

3.1 Protect the public, workers and the environment from radiation exposure

ARPANSA, on behalf of the Australian Government, continuously assesses the body of knowledge about ionising and non-ionising radiation to artificial, and natural sources. We aim to keep abreast of international best practice, and provide advice tailored to our Australian environment. While we cannot eliminate sources of radiation from the environment around us, if we can have a good understanding of radiation and ways of controlling our exposure, we can all minimise the risk when necessary, and use the knowledge to reduce concern where there is no reason to be concerned.

Protection of public and the environment

To protect the public and the environment from the harmful effects of radiation exposure, ARPANSA reviews the most up-to-date scientific research and gathers data to inform its regulatory activities. It allows ARPANSA to provide evidence-based, expert advice to the Australian Government and the public. In 2014-15, ARPANSA focussed its scientific activities in this area to characterise the sources of radiation exposures in Australia, to assess the risks from this exposure to radiation to people and the environment, and to reflect this understanding into advice and guidance to the public, Government and other stakeholders. This included the assessment of sources and exposure to naturally occurring ionising radiation, ultraviolet radiation (UVR), electromagnetic radiation and regulated activities.

Solar ultraviolet radiation

ARPANSA's nationwide solar UVR monitoring systems continues to provide real time information on the levels of solar UVR in selected cities. Recent international intercomparison studies, coordinated by ARPANSA, of solar UVR spectral measurement systems were made to demonstrate the consistency of the UVR measurements in different countries. In 2015, the results of an intercomparison program undertaken in 2013 between ARPANSA, Public Health England and the Bureau of Meteorology, supported by the National Institute of Water and Atmospheric Research of New Zealand were published. These results demonstrated there was good agreement between the UVR measurements in Australia, New Zealand and the United Kingdom.

ARPANSA also continued to operate its National Association of Testing Authorities (NATA) – accredited

Ultraviolet Protection Factor (UPF) Testing Service, testing 2005 samples of sun protective clothing and hats, sunglasses and other sun protective materials, and in 2014-15 issued 3 801 500 labels for sun protective clothing ('Swing Tags').

Protection of the environment

A national approach to protection of the environment from ionising radiation has been developed and a draft safety guide was released for public comment. In October 2014, ARPANSA hosted a workshop as a part of the Australasian Radiation Protection Society conference to provide guidance to industry and regulators and to promote a nationally uniform approach to protecting the environment from the harmful effects of ionising radiation. The workshop included the provision of training in the use of the best practice ERICA assessment tool. ERICA (Environmental Risk from Ionising Contaminants: Assessment and Management) is a software tool that enables the assessment of environmental impact of ionising radiation on biota and ecosystems. In April 2015, ARPANSA hosted a second workshop for Australian scientists involved with radiological protection of the environment with a focus on strengthening national collaboration and international linkages.

To continue the development of best practice guidance on how to assess environmental exposures and to demonstrate protection of the environment from human activities, ARPANSA signed a project workplan with the Norwegian Radiation Protection Authority to further develop the ERICA Tool and Database and strengthen its suitability for Australian conditions.

Building capability for measurement of radioactivity

ARPANSA hosted a workshop on alpha spectrometry and the use of Canberra's Apex Alpha acquisition and analysis software in December 2014. The course was attended by eighteen participants from Australia, New Zealand and Singapore and was delivered by Greg Landry from Canberra's Burbank, United States of America office. The workshop included practical demonstrations of laboratory techniques and participants sharing their experiences with alpha-spectrometry. The course was well received and provided participants with an opportunity to share their experiences and develop

a better understanding of the specific features of the Canberra Apex-Alpha software and alpha spectrometry in general.

The accident at the Fukushima Dai-ichi Nuclear Power Plant raised concerns about the possible impact to Australia from the release of radioactive elements to the ocean. Numerical ocean modelling indicates that these will reach the Australian coastline around 2016. ARPANSA conducted a study to determine the background levels of these radioactive elements, due to atmospheric nuclear testing in the 1960s, in commonly consumed seafood from northern Australia. Similar surveys will be conducted in the future to determine whether the releases from Fukushima are detectable in Australian seafood.

ARPANSA developed a system for measuring the very small amounts of radioactive caesium in seawater. This system was used to determine the background levels, due to atmospheric nuclear testing in the 1960s, at six locations around Australia. This program will continue in 2015-16. This system will also be deployed as a more sensitive method for monitoring for releases at ports used by visiting nuclear powered warships.

Electromagnetic radiation

In 2015, ARPANSA published its findings of a survey of extremely low frequency electric and magnetic fields (ELF EMF) associated with electricity supply and distribution infrastructure. The survey of

ELF EMF around electricity supply infrastructure showed that ELF levels were well below exposure limits. A total of 52 separate sites of different types of electricity infrastructure were chosen for measurement in Melbourne. All measurements of ELF EMF around electricity supply infrastructure were well below the National Health and Medical Research Council's exposure limits (generally below 1% of the limits).

ARPANSA also continued to publish on its website monthly summaries on recent scientific papers dealing with EMF/EMR (electromagnetic radiation) and health. The papers are selected on the basis of importance to the protection of health, on perceived likely interest to the wider public and where Australian research is reported.

Radioactive waste safety

Australia has accumulated low level and short lived intermediate level radioactive waste from over 40 years of medical, industrial, and research uses. Today, most of the radioactive waste generated in Australia comes from the operations at the Australian Nuclear Science and Technology Organisation; due to effective ALARA (as low as reasonably achievable) and waste minimisation efforts, however, the annual increase to Australia's inventory is only about 50 m³.

In May 2015, ARPANSA led the Australian delegation at the Fifth Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and



Dr Emilie Van Deventer - Team Leader, Radiation Programme, World Health Organization presenting at Science and Wireless 2014

the Safety of Radioactive Waste Management. Australia's National Report was well received, attracting particular praise from Spain for our regulatory consideration of interdependencies of multiple facilities on the Lucas Heights site. The Australian National Report is available on the ARPANSA website (www.arpansa.gov.au/AboutUs/Collaboration/jointconv.cfm).

Written questions to Australia were primarily focused on progress towards a national radioactive waste management facility and the interim and long term management plans for intermediate level waste (ILW), uranium mining and the management of disused sealed sources. One *Good Practice* was identified for Australia, namely, the planned construction of an industrial scale Synroc waste treatment facility demonstrating a new conditioning process, using titanate-based waste forms, for liquid ILW generated from the production of Molybdenum-99. Achieving a recognised *Good Practice* as a non-nuclear power contracting party is a significant achievement.

Protection of workers

Occupational exposure to ionising radiation occurs across a variety of work environments which may contain man-made sources of radiation, elevated levels of natural radiation, or radioactive materials from past activities. ARPANSA strives to promote the identification, characterisation and monitoring of radiation levels present in work environments to assist workers to take the necessary steps to reduce their occupational exposure. In 2014-15, ARPANSA continued to evaluate and monitor work environments to ensure workers are adequately protected and informed about occupational risks from exposure to radiation.

The Australian National Radiation Dose Register

Uranium workers are one such occupationally exposed group who are monitored for exposure to ionising radiation. Radiation protection of workers requires the maintenance of radiation dose records to assess compliance with occupational dose limits and to minimise the radiation health risk to individuals through the continued improvement of work practices. ARPANSA operates and maintains the Australian National Radiation Dose Register

(ANRDR or the 'Dose Register') for the collection, storage and auditing of radiation dose histories for uranium industry workers. The Dose Register is an electronic database which stores radiation dose information for workers who are occupationally exposed to radiation.

The Dose Register has now been successfully implemented across all uranium mines in Australia: Olympic Dam, Beverley and Honeymoon in South Australia, and Ranger in the Northern Territory. The Dose Register currently holds dose records for more than 34 000 workers from the uranium mining and milling industry. A worker's dose history report from the Dose Register contains all past doses received while working in applicable industries in Australia, and while registered with the Dose Register.

In supporting the control of doses to uranium workers, ARPANSA has focused upon reporting trends to key stakeholders as required, or on request, and ARPANSA is confident that this measure has been successfully met. Now that all uranium mines in Australia are providing records to the Dose Register, the trend data will become more meaningful and will allow ARPANSA to characterise radiation doses to uranium workers at the national level.

The Dose Register is now in the process of expanding to other industries where workers may be exposed to radiation sources, such as mineral sands mining and processing operations, and applicable Commonwealth licence holders. During this financial year, ARPANSA has engaged with Iluka Resources who have volunteered to participate in the ANRDR's pilot program for the mineral sands industry by volunteering a Western Australian worksite as a test site for the ANRDR. The ANRDR team is now in discussions with the relevant state regulator to establish the legal framework for allowing Iluka to submit workers' personal information to ARPANSA in line with privacy laws.

ARPANSA has also commenced stakeholder engagement to include occupationally exposed Commonwealth employees in the Dose Register. During this financial year, ARPANSA has worked closely with CSIRO in the ANRDR's pilot program to establish the legal and practical requirements for applicable Commonwealth licence holders to participate in the ANRDR.

Performance against deliverables

Qualitative Deliverables

Deliverable	Devise protection strategies for the Australian population from ionising and non-ionising radiation
2014-15 Reference Point or Target	Devise protection strategies for the Australian population from ionising and non-ionising radiation
RESULT	<p>ARPANSA nationwide UVR monitoring systems continues to provide real time information on solar UVR levels in selected cities. Recent international intercomparison studies coordinated by ARPANSA of UVR measurement demonstrate the accuracy of the systems.</p> <p>A national approach to protection of the environment from ionising radiation has been developed.</p> <p>A survey of ELF EMF around electricity supply infrastructure were well below exposure limits.</p>

Qualitative Key Performance Indicators

Key Performance Indicator	Radiation doses to uranium industry workers
2014-15 Reference Point or Target	Annual reporting of trend in radiation doses received by workers compiled from Australian National Radiation Dose Register facilitates optimisation of radiation protection in the uranium mining and milling industry.
RESULT	Delivered through publishing an annual newsletter and by providing trend updates at national stakeholder meetings, conferences and other relevant forums.