3.2 Promote radiological and nuclear safety and security and emergency preparedness

Over the reporting period, ARPANSA continued to promote the security and safety of radioactive material to support the Australian Government's approach to prevention of radiological and nuclear emergencies.

Security of radioactive sources

Artificial sources of radiation, whether these are installations, sealed sources, equipment that emit radiation, or any other kind, pose health risks to people and the environment in case of accidents or acts with malicious intent. Accordingly, measures need to be in place to maintain the safety and security of all such sources.

Safety and security is achieved through implementation of technical measures and standards, plans and arrangements for safety and security, and – perhaps most importantly – through safety and security culture among all those involved in the operations.

We support the development of safety culture through guidance on holistic safety and appropriate tools. We support the security of high activity radioactive sources through the promotion of a national approach to legislative, administrative and operational controls, including issuing permits for import/export of sources and radioactive substances.

Import and export permits

In order to continue to give effect to the International Atomic Energy Agency's (IAEA) *Code of Conduct on the Safety and Security of Radioactive Sources*, ARPANSA continued to issue permits for the import and export of radioactive materials. The importation of radioactive material into Australia requires permission under Regulation 4R of the Customs (Prohibited Imports) Regulations 1956. These regulations are made under the *Customs Act 1901*. Under the Customs (Prohibited Imports) Regulations 1956, the Minister for Health may authorise ARPANSA officers to approve import permissions as a permit issuing authority. During this period, ARPANSA authorised officers issued 710 non-medical permits (including 431 urgent permits, 257 standard permits and 22 twelve month permits) and 1174 permits for medical radioisotopes (including 1151 single shipment permits and 23 twelve month permits).

Graduates of the first Vocational Graduate Certificate in Radiation Security Course undertaken as part of the National Radiation Security Advisor Accreditation Scheme

Border control enhancements for the import and export of radioactive materials

During 2014-15, ARPANSA, in cooperation with the Australian Customs and Border Protection Service and the Australian Bureau of Statistics (ABS), introduced a number of changes in order to enhance the control of radioactive materials across Australia's borders, and to address identified weaknesses in the regulatory regime for the import and export of radioactive materials. Specifically, enhancements to the Customs Integrated Cargo System were implemented which now flags a requirement for ARPANSA issued permits to be sighted by Customs officers.

Furthermore, specific Australian Harmonised Export Commodity Classification Codes were developed by the ABS to clearly differentiate radioactive materials from other substances which may need a permit. These changes have translated into increased community safety and security outcomes for all Australians, and improve Australia's ability to give effect to the IAEA *Code of Conduct on the Safety and Security of Radioactive Sources*, including the supplementary guidance on imports and exports.

National Radiation Security Advisor Accreditation Scheme

In December 2014, the first class of the *Vocational Graduate Certificate in Radiation Security* graduated. The course was attended by protective security experts from around Australia. The establishment of this course allows the states and territories access to a pool of accredited assessors who will implement the ARPANSA RPS 11 *Code of Practice on the Security of Radioactive Sources* with consistency across all jurisdictions. The establishment of this course is a significant achievement by ARPANSA and the Protective Security Training College of the Attorney General's Department, resulting in an excellent security outcome for Australia.

ANZCTC CBRN Crime Scene Investigators and Incident Commanders Course

As part of the Australia and New Zealand Counter Terrorism Committee (ANZCTC) Chemical, Biological, Radiological and Nuclear Security Subcommittee (CBRNSSC), ARPANSA played a leading role in the annual CBRN Crime Scene Investigators and the CBRN Incident Commanders training course.

ARPANSA played the lead role in designing and preparing all of the CBRN Scenarios with the support of the Directing Staff and presented a number of lectures throughout the duration of the course.

In 2014, ARPANSA was nominated to represent the CBRN Technical Response Group which developed these courses through the CBRNSSC in order to promote national uniformity in CBRN skills and knowledge, while also ensuring interoperability and harmonised communications across all jurisdictions within Australia. This course was hosted by the Country Fire Authority and Mount Waverley Police Academy in Victoria and was attended by 60 incident commanders and front line counterterrorism operators from all jurisdictions. ARPANSA played the lead role in designing and preparing all of the CBRN scenarios with the support of the directing staff and presented a number of lectures throughout the duration of the course.

This activity has significantly elevated ARPANSA's ability to contribute to CBRN incidents in the national security space where all jurisdictions have been engaged at the tactical, operational and command levels. This activity has made a positive impact nationally to strengthen Australia's preparedness for these incidents or events should they ever transpire.

ARPANSA radiation emergency preparedness and response arrangements

ARPANSA Incident Management Plan

While 2014-15, following testing of the plan and as a consequence of other changes, nationally and organisationally the *ARPANSA Incident Management Plan* was renamed to *ARPANSA Emergency Preparedness and Response Manual* (EPR Manual).

Whilst the new document retains the same broad structure, it was timely to review the content having been in place for three years.

In June 2015, the ARPANSA Emergency Preparedness and Response Group conducted a recall and deployment exercise to simulate a realistic no-notice recall and deployment of trained personnel in response to a hypothetical nuclear powered warship (NPW) accident.

Other discrete elements of the plan were tested throughout the course of 2014-15, including deployment of liaison officers to Australian Government Operations Centres for exercises; formulation of public information products during the IAEA Convention Exercises; and our modelling, assessment and advice capabilities were tested in the lead up to and during ARPANSA participation in whole-of-government exercises.

IAEA ConvEx exercises

ARPANSA is also the designated National Competent Authority (NCA) for Australia for radiological and nuclear emergencies under the relevant IAEA Conventions. ARPANSA participated in three ConvEx-1 and two ConvEx-2 exercises which were aimed at testing NCA's ability to respond to hypothetical radiological emergency scenarios through information exchange, requesting and providing assistance. Participation in the exercises confirmed the responsiveness of ARPANSA in the role as an NCA, verified national coordination arrangements were operating effectively, and tested elements of our own arrangements identified in the EPR Manual.

ARPANSA radiation emergency response capability

ARPANSA has continued to maintain specialised radiation emergency capabilities in line with the EPR Manual, including the Operations Centre and provision of a 24 hour a day point of contact. During 2014-15, these response capabilities were restructured to align with the IAEA Response and Assistance Network (RANET) functional areas. This reduced the training liability for ARPANSA while also improving our interoperability should the Australian RANET capabilities be called upon to assist internationally. It also established a framework for improved interoperability between Australian Government and state and territory response teams, consistent with our promotion of national uniformity.

ARPANSA activities for national EPR arrangements

Functional analysis of national EPR arrangements supporting nuclear power warship visits

ARPANSA, as part of the Visiting Ships Panel (Nuclear) [VSP(N)], has undertaken a review of the plans and arrangements detailed in Australian Defence Organisation manual - OPSMAN1. A workshop was held in October 2014 which focussed on the development of a functional model that would map the roles and functions of the VSP(N) and nuclear powered warship activities at the national and regional level. Further work on implementing the functional model was undertaken in follow-up sessions of the VSP(N) during the course of 2014-15.

ARPANSA also participated in routine port validation process as part of the VSP(N). This included revalidating Western Australian ports, expanding the scope of Darwin to allow visits by nuclear powered aircraft carriers in addition to submarines. The Port of Brisbane was also revalidated which included a table top exercise of the Brisbane Port Safety Organisation. All of these activities ensure visits to Australian ports by foreign nuclear powered warships are conducted in a manner that assures the protection of the public and environment.

National Radioanalytical Laboratory Network

ARPANSA conducted a second capability exercise to ascertain the capability of Australasian laboratories to produce acceptable analyses for food that might contain radioactive elements created in a nuclear reactor. This exercise highlighted the need to develop a formal laboratory network that could provide the necessary capacity for radioactivity analyses in the event of a significant radiological incident.

ARGOS atmospheric dispersion modelling

The ARGOS decision support tool is ARPANSA's primary modelling tool for giving advice on atmospheric dispersion in a nuclear or radiological emergency. The system applies meteorological predictions supplied by Bureau of Meteorology, which have been refined to higher resolutions over the last twelve months. ARPANSA participates in the annual ARGOS Consortium Meeting (held in Copenhagen during September) and the ARGOS User

CASE STUDY – ARPANSA's involvement in monitoring compliance with the Comprehensive Nuclear-Test-Ban Treaty

What is the Comprehensive Nuclear-Test-Ban Treaty?

A Comprehensive Nuclear-Test-Ban Treaty (CTBT) to ban all nuclear explosion tests was opened for signature in New York on 24 September 1996. Australia signed the Treaty on the same day and ratified it on 9 July 1998. As of June 2015, 183 countries have signed and 164 have ratified. To see the latest country to sign or ratify and to find more information on the CTBT Organization (CTBTO) visit their website at *www.ctbto.org*.

How can nuclear tests be detected?

The CTBTO is constructing an International Monitoring System (IMS) to monitor compliance with the Treaty. By analysing, integrating and comparing data from the IMS, the time, location and nature of a possible nuclear event can be determined. The network consists of 321 monitoring facilities and 16 radionuclide laboratories that globally monitor for evidence of nuclear explosions in all environments. These monitoring facilities use a variety of methods to detect evidence of nuclear testing. Seismic, hydroacoustic and infrasound stations are employed to monitor the underground, underwater and atmosphere environments, respectively. The fourth technology detects radiation from atmospheric sampling.

The Radionuclide Monitoring Station on Cocos (Keeling) Island. Particulate matter from the air is collected on a filter using the high-volume sampler at the left of the compound. The radioactivity collected on the filter over a 24-hour period is measured using highly sensitive instruments inside the building at the right of the compound. The results of the measurement are transmitted to the CTBT Data Centre in Vienna via the satellite dish in the centre of the compound.

The IMS will comprise 80 radionuclide stations when fully implemented and ARPANSA is responsible for carrying out Australia's radionuclide monitoring obligations to the Comprehensive Nuclear-Test-Ban Treaty, and is also responsible for the installation, implementation and operation of seven radionuclide stations and one radionuclide laboratory within Australia and its territories. The stations are located at Melbourne, Perth, Townsville, Darwin, Cocos Island, Macquarie Island and Mawson station (Antarctica).

These stations can detect radioactive debris from atmospheric explosions or vented by underground or underwater nuclear explosions. The presence of specific radionuclides provides unambiguous evidence of a nuclear explosion. Forty of these stations will be capable of measuring for the presence of the relevant noble gases. ARPANSA also operates one of sixteen Radionuclide Laboratories across the IMS. These laboratories are used to analyse samples collected at IMS stations to verify samples that are suspected of containing radionuclide materials that may have been produced by a nuclear explosion.

How does Australia assist in preventing nuclear testing?

Due to their location, all of the stations, except Melbourne, are operated by either the Bureau of Meteorology (BOM) or the Australian Antarctic Division (AAD) under Memoranda of Understanding with ARPANSA. ARPANSA is responsible for training the staff of these organisations, supervising the operation of the stations and maintaining and repairing the equipment. During 2014-15, ARPANSA conducted ten visits to our stations for scheduled and unscheduled maintenance visits. This included one major trip to Macquarie Island to perform scheduled maintenance on the particulate radionuclide station on the island. Over a period of six days, a new gamma spectrometry detector and cooler system was installed, as well as a range of other general station maintenance and system calibrations.

Due to the high level of support from BoM and AAD, as well as ARPANSA's proactive approach to ensuring its stations operate at peak efficiency, the Australian stations were fully operational for 97% of the year, which is well above the average for the IMS network of 86%.

Group Meeting (held in Brazil during May; attended by video conference). ARPANSA also participated in the 'International Workshop on Dispersion and Deposition Modelling for Nuclear Accident Releases', held in Fukushima in March 2015.

ARPANSA activities for international EPR arrangements

Radiation EPR activities under the World Health Organization International Health Regulations

ARPANSA is a member of the World Health Organization's (WHO) Radiation Emergency Medical Preparedness and Assistance Network (REMPAN), established in 1987 in order to fulfil WHO's mandate under the two international conventions on Early Notification and Assistance (ENAC). ARPANSA is a WHO REMPAN Regional Collaborating Centre in conjunction with Peter MacCallum Cancer Centre.

In March 2015, ARPANSA attended a Workshop on Medical Preparedness and Response to Radiation Emergencies jointly hosted by the WHO and Korea Institute of Radiological Medical Sciences in Seoul, Korea. This workshop was attended by countries from the South East Asian and Western Pacific Regions and led to an improved understanding of neighbouring countries arrangements, how they are linked to the international arrangements for medical response to radiological and nuclear (RN) emergencies, including those implemented under the ENAC and the International Health Regulations.

The workshop dedicated a significant portion of the time on discussing the importance of psycho-social consequences of RN emergencies and highlighted the role that risk communication plays in mitigating these impacts on the affected population. ARPANSA will ensure these considerations are adopted into emergency communication strategies.

ARPANSA's contribution to this workshop demonstrated Australian commitment to the International Heath Regulations and REMPAN activities for strengthening the regional preparedness, particularly in medical response to a radiological emergency.

Comprehensive Nuclear-Test-Ban Treaty

As a signatory to the Comprehensive Nuclear-Test-Ban Treaty (CTBT), ARPANSA operates seven radionuclide stations and a radionuclide laboratory which forms part of an International Monitoring System (see case study on CTBTO, page 29).

In February 2015, in cooperation with the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), ARPANSA hosted a workshop for the Radionuclide Laboratories designated in the treaty to provide independent analyses of samples from the CTBTO IMS. These workshops are held about every two years and bring together the operators of these laboratories to discuss developments and issues pertaining to laboratory operations, share operational experience and

Participants in the CTBT Workshop

discuss advances in measurement techniques. The workshop was attended by 34 participants from 13 countries. These participants represented 13 of the 16 laboratories in the network, together with representatives from five different equipment suppliers and representatives of the CTBTO. The observations and recommendations from the workshop were reported by the ARPANSA member of the Australian delegation at the 44th meeting of the CTBTO working group B meeting held in Vienna in March 2015.

CAPABILITY EXERCISE 2015 – Ottawa, Canada

CAPEX 2015 is a practical exercise forum under which a number of nations come together to share skills, knowledge, techniques and experiences relating to CBRN security events. It is a full scale field exercise which includes complex scenarios to be completed by each of the participating countries. ARPANSA provided subject matter expertise to support the incident commanders, forensics officers, bomb technicians, investigators, intelligence officers, medical support and defence personnel during the radiation related exercises.

Performance against deliverables

Qualitative Deliverables

Deliverable	**Enhanced system for response to radiological and nuclear threats and events consistent with international guidance and best practice**
2014-15 Reference Point or Target	The ARPANSA Incident Management Plan is fully implemented and tested
RESULT	During 2014-15 the *ARPANSA Incident Management Plan* (IMP) was tested. As a consequence of testing, changes in organisational and national arrangements were identified requiring the plan to be updated. The IMP was subsequently renamed the *Emergency Preparedness and Response Manual* (EPR Manual) and is now being revised to ensure consistent terminology and enhanced integration with national plans and arrangements. Sub-element testing of the EPR Manual has continued during this period of revision.

Quantitative Key Performance Indicator

Quantitative Indicator	2013-14 Revised Budget	2014-15 Budget Target	2015-16 Forward Year 1
Number of security incidents involving high activity radioactive sources requiring immediate reporting	<2	<2	<2
RESULT	Nil	Nil	

CASE STUDY

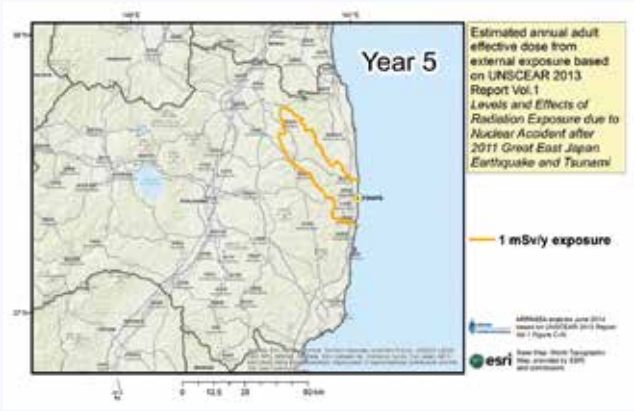
UNSCEAR – 60 years of scientific evaluations

In June 2015, Carl-Magnus Larsson, CEO of ARPANSA, completed his 2.5-year term as Chair of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). The Committee was formed in 1955 to undertake scientific evaluations of sources and effects of ionising radiation, including health risks to people and the environment. UNSCEAR reports its findings directly to the United Nations General Assembly. The reports provide the scientific evidence underpinning the establishment of international guidance and regulation for radiation protection from ionising radiation.

ARPANSA has close links with UNSCEAR, dating back to the beginning. Australia was one of fifteen UN Member States originally invited by the General Assembly to establish UNSCEAR. Cecil E Eddy, Director of the Commonwealth X-ray and Radium Laboratory (one of the predecessors of ARPANSA) was the Chairman of the inaugural UNSCEAR meeting held in March 1956. Since that time, Australia has made significant contributions to the work of UNSCEAR and has chaired nine of its 62 Sessions.

Following the nuclear accident at the Fukushima Dai-ichi Nuclear Power Plant in March 2011, UNSCEAR initiated a project for an assessment of levels and effects of radiation exposure due to the nuclear accident. The work involved contributions of 80 scientists from 18 countries, plus an additional 200 scientists working closely with those nominated to the project. Of the four Expert Groups established by UNSCEAR for this work, the group responsible for the dose and risk assessment to the public and biota, was led by the Chief Radiation Health Scientist from ARPANSA, Stephen Solomon. In addition, ARPANSA provided significant technical and scientific expertise to the assessment.

In April 2014, UNSCEAR published the assessment report *Levels and effects of radiation exposure due to the nuclear accident after the 2011 great east-Japan earthquake and tsunami*. Following the publication of this report UNSCEAR undertook a program of 'outreach' to the Japanese public, government officials, prefecture and municipality governments, academia and other stakeholders, to communicate the report findings and provide an opportunity for open dialogue and feedback on the report. The first of these outreach activities was conducted in May 2014, when an UNSCEAR delegation that included the CEO, 'launched' the report in Fukushima City and Tokyo. In September 2014, a second activity involved visits of an UNSCEAR delegation, including the CEO, to Fukushima City and Koriyama City in Fukushima Prefecture, where public meetings were held which in particular aimed at reaching 'multipliers' (teachers, nurses, doctors and other professionals with a broad outreach in society). In November 2014, a third of these outreach activities was undertaken, with the delegation including the Chief Radiation Health Scientist and one other ARPANSA staff member.



The figure shown is part of an animation prepared by ARPANSA for the outreach program to illustrate the impacts of the Fukushima accident in future years. Based on the published UNSCEAR dose estimates, the ARPANSA animation illustrates the reduction of radiation doses with time as a result of radioactive decay and other physical processes.

The full report can be accessed on *www.unscear.org*.