Australian Government
Australian Radiation Protection and Nuclear Safety Agency

arpansa

ANRDR in Review
2018

Welcome to the 2018 edition of the Australian National Radiation Dose Register (ANRDR) annual newsletter, ***ANRDR in Review***.

The past 12 months has seen some major developments for the ANRDR and in the radiation protection space more generally.

On the ANRDR front, our long-awaited expansion to the medical sector has arrived, and there are exciting improvements on the horizon that will be coming in the near future. In other radiation protection developments, the International Commission on Radiological Protection (ICRP) has published their new dose coefficients for a range of radionuclides, which may affect how internal dose assessments are undertaken in the mining and medical sectors.

In this issue, you will also find the latest analysis of industry doses and information on some of the interesting local and international activities in which the ANRDR team has been involved.

We extend our thanks to all of our current and future partner organisations who support us in our journey to achieve best practice for recording and maintaining dose records for all Australians who work with radiation.

We hope that you find this newsletter of interest and, as always, we encourage your feedback and suggestions for future editions of *ANRDR in Review*.

Significant events

October 2017

The **Minerals Council of Australia** met with ARPANSA representatives to discuss radiation protection issues in the minerals sector.

December 2017

Medical physicists attended the **Diagnostic Imaging Medical Physicists Learning & Education (DIMPLE) Day** at ARPANSA to learn about the ANRDR and other developments in medical imaging.

February 2018

Our ANRDR representative attended the **International Atomic Energy Agency (IAEA)** expert mission to the United Arab Emirates.

May 2018

The 5th **Asian and Oceanic International Radiation Protection Association's (IRPA) Regional Congress on Radiation Protection (AOCRP-5) Conference** was held in Melbourne, highlighting the latest developments in radiation protection from around the world.

May 2018

Our ANRDR team hosted international visitors at ARPANSA for the IAEA's ***Regional Workshop on National Dose Registries***.

July 2018

The ANRDR goes live for the **medical and education** sectors!

Expansion activities

Expansion to the medical sector

Peter Mac pilot phase completion

ARPANSA collaborated with the Peter MacCallum Cancer Centre for a trial to expand coverage of the ANRDR into the medical space.

As a leading cancer research, treatment and education centre, Peter Mac provided the ideal test case for evaluating the capability of the ANRDR system to accept and process occupational dose records from a multidisciplinary medical organisation. Because of this landmark achievement, the pilot phase was successfully completed and the ANRDR is now open to receive dose records from all medical facilities in Australia.

Our ANRDR team acknowledges the support provided to Peter Mac by Historion in achieving this milestone.

To discover how the ANRDR can help manage your organisation's dose records and meet your record keeping requirements, visit our ***website*** or contact us by ***email*** to express your interest.

Expansion to the university sector

Universities around Australia educate and train thousands of students every year who may be occupationally exposed to radiation as part of their education. Radiation exposure can occur in a variety of settings, such as classroom practical sessions or during on-the-job training in placement programs. Many of these students will go on to have careers in a field where they may continue to be exposed as part of their work.

Capturing exposure records in the ANRDR at the university level is vital, because it:

- allows workers to have access to their lifetime dose histories
- encourages workers to keep track of their exposures as they progress in their careers
- facilitates an understanding of the effectiveness of specific dose optimisation programs.

If staff or students at your university work with radiation, ***contact the ANRDR team*** to find out how the ANRDR can support you with your dose record management.

Expansion activities

ANRDR improvements – new worker and regulator portals are coming

To improve the support provided to workers and our regulatory partners, the ANRDR team will shortly begin work on the development of portals for workers and regulators to have access to the ANRDR.

The worker portal will allow workers to access and download their own dose history reports promptly and securely. Regulators will have access to dose records submitted by their licence holders, as well as statistical information and industry dose trends within their jurisdictions and nationally. These changes will significantly improve how the data in the ANRDR is used and, in turn, provide regulators with a powerful tool to modernise and enhance their regulatory capabilities.

Over the past few months, the ANRDR team has formed a working group of radiation regulators around Australia to seek their input for the development of a regulator portal. The working group members were consulted on the functionality of the portal, and provided valuable input that will be used for its development.

New dose coefficients for occupational exposures

The ICRP have recently published the third part of their updated ***Occupational Intakes of Radionuclides series***, the first of which was released in 2015. These documents provide updated dose coefficients for all radionuclides and will replace ICRP Publications 54 and 78 (ICRP, 1988a & 1997b). The series will comprise of five parts:

- Part 1 – this part provides a description of biokinetic and dosimetric methodology, and the use of bioassay data (ICRP Publication 130, 2015).
- Part 2 – provides data for hydrogen (H), carbon (C), phosphorus (P), sulphur (S), calcium (Ca), iron (Fe), cobalt (Co), zinc (Zn), strontium (Sr), yttrium (Y), zirconium (Zr), niobium (Nb), molybdenum (Mo), and technetium (Tc) (ICRP Publication 134, 2016).
- Part 3 – provides data for ruthenium (Ru), antimony (Sb), tellurium (Te), iodine (I), caesium (Cs), barium (Ba), iridium (Ir), lead (Pb), bismuth (Bi), polonium (Po), radon (Rn), radium (Ra), thorium (Th), and uranium (U) (ICRP Publication 137, 2018).
- Part 4 – provides data for lanthanides and remaining actinides (publication TBC).
- Part 5 – provides data for remaining elements (publication TBC).

Publication 137 Occupational Intakes of Radionuclides: Part 3 (ICRP 2018) includes new dose coefficients for radon progeny. The new dose coefficients are consistent with the estimates of lung cancer risk. The new ICRP approach will apply the ICRP reference biokinetic and dosimetric models to the inhalation of radon progeny, consistent with the approach for other radionuclides.

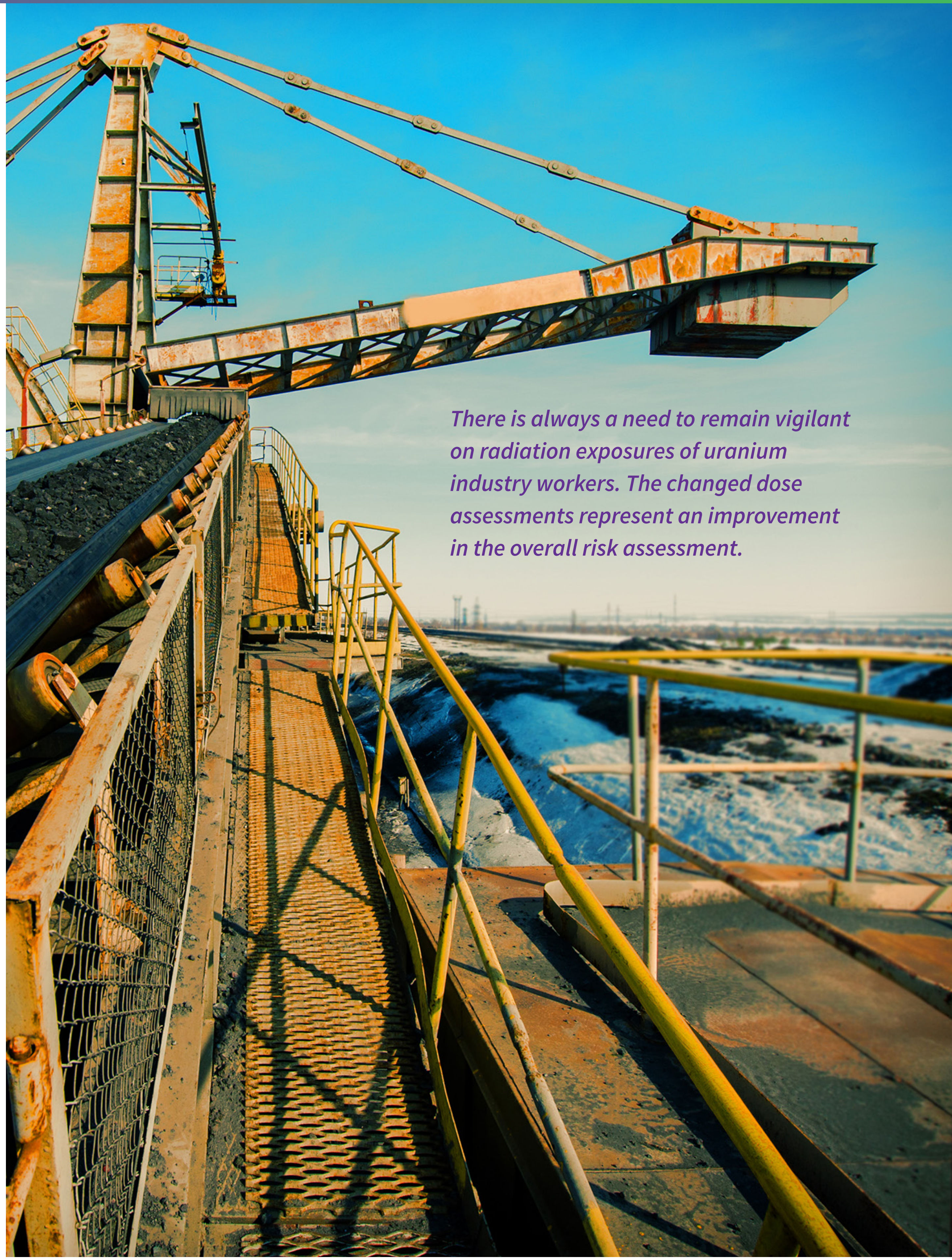
These publications are part of a series that will provide new dose coefficients for all radionuclides. When the new suite of documents are published, it is expected that the dose coefficients for uranium and thorium ores, tailings and dusts as well as medically used isotopes will also be changed. ARPANSA will provide advice to state and territory regulators on this shortly.

For the calculation of doses following inhalation of radon and radon progeny in mines and most buildings, the ICRP recommends a dose coefficient of 3 mSv per mJ h m^{-3} (approximately 10 mSv per WLM). The ICRP considers this dose coefficient to be applicable to the majority of circumstances with no adjustment for aerosol characteristics.

Radiation doses to workers in uranium mines in Australia are typically low. When other exposure pathways are considered, the increase in the total effective dose for a uranium industry worker due to the new ICRP dose coefficients is expected to be about a factor of two or less.

There is always a need to remain vigilant on radiation exposures of uranium industry workers. The changed dose assessments represent an improvement in the overall risk assessment. However, the implications for workers' health are minimal at the current exposure levels.

We have produced a communications package that includes an advisory, frequently asked questions (FAQs) and a Radiation Health Committee (RHC) statement relating to the changes to the radon progeny dose coefficients. These can be found on our ***website***.



There is always a need to remain vigilant on radiation exposures of uranium industry workers. The changed dose assessments represent an improvement in the overall risk assessment.

Stakeholder engagement

AOCRP-5

AOCRP-5 was held in Melbourne in May 2018. This Congress incorporated the International Radiation Protection Association's (IRPA) regional meeting for 2018 in the Asia-Pacific Region. It offered the opportunity for radiation protection experts to meet and discuss radiation safety matters in all areas of application of ionising and non-ionising radiation.

Update on ANRDR activities

The ANRDR's Cameron Lawrence presented a review of recent ANRDR activities. Cameron discussed the benefits of the ANRDR. These included:

- providing a single uniform national approach for the management of radiation dose records
- safeguarding radiation dose records' longevity in a central location to ensure they remain available to workers
- analysis of data in the ANRDR, which provides valuable information for regulators and industry that can be used to establish radiation protection programs and evaluate their effectiveness.

The presentation also covered the ANRDR's latest expansion activities focussing on the medical sector, the challenges faced and analysis of data.

UNSCEAR medical and occupational exposure reviews

In a separate presentation, Cameron provided an update on our participation in the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) work program for the Collection, Analysis and Dissemination of Data on Radiation Exposures, in particular on medical and occupational exposures.

Two expert working groups were established – an Expert Group for Medical Exposure (EGME) and an Expert Group for Occupational Exposure (EGOE). This program consists of data collection from UNSCEAR member nations via surveys and literature reviews to assess the current worldwide levels of medical and other occupational exposures.

The main objectives of the EGOE are to:

- assess the doses to workers for each of the major practices using ionising radiation
- analyse temporal trends in occupational exposures
- estimate and compare the worldwide levels of occupational exposures.

Additional objectives for EGME are to:

- review the impact of changes, new techniques and technologies
- identify emerging issues and opportunities.

UNSCEAR produces detailed reports for the United Nations General Assembly that are highly regarded as authoritative reviews examining radiation exposure from natural and artificial sources. The reports are expected to be published during 2019–2020.

Stakeholder engagement

Minerals Council of Australia Uranium Forum – ARPANSA dialogue

Each year, ARPANSA and the Minerals Council of Australia (MCA) Uranium Forum meet to exchange information, views and ideas on radiation safety and radiation protection-related issues associated with the exploration, extraction, processing and transport of minerals that contain radioactive material.

A major topic of discussion at the November 2017 meeting was the upcoming publication of the new radon progeny dose coefficient in the ICRP publication, Occupational Intakes of Radionuclides Part 3. To address the implications for industry, we introduced a draft advisory note, titled: *New dose coefficients for radon progeny: impact on workers and the public* to seek industry feedback. Incorporating the feedback received at that meeting and from a range of other stakeholders, we developed a communications package consisting of fact sheets, FAQs and an advisory targeting industry, regulators and the public. The full meeting minutes are available on the ARPANSA ***website***.

DIMPLE Day

In December 2017, our ANRDR team was invited to present an overview of the ANRDR to participants of the DIMPLE Day held at ARPANSA. With over 30 participants, DIMPLE Day is an annual opportunity for Victorian diagnostic imaging medical physicists and their regulator to present and review updates within their field.

Our ANRDR team took the opportunity to discuss and promote the benefits of the ANRDR in this setting as medical physicists often hold radiation safety officer responsibilities and would be responsible for the submission of dose records to the ANRDR.

Uranium Council meeting

The 12th Uranium Council was held in Adelaide on 7 June 2018 and Cameron Lawrence attended on behalf of ARPANSA.

Cameron provided an update on our involvement in uranium-related activities. This included discussion on the changes to the dose coefficients for radon, radon progeny and other radionuclides, as well as an update on the status of the ANRDR.

As part of the Department of Industry, Innovation and Science's resources portfolio, the Uranium Council promotes the progressive and sustainable development of the Australian uranium exploration, mining, milling and exporting industry in line with world's best practice standards. Membership of the Council comprises representatives of the Commonwealth and state and territory government agencies, industry associations and uranium mining companies.

Stakeholder engagement

The Hon Dr David Gillespie (R) learning all about the ANRDR during a visit to ARPANSA

Minister Gillespie visits ARPANSA for SunSmart launch

Each year, Australian workers are diagnosed with 200 melanomas and 34 000 other skin cancers linked to occupational exposure to ultraviolet radiation (UVR). ARPANSA, in conjunction with Cancer Council Victoria, has developed a UVR policy and procedure. Our procedure is based on best practice advice from SunSmart, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the World Health Organization (WHO). As part of the UVR guidance, the agency will educate and train staff, contractors and visitors to encourage better workplace sun protection. Staff contractors and visitors will also be encouraged to use appropriate sun protection through available sunscreen and outside shade.

On Thursday 23 November, former Assistant Minister for Health, the Hon Dr David Gillespie visited the Melbourne office to announce ARPANSA as a SunSmart workplace. Staff attending the announcement ceremony heard speeches from Minister Gillespie, ARPANSA's CEO Carl-Magnus Larsson and Cancer Council Australia's Head of Prevention Craig Sinclair.

Staff and their families were pleased to meet the star of the day, Sid the Seagull, who was there to remind everyone to slip, slop, slap, seek and slide.

As a strong supporter of the ANRDR, Minister Gillespie also took time out of his busy schedule to tour ARPANSA and learn all about the important work being done by the ANRDR team in the occupational exposure space.

Read more about the ***announcement ceremony and our commitment to sun safety*** on our website.

International engagement

ARPANSA's CEO Carl-Magnus Larsson and Miroslav Pinak of the IAEA sign an agreement for cooperation between the two organisations

The IAEA and ARPANSA strengthen cooperation to enhance radiation protection of uranium mining and processing workers

The IAEA and ARPANSA have agreed on a cooperation agreement outlining plans for joint work to strengthen radiation protection of workers in the uranium mining and processing industries.

This cooperation will address potential harm that could be caused by the higher concentrations of naturally occurring radioactive material (NORM) resulting from the processing and handling of raw materials.

Miroslav Pinak, head of the Radiation Safety and Monitoring Section at the IAEA, visited ARPANSA to ***open the Regional Workshop on the Establishment and Maintenance of a National Dose Registry*** and to sign the agreement with ARPANSA's CEO, Carl-Magnus Larsson.

The Practical Arrangements, signed on 24 May in Melbourne, builds on an earlier agreement. This agreement outlined work to be conducted as part of the IAEA Safety Report Series, to create a publication on occupational radiation protection approaches in uranium mining and processing stages and techniques. The report was developed during meetings in Australia, Canada and South Africa involving regulatory body and industry representatives.

The cooperation under the new three-year agreement is expected to provide practical tools for regulators, mine operators and workers through a training package that supports the use of the report's recommendations.

Also as part of the agreed cooperation, we will help the IAEA strengthen its global survey on the Information System on Occupational Radiation Protection in Uranium Mining (UMEX). This aims to improve protection and safety through sharing of good practices and other information.

IAEA expert mission to the United Arab Emirates

The United Arab Emirates (UAE) are in the process of constructing a nuclear reactor fleet for the supply of electricity. As part of this endeavour, the Federal Authority for Nuclear Regulation (FANR) is investigating the implementation of a national dose register (NDR). To assist the UAE, the IAEA coordinated an expert mission, inviting experts from countries with established NDRs to deliver assistance. Australian and Canadian NDR experts attended the UAE to provide expertise for establishing an NDR in the UAE. This work was performed over three days at the FANR offices in Abu Dhabi.

IAEA experts presented the IAEA requirements for an NDR that included a review of the ***General Safety Requirements (GSR) Part 3*** and included specifics from the draft ***IAEA Safety Guide on Occupational Radiation Protection (DS453)***. A review of the UAE white paper on the establishment of an NDR in the country was presented. A representative from the Nawah Energy Company that will be operating the nuclear reactors provided an example of a company-based NDR. The IAEA experts also performed a live demonstration of the functionality of their NDR software. To assist with the development of the conceptual design, an open discussion was held on the UAE NDR requirements.

This was an excellent opportunity for us as ARPANSA to demonstrate the ANRDR as an effective and efficient dose record management system that can be used to assist with regulatory activities. A Canadian expert was also present for the mission to bring expertise from a country with a well-established NDR. This provided a learning opportunity for Australia and a benchmarking opportunity for comparison of the ANRDR with the Canadian NDR.

International engagement

IAEA National Dose Registry Workshop

In May, ARPANSA and the IAEA hosted and coordinated a Regional Workshop on the Establishment and Maintenance of a National Dose Registry. The workshop was also facilitated by experts from Latin America. It gave an opportunity for knowledge sharing on the best practice approaches for establishing and maintaining a national dose registry.

Participants from the Asia-Pacific region presented on the status of their national dose registries, challenges they face in implementing and operating a registry, and shared lessons learned.

Monitoring workers for radiation exposure and recording of occupational doses are important aspects of any radiation protection program. In Australia, it is mandatory that workers' doses are recorded and maintained for the long term, in accordance with IAEA requirements. The ANRDR team facilitates this requirement by providing the ability to manage occupational dose records securely, allowing employers to meet their record keeping requirements.

Workshop participants discussing the strengths and gaps of national dose registers in their respective countries

Analysis of data

Dosimetry service providers in Australia report monitoring results in different ways. ARPANSA's Personal Radiation Monitoring Service (PRMS), for example, does not report results below 100 µSv due to the high uncertainty associated with results below that level.

The ANRDR collects information on quarterly-assessed radiation doses for a range of dose types and exposures. Employer and personal information are also collected to allow us to match workers with their doses. The data collected is used to monitor individual doses and generate annual statistics related to exposure trends. This assists with the optimisation of radiation protection practices for workers.

The ANRDR currently holds the dose records for more than 43 000 individuals from the uranium and mineral sands industries, and government organisations. While annual effective doses continue to remain low (71% of all workers are below 1 mSv) for all industries, a notable increase in both the average doses and workforce numbers was observed for uranium processing workers in 2017, compared with the previous year. We understood this to be a result of maintenance work undertaken at a number of processing facilities, and not the result of poor work practices.

A challenge has been identified with the reporting of doses to the ANRDR that are below the minimum reportable dose (<MRD). Dosimetry service providers in Australia report monitoring results in different ways. ARPANSA's Personal Radiation Monitoring Service (PRMS), for example, does not report results below 100 µSv due to the high uncertainty associated with results below that level. Due to the high uncertainty, which below 100 µSv is around 100%, the results become meaningless. Many database systems, including the ANRDR, require a numerical dose to be entered. As a result, a zero dose value is commonly substituted for the '<MRD' result, skewing the results. The ANRDR is considering a number of options to minimise the impact of this issue on data analysis. These may be introduced in future editions of the newsletter.

Although the pilot phase for the medical sector has been completed, we are unable to present an analysis of medical workers' exposures in this edition, as only one facility from the medical sector is currently submitting to the ANRDR.

Analysis of data

Uranium industry data

The ANRDR has had coverage of all licenced Australian uranium operators with exposure records for all operations from 2011.

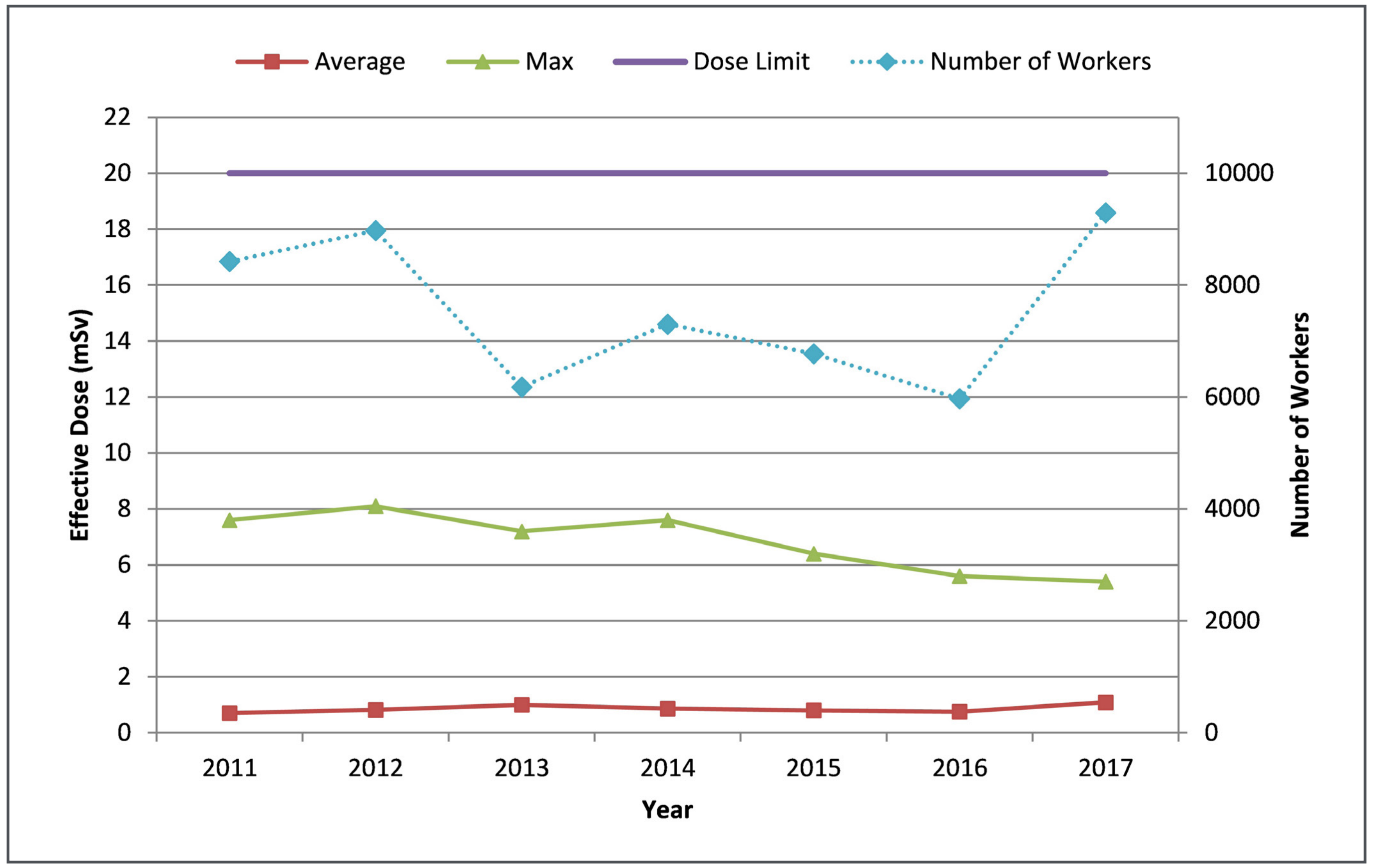


Figure 1: Uranium industry average and maximum effective doses with workforce numbers (2011–17)

Figure 1 shows an increase in the average effective dose and a decrease in the maximum effective dose for uranium industry workers, when compared with the previous year. The average effective dose increased from 0.75 mSv in 2016 to 1.09 mSv in 2017. On the other hand, there was a minor decrease in the maximum effective dose from 5.6 mSv in 2016 to 5.4 mSv in 2017. A large increase in the number of workers in the industry was also observed for 2017.

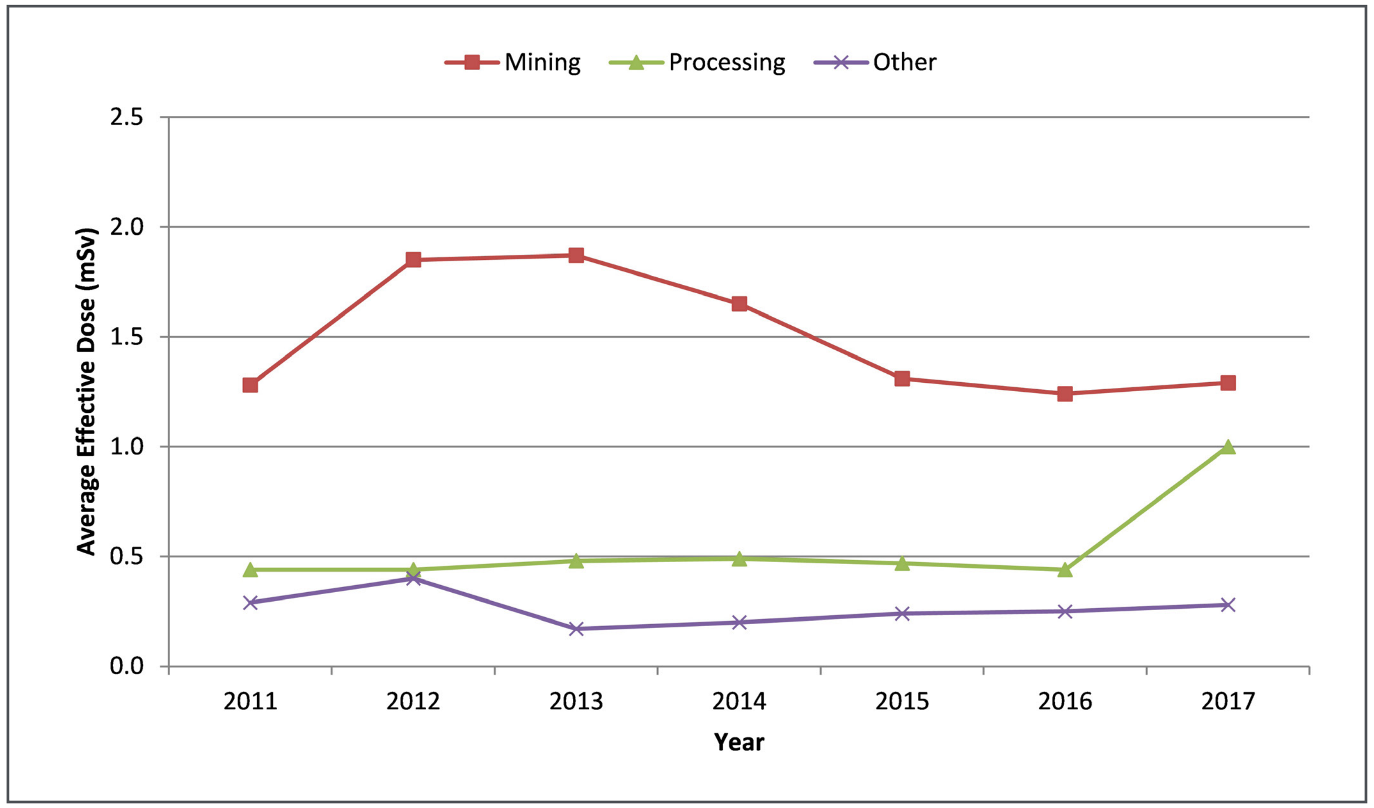


Figure 2: Uranium industry average effective doses by worker categories (2011–17)

Figure 2 shows an increase in the average effective dose for all of the work categories in the uranium industry. The largest increase is observed in processing workers, which has more than doubled from 0.44 mSv in 2016 to 1 mSv in 2017.

Review of this analysis led to further investigation of the 2017 industry data in order to understand the increase in exposure and worker numbers. It was observed that in 2017 there were 4018 people employed in worker categories that were classed as 'shutdown', compared with only 1241 in 2016.

Shutdown work typically involves the closure of a process to allow for the cleaning and repair or replacement of critical equipment. This work commonly involves higher exposures than normal operations, as exposure controls move to the use of personal protective equipment.

Shutdown work is typically performed for short periods. Assessment of worker duration in the uranium industry is compared against Commonwealth organisations (organisations under ARPANSA's regulatory authority) in Figure 3.

Analysis of data

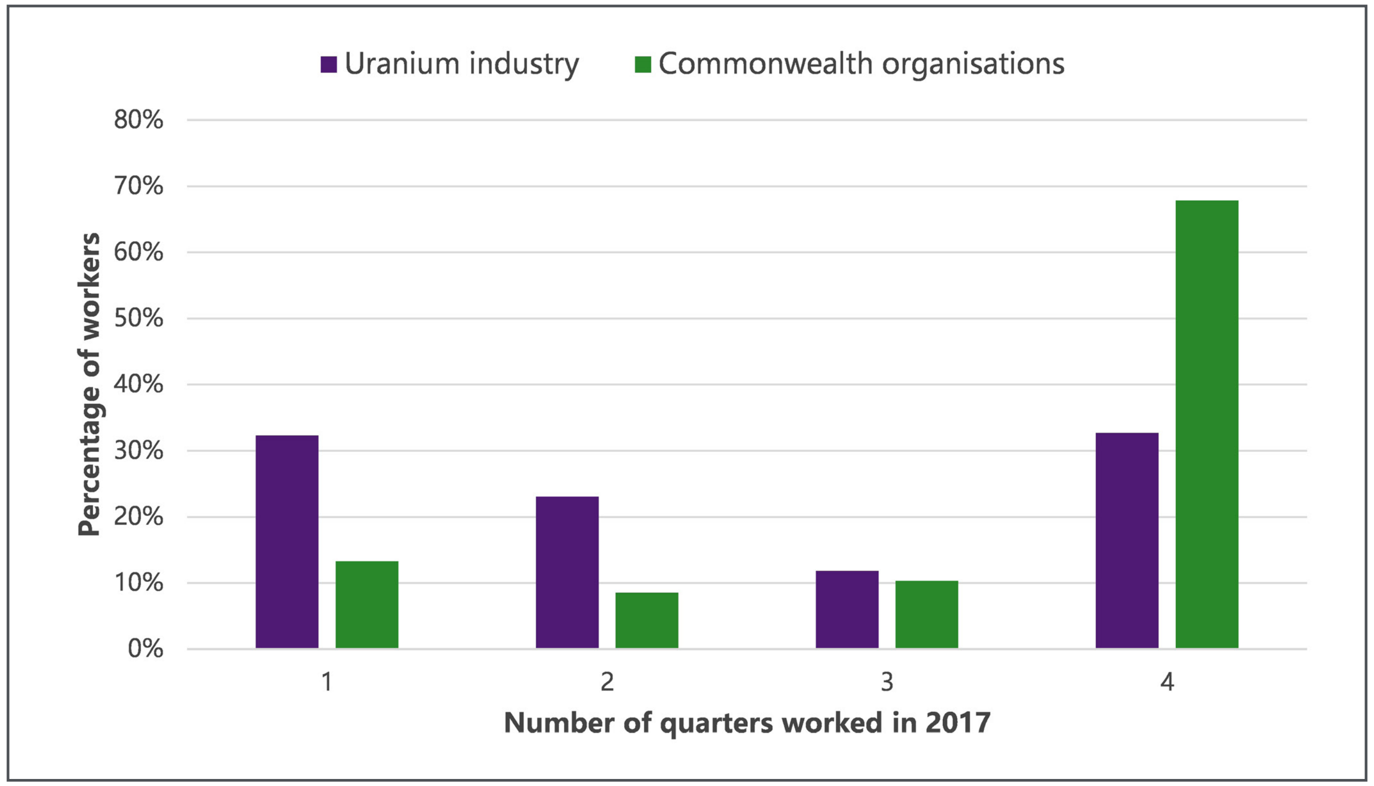


Figure 3: Comparison of the number of quarters worked for workers in 2017 (uranium industry vs. Commonwealth organisations)

Figure 3 shows that only a third (33%) of uranium workers had worked in this industry for all four quarters in 2017. Additionally, a third of uranium workers had doses recorded for only one quarter. This analysis indicates that the majority of individuals who worked in the uranium industry last year were temporary maintenance workers. In comparison, Commonwealth facilities, who have more of a permanent workforce, had double the percentage (68%) of workers who worked all four quarters.

Collective effective dose

The collective effective dose can be used as a comparative tool for the optimisation of radiation protection practices. It has been used by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) for reporting and comparing exposures from different practices around the world (UNSCEAR 2008).

The collective effective dose is simply the sum of the individual doses incurred by a group, and is expressed as 'man-sieverts' (man Sv), to distinguish the collective dose from the individual dose (IAEA 2007). The collective effective doses from the uranium industry are shown in Figure 4.

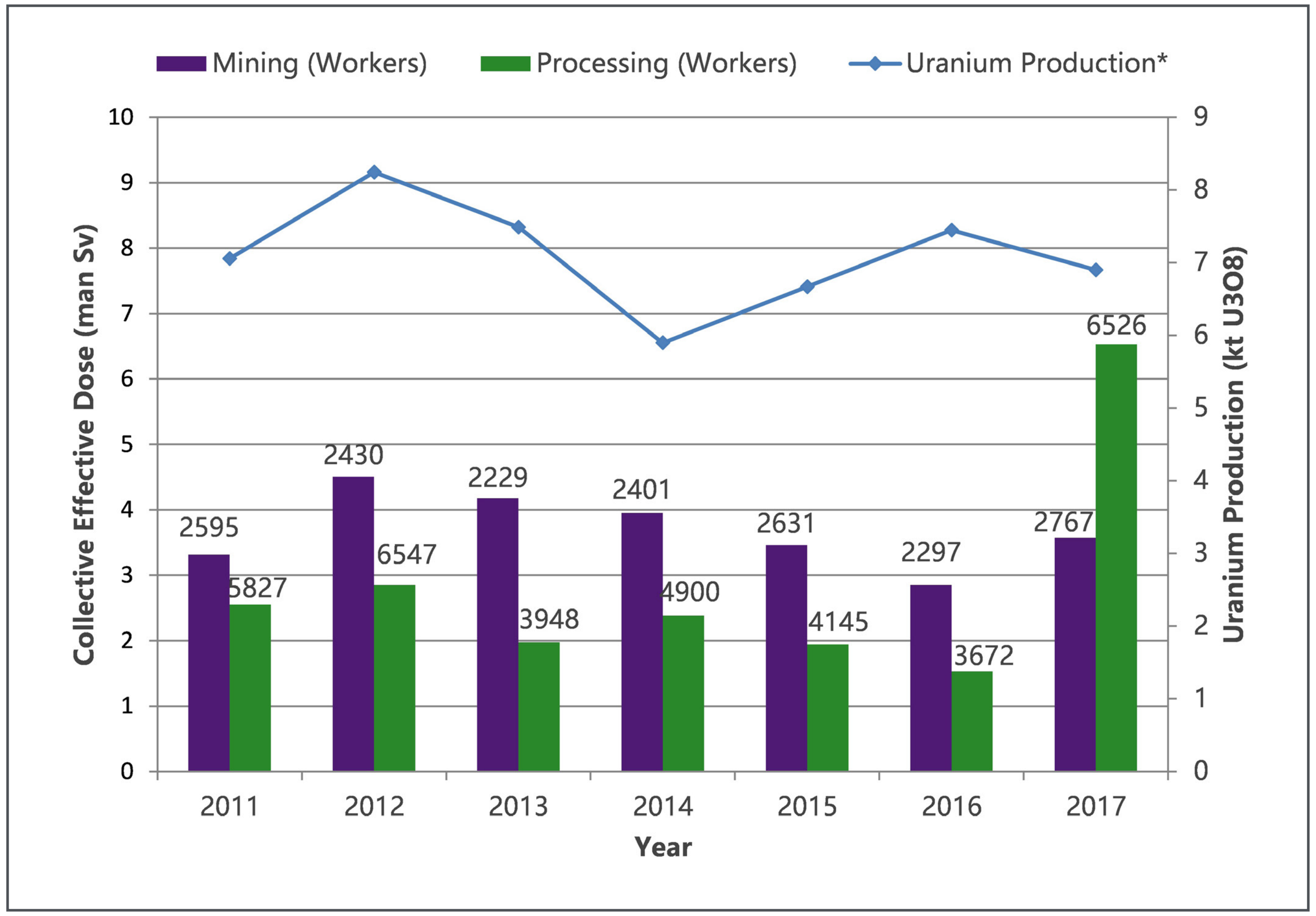


Figure 4: Australian uranium industry collective effective dose and uranium production, with worker numbers above columns (2011–17)

Analysis of data

Mineral sands industry

As of this year, the ANRDR has multiple mineral sands operators submitting data to the ANRDR. This has allowed us to publish industry data analysis for the first time. So far, comparative data is only available from 2016. The average and maximum effective doses are shown in Table 1.

Table 1: Mineral sands mining average and maximum effective doses

Year	Average effective dose (mSv)	Maximum effective dose (mSv)
2016	0.03	0.26
2017	0.08	1.25

Government regulators

Submission of dose records from ARPANSA and the South Australian Environmental Protection Agency allows for the reporting of exposure to government regulators. Pooled data is available from 2016 and is shown in Table 2 below.

Table 2: Government regulators' average and maximum effective doses

Year	Average effective dose (mSv)	Maximum effective dose (mSv)
2016	0.17	0.80
2017	0.13	0.74

Commonwealth organisations

Since the amendments to the ***ARPANS Regulations*** came into effect in July 2017, all relevant Commonwealth organisations must submit or make effort to submit dose records to the ANRDR. The ANRDR team has been working with all of ARPANSA's licence holders to ensure the submission of their dose records occurs within appropriate timeframes.

Pooled analysis from Commonwealth organisations currently submitting data, including ARPANSA, is shown in Figure 5. This analysis shows that average effective doses for regulators continue to remain low (below 100 μSv) and all doses were below 1 mSv. The maximum effective dose in 2017 was 0.89 mSv, compared with 0.25 mSv previous year.

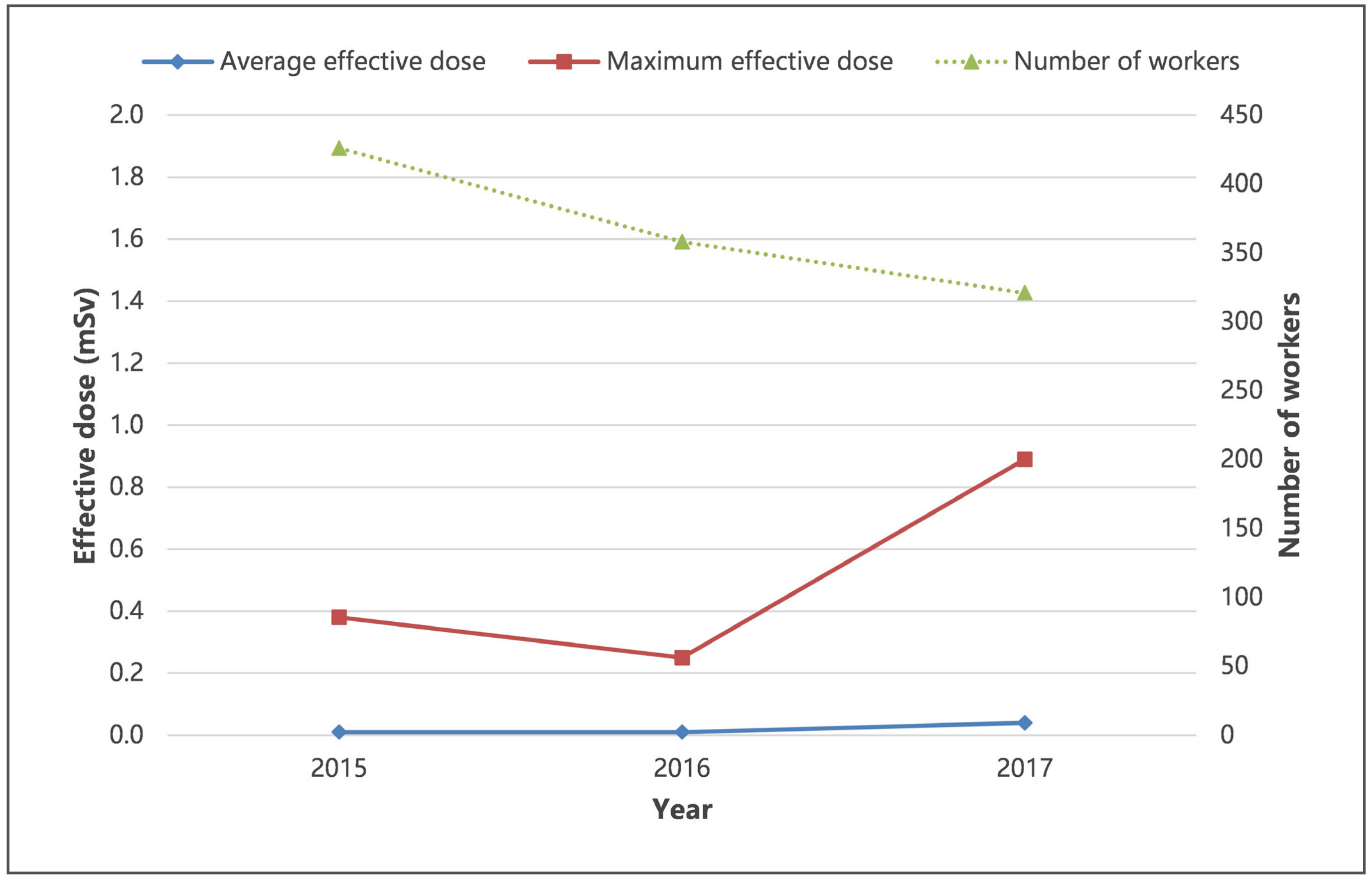


Figure 5: Pooled Commonwealth organisations' average and effective doses with worker numbers (2015–17)

Analysis of data

Dose distribution histogram

The data for all organisations contributing to the ANRDR has been analysed to produce a dose distribution histogram for 2017. The dose distribution histogram is an effective way to demonstrate the distribution of occupational doses, as it eliminates the skewing effect on the average effective doses of the <MRD doses that have been reported as zero doses, as discussed in the data analysis introduction.

This analysis shows that more than 71% of occupationally exposed workers in the ANRDR received an annual effective dose in 2017 of 1 mSv or less. This increases to more than 84% for annual effective doses of 2 mSv or less. Less than 3% of occupationally exposed workers received an annual effective dose greater than 3 mSv and the maximum annual effective dose recorded was 5.4 mSv.

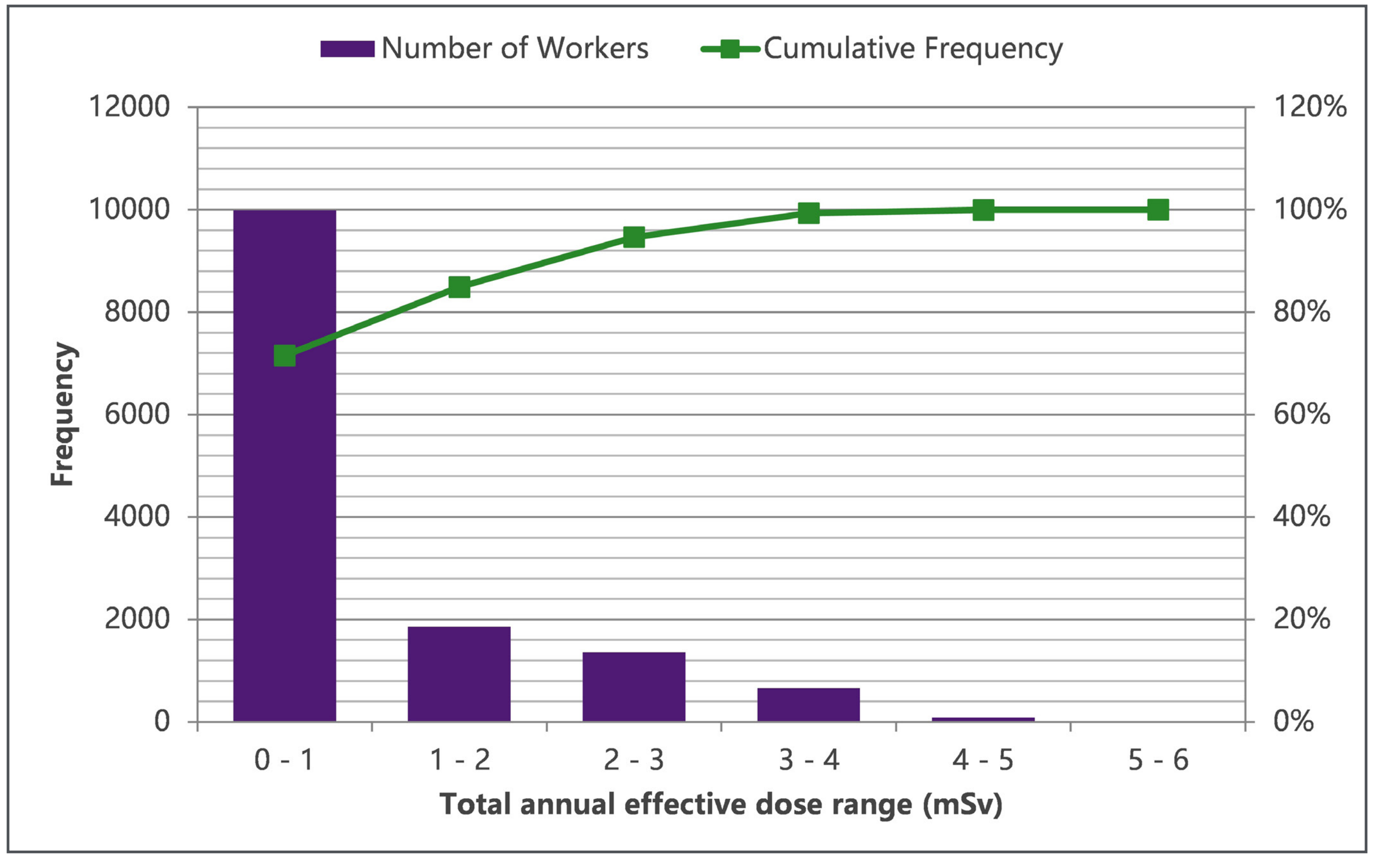
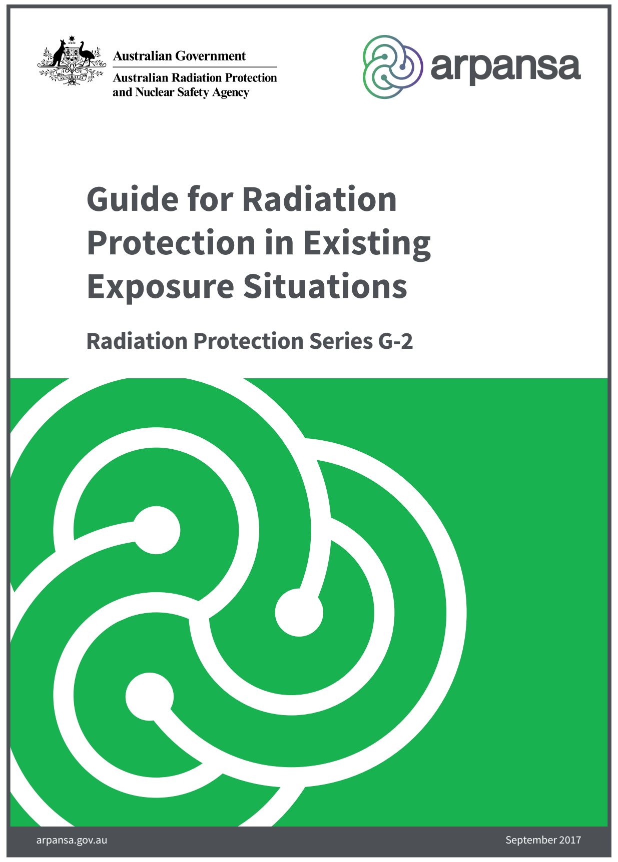


Figure 6: 2017 dose distribution histogram for all ANRDR data

Publications of interest

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

ARPANSA has published a Guide to assist regulators and industry with radiation protection in existing exposure situations (RPS G-2).



The ***Guide for Radiation Protection in Existing Exposure Situations*** (2017) establishes a framework in Australia for the protection of occupationally exposed persons, the public and the environment in existing exposure situations. In other words, situations of exposure that already exist when a decision on the need for control is taken. This guide applies a risk-based approach when considering the application, justification and optimisation of existing exposure strategies and remedial actions.

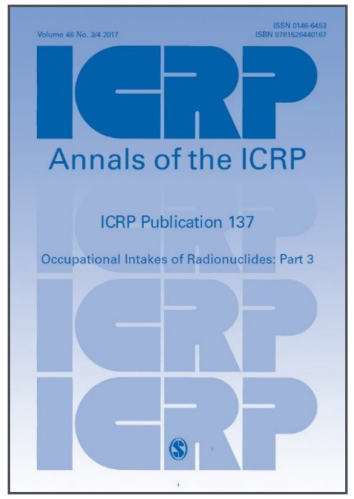
Existing exposure situations include situations of elevated exposure to radiation of natural origin. They also include situations of exposure due to residual radioactive material. This material would come from past practices that were not subject to regulatory control or that remains after an emergency exposure situation.

ARPANSA, jointly with state and territory regulators in the Radiation Health Committee (RHC), has developed this guide based on the requirements relating to existing exposure situations described in the Safety Requirements GSR Part 3 of the IAEA, *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards* (IAEA 2014). Further guidance material will be developed relating to existing exposure situations and made available in the form of case-specific studies.

This guide is applicable for situations involving the remediation of legacy sites, radon in the home or the workplace, radioactive waste, commodities and aircrew exposures.

Occupational Intakes of Radionuclides: Part 3 (ICRP Publication 137)

The next instalment in the series of ***Occupational Intakes of Radionuclides*** (OIR) reports has been published.



The OIR series will replace the Publication 30 series (Limits for Intakes of Radionuclides by Workers) and Publications 54: Individual Monitoring for Intakes of Radionuclides by Workers, 68: Dose Coefficients for Intakes of Radionuclides by Workers, and 78: Individual Monitoring for Internal Exposures of Workers. OIR Part 1 has been issued (ICRP, 2015), and describes the:

- assessment of internal occupational exposure to radionuclides
- biokinetic and dosimetric models
- methods of individual and workplace monitoring
- general aspects of retrospective dose assessment.

In addition, new data is now available that supports an update of the radionuclide-specific information given in Publications 54 and 78 (ICRP, 1988a, 1997b) for the design of monitoring programmes and retrospective assessment of occupational internal doses. New biokinetic models, dose coefficients, monitoring methods, and bioassay data have been provided in this new series.

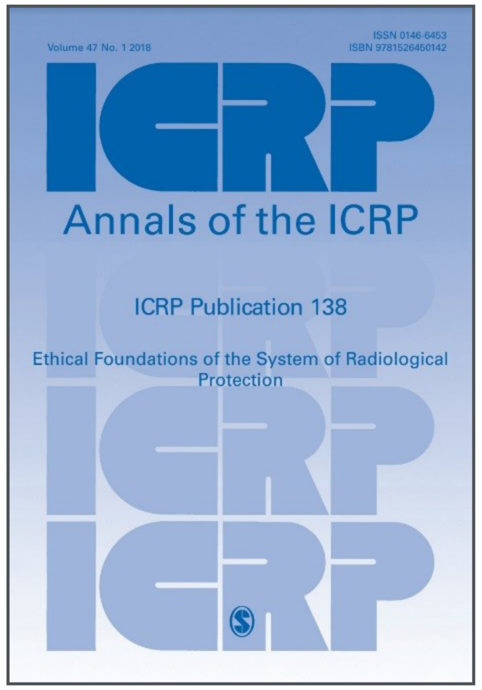
The OIR series provides committed effective dose per intake ($Sv\ Bq^{-1}$ intake) for inhalation and ingestion, committed effective dose per content ($Sv\ Bq^{-1}$ measurement) for inhalation, and graphs of retention and excretion data per Bq intake for inhalation.

OIR 3 (Publication 137) provides data on radionuclides of: ruthenium (Ru), antimony (Sb), tellurium (Te), iodine (I), caesium (Cs), barium (Ba), iridium (Ir), lead (Pb), bismuth (Bi), polonium (Po), radon (Rn), radium (Ra), thorium (Th), and uranium (U).

A number of industries may be affected by these changes, including the minerals, medical and research sectors. Organisations whose workers may be internally exposed to any of these radionuclides are encouraged to review their radiation protection programs and consult with their regulator on what actions, if any, should be taken.

Publications of interest

How do ethics interact with radiological protection?



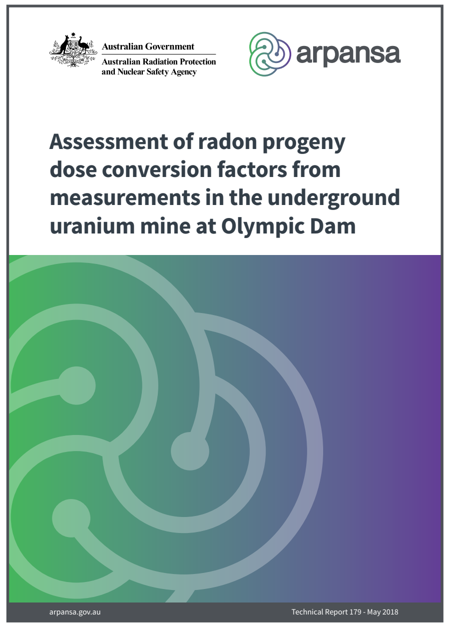
The new ***ICRP Publication 138*** explores the Ethical Foundations of the System of Radiation Protection.

Despite a longstanding recognition that radiological protection is not only a matter of science, but also ethics, ICRP publications have rarely addressed the ethical foundations of the system of radiological protection explicitly. The purpose of this publication is to describe how the Commission has relied on ethical values, either intentionally or indirectly, in developing the system of radiological protection with the objective of presenting a coherent view of how ethics is part of this system. In so doing, it helps to clarify the inherent value judgements made in achieving the aim of the radiological protection system as underlined by the Commission in Publication 103.

Although primarily addressed to the radiological protection community, this publication is also intended to address authorities, operators, workers, medical professionals, patients, the public, and its representatives (e.g. non-government organisations) acting in the interest of the protection of people and the environment. This publication provides the key steps concerning the scientific, ethical, and practical evolutions of the system of radiological protection since the first ICRP publication in 1928. It then describes the four core ethical values underpinning the present system: beneficence or non-maleficence, prudence, justice, and dignity. It also discusses how these core ethical values relate to the principles of radiological protection, namely justification, optimisation, and limitation. The publication finally addresses key procedural values that are required for the practical implementation of the system, focusing on accountability, transparency, and inclusiveness.

This publication is recommended for anyone who is interested in advancing his or her understanding of the ethics in radiation protection.

Particle sizing project at Olympic Dam



This report summarises the measurements conducted at the Olympic Dam uranium mine in Roxby Downs, South Australia, in December 2013 to characterise the radon decay product (RDP) parameters.

In Publication 65: Protection Against Radon-222 at Home and at Work (1994), the ICRP recommended the use of a single conversion factor, determined from uranium mining epidemiological studies, as the preferred method for converting RDP inhalation exposure to effective dose.

This is the so-called RDP 'conversion convention'. In ICRP Publication 115: Lung Cancer Risk from Radon and Progeny (2010), the ICRP revised upwards its assessment of risk detriment for inhalation of RDP and indicated its intention to replace the current dose conversion convention with a dose coefficient derived from dosimetric modelling.

There is very little published data on RDP aerosol characteristics in modern uranium mines. Some measurements of this type were carried out at the Olympic Dam uranium mine in 1992. Given the potential regulatory and operational impacts for assessment of doses from inhaled radon decay products in Australian uranium mines, it was determined that a study of the RDP aerosol characteristics in current Australia mines should be undertaken.

This report may be of interest to anyone involved in radiation protection in an underground uranium mine.

References

ICRP

UNSCEAR

IAEA

Contact us

P 1800 022 333

E anrdr@arpansa.gov.au

W arpansa.gov.au/anrdr