in the organization). 6.11. The results of self-assessments and independent assessments of leadership for safety and of safety culture [1] shall be communicated at all levels in the organization. The results of such assessments shall be acted upon to foster and sustain a strong safety culture, to improve leadership for safety and to foster a learning attitude within the organization.		
Context	A positive safety culture across the Agency is promoted through a number of activities and initiatives, including WHS induction training, WHS training for supervisors, adoption of 'safety moments' at the commencement of key meetings, WHS inspection program, participation and contribution in the HIRAM process, report card process and by employing a holistic safety approach in accordance with the ARPANSA Holistic Safety Guidelines.		
Action to perform	ARPANSA is establishing a system for the systematic assessment of the culture of the regulator which can be utilised to foster and sustain a strong safety culture, drawing on external expertise The first area to undertake this survey is intended to be the Regulatory Services Branch, followed by other Branches and Offices.		
Deadline	Project has commenced. First analysis, focusing on the Regulatory Services Branch, to be completed mid-2019.		
Organisation/person responsible	ARPANSA		

Action number	Short description		
12.	**Transport package approval [national uniformity]**		
IRRS module number	11c	**Summary report section**	5.6
IAEA safety standard requirement(s)	**GSR Part 1 - Requirement 7: Coordination of different authorities with responsibilities for safety within the regulatory framework for safety** 2.18. Where several authorities have responsibilities for safety within the regulatory framework for safety, the responsibilities and functions of each authority shall be clearly specified in the relevant legislation. The government shall ensure that there is appropriate coordination of and liaison between the various authorities concerned in areas such as: ... (11) Safety in the transport of dangerous goods, including nuclear material and radioactive material; ... This coordination and liaison can be achieved by means of memoranda of understanding, appropriate communication and regular meetings. Such coordination assists in achieving consistency and in enabling authorities to benefit from each other's experience.		
Context	ARPANSA certifies of package design (including special form radioactive material, low dispersible radioactive material, packages containing 0.1 kg or more of uranium hexafluoride, packages containing fissile material, Type B(U) packages, Type B(M) packages, Type C packages) and validations of certificates. States and Territories also perform these functions or may request ARPANSA to provide these authorisations, or assistance in the review and assessment of these applications.		
Action to perform	Establish a formal process for the management of transport certification for use by all jurisdictions. For example a register of all certificates issued in Australia and maintain this information in a readily accessible format. Additionally the arrangements whereby jurisdictions recognise or perform authorisations on behalf of a jurisdiction are to be documented to ensure clarity.		
Deadline	2020		
Organisation/person responsible	RHC/ARPANSA		

Action number	Short description		
13.	**Transport inspection and verification**		
IRRS module number	11c	**Summary report section**	7.6
IAEA safety standard requirement(s)	**SSR-6, 307-308** 307. The competent authority shall assure compliance with these Regulations. 308. The relevant competent authority shall arrange for periodic assessments of the radiation doses to persons due to the transport of radioactive material, to ensure that the system of protection and safety complies with the Basic Safety Standards [2]. **GUIDE TS-G-1.5 Compliance Assurance for the Safe Transport of Radioactive Material:** 2.5. Through the compliance assurance programme, the competent authority should obtain assurance that all transport requirements are being met in practice by the users of the Transport Regulations. Monitoring of the effectiveness of compliance is generally performed by routine, periodic inspections (announced or unannounced) of the user's activities. For consignors, such inspections are generally examinations of the procedures before, during or after the transport. For carriers, such inspections are generally performed during or after the transport. The frequency of inspection should be established by taking into account the scope and potential importance to safety of the user's activities		
Context	ARPANSA complies with the standard. However, ARPANSA has not implemented the recommendations of the safety guide.		
Action to perform	ARPANSA to implement a system for inspection of handling and stowage of packages by consignors and carriers of packages while in transit.		
Deadline	Mid 2019		
Organisation/person responsible	ARPANSA		

Action number	Short description		
14.	**Regulatory assessment principles review**		
IRRS module number	9	**Summary report section**	9.1
IAEA safety standard requirement(s)	**GSR Part 1 (Rev. 1) - Requirement 33: Review of regulations and guides** *Regulations and guides shall be reviewed and revised as necessary to keep them up to date, with due consideration of relevant international safety standards and technical standards and of relevant experience gained.*		
Context	The ARPANSA guide Regulatory Assessment Principles (RAPs), which consolidated design and operational requirements for ARPANSA licence holders, was recently retried in favour of direct reference to IBP documents.		
Action to perform	A comprehensive analysis on which documents are applicable to which facilities and any gaps has commenced but not yet completed; it should be pursued in order to ascertain appropriate consideration of 'international best practice in ARPANSA's licensing activities. As necessary, revise the Performance Objectives and Criteria (PO&C) to reflect the Regulatory Assessment Principles.		
Deadline	Mid 2019		
Organisation/person responsible	ARPANSA		

Action number	Short description		
15.	**Emergency plans**		
IRRS module number	10 (5,9)	**Summary report section**	10.2 (5)
IAEA safety standard requirement(s)	**GSR Part 7**		
Context	While the ARPANSA Plans and Arrangements Guide includes the key elements described above, it currently refers to RPS7 rather than RPS G-3 which has not yet been formally adopted and published.		
Action to perform	Following publication of RPS G-3 ARPANSA's Regulatory Guide *Plans and Arrangements for Managing Safety* will need to be revised to include RPS G--3 guidance including: • expectation of response time objectives and emergency action levels in operator plans (extent depends on hazard) • general, site area, facility and alert levels of classification • requirement for redundancy/diversity in off-site communications in the Plans and Arrangements Guide • consideration of waste generated in an emergency. The Performance Objectives & Criteria to be reviewed and as necessary also revised in the light of the changes to the plans and arrangements.		
Deadline	Following publication of RPS G-3		
Organisation/person responsible	ARPANSA		

Action number	Short description		
16.	**Implement actions from JEE for radiation emergencies**		
IRRS module number	10; 5; 9	**Summary report section**	10.2; 5
IAEA safety standard requirement(s)	***GSR Part 7***		
Context	Australia received a Joint External Evaluation (JEE) of International Health Regulation Core Capacities of Australia in 2017 and a number of recommendations were made that related to radiation emergencies. ARPANSA has been tasked with leading the implementation of the action plan for 3 recommendations and contributing to other recommendations in the NAPHS.		
Action to perform	ARPANSA continue to action Implementation of the JEE recommendations as identified in NAPHS.		
Deadline	2023		
Organisation/person responsible	ARPANSA (in cooperation with RHC, and other Commonwealth, State and Territory agencies as required)		

Action number	Short description		
17.	**Radon strategy/radon action plan**		
IRRS module number	5e	**Summary report section**	11.3
IAEA safety standard requirement(s)	**GSR Part 3 - Requirement 50: Public exposure due to radon indoors** 5.21. The government shall assign responsibility for: (a) Establishing and implementing the action plan for controlling public exposure due to ^{222}Rn indoors; (b) Determining the circumstances under which actions are to be mandatory or are to be voluntary, with account taken of legal requirements and of the prevailing social and economic circumstances.		
Context	ARPANSA has guidance and advice on radon. However, Australia has no Radon Strategy or Radon Action Plan in place.		
Action to perform	The national radon protection strategy is currently under development by ARPANSA and will assess the need for a national action plan. Additionally, ARPANSA is presently undertaking studies to characterise possible radon prone areas.		
Deadline	End 2019		
Organisation/person responsible	ARPANSA		

Action number	Short description		
18.	**Referring medical practitioner [national uniformity]**		
IRRS module number	11d	**Summary report section**	11.1
IAEA safety standard requirement(s)	**GSR Part 3 - Requirement 4: Responsibilities for protection and safety** 2.41. Other parties shall have specified responsibilities in relation to protection and safety. These other parties include: (c) Referring medical practitioners; **GSR Part 3 - Requirement 37: Justification of medical exposures** 3.158. Relevant national or international referral guidelines shall be taken into account for the justification of the medical exposure of an individual patient in a radiological procedure. *[Introduction 1.14: The specific objectives of the exposure, the clinical circumstances and the characteristics of the individual involved have to be taken into account by means of referral guidelines developed by professional bodies and the health authority.]*		
Context	There is a lack of uniformity on the responsibilities of, and guidance available to, the referring medical practitioner.		
Action to perform	Engage with jurisdictional regulators to publish and adopt a revised Code for Medical Exposure (RPS C-5) which includes a requirement to ensure that relevant referral guidelines are taken into account for the justification of diagnostic medical exposures.		
Deadline	June 2019 (for publication of RPS C-5)		
Organisation/person responsible	ARPANSA/RHC		

Action number	Short description		
19.	**Diagnostic reference levels**		
IRRS module number	11d	**Summary report section**	11.1
IAEA safety standard requirement(s)	**GSR Part 3 - Requirement 34: Responsibilities of the government specific to medical exposure** 3.148. The government shall ensure, as part of the responsibilities specified in paragraph 2.15, that as a result of consultation between the health authority, relevant professional bodies and the regulatory body, a set of diagnostic reference levels is established for medical exposures incurred in medical imaging, including image guided interventional procedures. In setting such diagnostic reference levels, account shall be taken of the need for adequate image quality, to enable the requirements of para. 3.169 to be fulfilled. Such diagnostic reference levels shall be based, as far as possible, on wide scale surveys or on published values that are appropriate for the local circumstances.		
Context	Diagnostic reference levels are established for MDCT and nuclear medicine and in consultation with relevant professional bodies are being developed for image-guided interventional procedures.		
Action to perform	Establish and monitor diagnostic reference levels for appropriate modalities.		
Deadline	Ongoing		
Organisation/person responsible	ARPANSA		

Action number	Short description		
20.	**Health surveillance [national uniformity]**		
IRRS module number	11e	**Summary report section**	11.2
IAEA safety standard requirement(s)	**GSR Part 3 - Requirement 32: Monitoring and reporting** 3.76. Employers, registrants and licensees shall ensure, for all workers engaged in activities in which they are or could be subject to occupational exposure, that: (f) Necessary workers' health surveillance and health services for workers are provided;		
Context	ARPANSA does not require mandatory health surveillance for radiation workers, or provide specific guidance on this topic. However, there is a general requirement in the WHS Regulations for this to be considered. IAEA draft document DS 453 will detail requirement health surveillance of occupational exposed workers		
Action	Jurisdictions to consider applying the requirements of DS453 once published.		
Deadline	Following publication of IAEA DS 453.		
Organisation/person responsible	ARPANSA/RHC		

Action number	Short description		
21.	**Independent monitoring/public data**		
IRRS module number	5e	**Summary report section**	11.3
IAEA safety standard requirement(s)	**GSR Part 3 - Requirement 32: Monitoring and reporting** The regulatory body and relevant parties shall ensure that programmes for source monitoring and environmental monitoring are in place and that the results from the monitoring are recorded and are made available. 3.135. The regulatory body shall be responsible, as appropriate, for: (c) Making provision for an independent monitoring programme. 3.136. The regulatory body shall publish or shall make available on request, as appropriate, results from source monitoring and environmental monitoring programmes and assessments of doses from public exposure		
Context	Licence holders have monitoring programs in place. However, ARPANSA does not provide for an independent monitoring programme and assessment of public doses due to authorised facilities or activities. Therefore, these results are not made publicly available by ARPANSA, but may be made available by the licence holder.		
Action to perform	ARPANSA is establishing the Australian Radiation Monitoring System (ARMS) to monitor the environment when Australian ports receive a visiting nuclear-powered vessel. In the unlikely event of an accident, Australia has adopted arrangements which require radiation monitoring of the nuclear-powered vessel while it is berthed at port. This monitoring program has two components: environmental monitoring to detect the release of any radioactive material to the environment; and direct radiation monitoring of the vicinity of the nuclear-powered vessel to provide warning of any malfunction which may result in a release of radioactivity. The automated system will be an early warning system in the event of a radiological release from a visiting vessel and will be able to provide valuable data before, during and after a nuclear accident. The real-time data generated by ARMS will be accessible to the public via an interactive chart that will be available on our website once the network is installed. ARPANSA is currently installing ARMS stations in Western Australia, Northern Territory and Queensland. ARPANSA will also establish an ARMS station at the ANSTO Lucas Heights site. This will be one component of an independent environmental monitoring program that is currently being developed for the Lucas Heights site.		
Deadline	End of 2018 for ARMS, end of 2019 for an environmental monitoring including environmental sampling for Lucas Heights.		
Organisation/person responsible	ARPANSA		