Australian Government

ANSTO

Annual Report

2017 - 2018

Science. Ingenuity. Sustainability.

Chair's letter

Australian Government | ANSTO

21 August 2018

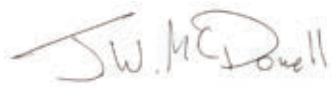
Hon Karen Andrews MP
Minister for Industry, Science and Technology
Parliament House
CANBERRA ACT 2601

I am pleased to present the Annual Report of the Australian Nuclear Science and Technology Organisation (ANSTO) for the period 1 July 2017 to 30 June 2018.

This report has been prepared in accordance with the requirements of the *Australian Nuclear Science and Technology Organisation Act 1987* (ANSTO Act) and section 46 of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

The report has been approved for presentation to you by a resolution of the ANSTO Board members on 21 August 2018.

Yours sincerely



James (Jim) McDowell
Chair

New Illawarra Road, Lucas Heights (Locked Bag 2001, Kirrawee DC 2232) **ABN** 47 956 969 590 **T** +61 2 9717 3111
www.ansto.gov.au

Contents

Chair's letter I
Contents 1
About ANSTO 2
Chair's report 6
Chief Executive Officer's report 8
2017–2018 highlights 10
Annual Performance Statement 11
Improving the health of Australia 14
Solutions for Australian industry 18
Understanding our environment 24
Australia's research infrastructure 27
Outreach 30
International engagement 32
Support to Government 34
Partnerships and collaborations 36
Awards and achievements 42
Our Organisation 45
Corporate governance 50
2017–2018 financial statements 60
Appendices 98

- **Appendix 1**
  Equality of employment opportunity
- **Appendix 2**
  Functions and powers of the organisation under the *ANSTO Act 1987*
- **Appendix 3**
  Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act), section 516A
- **Appendix 4**
  Work Health and Safety Act 2011
- **Appendix 5**
  Freedom of Information Act 1982, subsection 8
- **Appendix 6**
  Index of compliance with reporting guidelines

Acronyms 128
Index 130
Contact details 135

About ANSTO

ANSTO uses nuclear research techniques to address many of the important issues of our time relating to our environment, human health and industry.

We do this using our country's most sophisticated research infrastructure, including the Open Pool Australian Light-water (OPAL) multi-purpose reactor, the Australian Synchrotron, the Centre for Accelerator Science (CAS), the Australian Centre for Neutron Scattering (ACNS) and the National Deuteration Facility (NDF).

Every year, ANSTO researchers plus around 6000 visiting national and international researchers and industry researchers use our facilities.

ANSTO's many strategic international collaborations with some of the world's leading research institutes and universities ensure Australian scientists are well placed to drive innovation for Australia.

These important partnerships give Australian scientists access to some of the world's most sophisticated research techniques, enabling discoveries that benefit Australia and the world.

As part of enabling a strong national collaborative network, ANSTO is connected with Australian and New Zealand universities through the Australian Institute of Nuclear Science and Engineering (AINSE), providing researchers with access to Australia's nuclear science, technology and engineering expertise and landmark infrastructure which, in turn, facilitates greater national science collaboration.

ANSTO is central to Australia's nuclear medicine manufacturing capabilities. Each week ANSTO delivers over 12,500 patient doses of potentially lifesaving nuclear medicines to over 250 partner hospitals and medical practices across Australia and the region. On average, one in two Australians will benefit from the nuclear medicines that originate from ANSTO in their lifetime.

ANSTO is committed via its strategic priorities of 'Putting people first'.

Australia has a strong international role in nuclear science and technology through ANSTO. As a member of the International Atomic Energy Agency (IAEA) Board of Governors, Australia is committed to the peaceful application of nuclear science and technology. ANSTO's long-term partnership with the IAEA has given our country important global responsibilities.

ANSTO operates research facilities in three locations — Lucas Heights and Camperdown in Sydney New South Wales, and Clayton in Melbourne Victoria.

ACNS is the home of neutron science in Australia and a leading facility in the Asia Oceanic region.

Strategic objectives

ANSTO's strategic priorities for 2017–2018 are:

> Putting people first

Equipping and empowering our people to respond to the growing nuclear science and technology needs of Australia and the world.

> World class science and technology outcomes

Create innovative solutions to complex problems and provide new insights into our world.

> Strategic management of landmark and national infrastructure

Realise opportunities, serve users and create value.

> Nuclear and related expertise and advice

Provide expert, science and technology-based advice and services to support Australia's nuclear policy.

> ANSTO's business and innovation

Provide services and products to our customers that benefit the broader community.

Our vision

To deliver excellence in innovation, insight and discovery through our people, partnerships, distinctive competencies, nuclear expertise and landmark infrastructure.

Our Corporate Plan 2017–2018

ANSTO's Corporate Plan 2017–2018 is the enabling document for the organisation to implement our strategic priorities and vision. Approved by the ANSTO Board and accepted by the responsible Minister, the plan is a public document, available via the ANSTO website.

Responsible Ministers

Senator the Hon Arthur Sinodinos AO
Minister for Industry, Innovation and Science
1 July 2017 - 20 December 2017

Senator the Hon Michaelia Cash
Minister for Jobs and Innovation
20 December 2017 - 30 June 2018

The Hon Craig Laundy MP
Assistant Minister for Industry, Innovation and Science
1 July 2017 - 20 December 2017

Senator the Hon Zed Seselja
Assistant Minister for Science, Jobs and Innovation
20 December 2017 - 30 June 2018

Senator the Hon Arthur Sinodinos AO
Minister for Industry, Innovation and Science

Senator the Hon Michaelia Cash
Minister for Jobs and Innovation

New look ANSTO

In August 2018, ANSTO introduced a new look to more clearly showcase the outcomes and benefits we deliver to all Australians.

ANSTO has changed and evolved since its official launch in 1987.

In the past 12 years, ANSTO has gone through an exciting period of growth and development. The OPAL reactor went critical; neutron guide instruments were installed; the Centre for Accelerator Science came to life; the Australian Synchrotron became part of ANSTO – we are now the custodian of Australia's most significant infrastructure for science.

Our products and services play a key role in supporting industries. We now are a significant partner to the Australian minerals and mining industry; we're responsible for 46 per cent of the world's highest grade silicon; and everyday thousands of Australians benefit from having access to the nuclear medicines we produce.

The ANSTO Innovation Precinct is gaining momentum and we are able to focus our business and research capabilities ton nurturing innovation.

ANSTO achieved all this but was still presenting itself in the same way as it was since it's inception 31 years ago.

We now have the opportunity to harness this growth and development, and understand how this has changed us as an organisation. We have delivered a brand and brand framework that communicates who we are today and that will support our continued growth into the future.

ANSTO logo, launched in 2018

ANSTO previous logo, launched in 1987

Chair's report

As custodian of Australia's key national research and science infrastructure, ANSTO plays an important role in addressing some of the most challenging issues facing Australia today. In this time of continued fiscal constraint, ANSTO is committed to finding new and ingenious ways to deliver solutions and opportunities for growth and development for the benefit of Australia, its people and its economy.

ANSTO has now secured $94.1 million in capital investment funding from 29 contributors as part of Project BR–GHT to expand the number of beamlines at the Australian Synchrotron by eight. Currently all existing beamlines are oversubscribed, and the expansion will help the facility to keep up with significant researcher demand as well as increasing research output. This support is a testament to the value of the research that the Synchrotron enables and ANSTO will continue to seek additional funds to ensure as many additional beamlines are constructed as possible.

The Board has reviewed and endorsed the ANSTO Health Strategy which draws together in an integrated way the research, translation and business activities that ANSTO undertakes. There are good opportunities to expand the range of products produced at ANSTO, in particular those based on luthetium-177 - a very promising therapeutic isotope.

Innovation is essential if we as a society are to address the challenges ahead. In addition to providing unparalleled access to Australia's landmark and national research infrastructure, the ANSTO Innovation Precinct will connect Australian industry with some of our nation's best and brightest researchers and engineers. FY18 saw the first five members taking residency in the nandin Deep Technology Incubator. Work also continued on the Graduate Institute, which is set to open later in 2018.

ANSTO's leadership in the region

During the year, ANSTO worked to strengthen its relationships with neighbouring countries and demonstrated leadership in the region through a number of programs.

ANSTO continued its collaboration with the Sri Lankan Presidential Taskforce on the Prevention of Chronic Kidney Disease to address Chronic Kidney Disease of Unknown Aetiology (CKDu) by hosting a workshop in Sri Lanka. Bringing together nephrologists and researchers in Colombo, participants committed to a tangible and measurable action plan. Although not well understood, CKDu is a significant public health issue in Sri Lanka and ANSTO is facilitating the project, bringing together experts to use its world-class research infrastructure in order to find robust and sustainable solutions for the prevention, early detection, and treatment of CKDu.

Nuclear forensics is a critical component of a State's nuclear security architecture and ANSTO shared its expertise by hosting an International Atomic Energy Agency (IAEA) Regional Training Course, which provided a practical introduction to nuclear forensics. It is the first time that the IAEA has implemented practical nuclear forensics training in the South-East Asia region. Research scientists and representatives from regulatory agencies from across the region came together to gain practical experience with nuclear forensic techniques. This experience will enable them to support the development or enhancement of nuclear forensic capabilities in their home country which will enhance safety across the entire region.

Safe, secure and sustainable

Nuclear medicine is needed, on average, by one in two Australians during their lifetime. Although there have been challenges over the past year, ANSTO is committed to ensuring the ongoing supply of nuclear medicine to the Australian public. To that end, I would like to thank Dr Paterson and the ANSTO team for all of their work during the Southern Sydney bushfires to ensure that patients continued to receive critical nuclear medicine during this time. 'Safe, secure and sustainable' underpins everything that ANSTO does and it is something that we continually strive towards.

ANSTO Board

This will be my last Chair's Report for ANSTO as I am stepping down to take up a new position with the South Australian Government. I would like to thank my fellow Board members for all of their support during my time at ANSTO. I am immensely proud of what we have accomplished and the exciting projects, including the ANSTO Innovation Precinct, which will come to fruition over the next few years that will benefit the wider community.

I would also like to acknowledge Ms Erica Smyth, whose term on the ANSTO Board expired during the year, and congratulate her on her well-deserved appointment as a Companion of the Order of Australia for her service to the community. My fellow Board members are a group of dedicated individuals, and I know that they will continue to guide ANSTO's future growth and development.

James (Jim) McDowell
Chair

Chief Executive Officer's report

Through our people, partnerships and landmark and national infrastructure, ANSTO has delivered a strong performance again this year. Our work continues to support Australian industry, improve the health of our country's people, and protect our environment.

Together with medical and health experts from across Australia and New Zealand, I attended the National Particle Therapy Symposium in Adelaide in November. The day was an opportunity for industry leaders to discuss the way forward for particle therapy in Australia as well as advances in patient treatment, clinical trials and technology. There are over 70 operational particle therapy facilities around the world, and a further 40 currently under construction. As the Federal Government has recognised with the provision of funding to build the country's first particle treatment facility in South Australia by 2020, it's well and truly time for Australia to begin delivering this type of cancer treatment.

ANSTO's Innovation Precinct will act as a vehicle for supporting an internationally competitive and technologically advanced Australian economy. We continue to make significant progress in establishing the Precinct, as marked by this year's opening of the nandin Deep Technology Incubator. nandin provides a dynamic co-working space, an entry point into the ANSTO Innovation community, including startup support and innovation programs, challenge-based innovation and access to world-class research outcomes. nandin hosts a knowledge transformation and innovation network that supports engagement between innovative industry and the research community through regular community events. The Innovation Precinct will foster further collaboration and realise the benefits of co-locating industrial partners, research institutes and university students around ANSTO's scientific infrastructure and world-class scientists.

Australia's research and science infrastructure is a core component in enabling the country's greatest minds to address a wide range of national and regional challenges. During the year, we secured $94.1 million in new funding to expand the research capabilities of the Australian Synchrotron. The expansion will alleviate demand issues and enable new research opportunities, enabling Australian and New Zealand researchers and industry to continue to compete on the world-stage and deliver real-life benefits to the community.

The funding boost was made by the New Zealand Synchrotron Group Limited (representing funding from the New Zealand Government and New Zealand universities and research institutions), the Defence Science and Technology Group and universities and medical research institutes from across Australia.

We continued to provide expert advice to the Australian Government on the management of radioactive waste in relation to the National Radioactive Waste Management Facility. This included assistance in engaging with and providing information to communities surrounding the nominated sites, to ensure those communities can make an informed decision regarding the facility.

ANSTO is a member of the Science and Gender Equity initiative (SAGE) which strives to address gender equity in the STEMM sector in Australia. We made a number of advances in this area over the year including welcoming Jayne Senior and Pamela Naidoo-Ameglio onto the ANSTO Executive. I would like to thank them for their contribution to the team.

ANSTO strives to ensure that potential hazards and risks are as low as reasonably achievable, but unfortunately there were two radiological spills in the nuclear medicine quality control area over the past year. The health and wellbeing of staff and the wider community is paramount. ANSTO is working with the regulator, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), to ensure that recurrences are prevented. ANSTO appointed an external reviewer and expert team to conduct an independent third party review and report on best workplace health and safety practice in line with a direction received from ARPANSA. Our people are key to our ability to deliver to the Australian public, and ANSTO takes its responsibilities to its people very seriously.

ANSTO had to suspend production of Technetium-99m (Tc-99m) Generators, the most common nuclear medicine, after a mechanical failure in the plant. We worked closely with our customers and the wider Australian health community during this period to minimise disruptions as much as possible. ANSTO will undertake a comprehensive mechanical review of the Mo-99 processing and distribution facility.

I would like to thank all our dedicated staff for their hard work and efforts over the year. Without our exceptional people, the work that we do would not be possible. I would also like to acknowledge the ANSTO Board for their continued good governance and strategic leadership.

We look forward to continuing to deliver the many benefits that nuclear science and technology has to offer to Australia and the world.

Dr Adrian (Adi) Paterson
Chief Executive Officer

2017–2018 highlights

Lutetium-177
supplied for **advanced prostate cancer** clinical trials

$94.1 million
in new funding secured from organisations across Australian and New Zealand to expand the **Australian Synchrotron's** research capabilities

Australian Synchrotron
played a crucial role in the discovery of a successful new drug to treat **chronic lymphocytic leukaemia**

Over
17,000 people
visited ANSTO's main Lucas Heights campus on **educational and community tours**

CAS exceeded performance target, reporting
79 per cent
availability
(compared to a target of 65 per cent)

Australian Synchrotron exceeded performance target, reporting
99 per cent
availability
(compared to a target of 95 per cent)

Annual Performance Statement

Introductory statement

We, the Australian Nuclear Science and Technology Organisation (ANSTO) Board, as the accountable authority of ANSTO, present the 2017-2018 Annual Performance Statements of ANSTO, as required under paragraph 39(1)(a) of the *Public Governance, Performance and Accountability Act 2013 (PGPA Act)*. In our opinion, this Annual Performance Statement is based on properly maintained records, accurately reflects the performance of the entity, and complies with subsection 39a(2) of the PGPA Act.

Entity Purpose

ANSTO's purpose is set by the following core functions, as provided by the *Australian Nuclear Science and Technology Organisation Act 1987*:

- Conduct research and development in relation to nuclear science and technology;
- Produce and use radioisotopes, isotopic techniques and nuclear radiation for medicine, science, industry, commerce and agriculture;
- Encourage and facilitate the application and use of the results from research and development;
- Manage radioactive materials and waste arising from various prescribed activities;
- Provide goods and services related to core activities;
- Provide advice to government and undertake international liaison in nuclear-related matters;
- Make available (on a commercial basis where appropriate) facilities, equipment and expertise for research in nuclear science and technology;
- Publish scientific and technical reports, periodicals and papers, and provide public information and advice; and
- Facilitate education and training in nuclear science and technology, including through granting scientific research studentships and fellowships, in cooperation with universities, professional bodies and other education and research institutions.

Outcome:

Improved knowledge, innovative capacity and healthcare through nuclear-based facilities, research, training, products, services and advice to government, industry, the education sector and the Australian population.

Performance Criterion 1 *Full utilisation of our landmark infrastructure*	**Criteria***	**Result**
Total availability of OPAL: Days at power	300	299
Accelerators: % of availability	65%	79%
Neutron Beam Instruments: % of availability	85%	85%
Australian Synchrotron: % of availability	95%	99%
Performance Criterion 2 *Human health products*	**Criteria***	**Result**
Radiopharmaceutical doses: potential doses**	2,462,510	2,492,917

*Criteria Source: ANSTO's 2017-2018 Corporate Plan and ANSTO Budget Statements, Programme 1.1, Portfolio Budget Statements 2018-2019, Budget Related Paper No. 1.12, Industry, Innovation and Science Portfolio

** The criteria and result reported in last year's Annual Performance Statement, included forecast doses for the ANM facility; the actual number of potential doses produced in 2016-2017 was 2,473,488. ANSTO is reviewing the method used to estimate doses based on changes in utilisation in clinical practice.

ANSTO is the custodian of most of Australia's landmark and national research infrastructure – the OPAL research reactor and its associated suite of neutron beam instruments, the Australian Synchrotron, the Centre for Accelerator Science (CAS). and the National Deuteration Facility (NDF). Consistent with the purposes set out in the ANSTO Act, ANSTO makes its research infrastructure and expertise available to researchers and industry users from across Australia and around the world. Approximately 6000 national and international researchers and industry users depend on the availability of ANSTO's infrastructure each year. This infrastructure has particular importance in sustaining Australia's research competitiveness, innovation and support for Australian industry. Its unique capabilities are instrumental for research that aligns with the National Science and Research Priorities and innovation in major economic sectors, including mining, manufacturing, agriculture and healthcare.

In 2017-2018, similar to previous years, the availability and reliability of ANSTO's landmark research infrastructure was high, exceeding nearly all performance criteria. This result is a credit to ANSTO's commitment to continuous improvement and its comprehensive asset management practices, implemented to ensure the sustainable operations of ANSTO's landmark infrastructure.

ANSTO's OPAL reactor maintained its status as the hardest-working and most reliable multi-purpose research reactor in the world, recording 299 days at power in 2017-2018. The reliable operation of OPAL is critical in supporting the production of lifesaving nuclear medicines as well as the steady supply of neutrons for research.

In May 2018, the Australian Government released its response to the *2016 National Research Infrastructure Roadmap*. The *Research Infrastructure Investment Plan* will deliver an additional $7.3 million for the Australian Centre for Neutron Scattering (ACNS), National Deuteration Facility (NDF) and CAS over the next five years.

ANSTO's neutron beam instruments at ACNS fully met targeted availability, continuing to demonstrate the importance of proactive maintenance to support Australia's strong reputation as a global leader in the field of neutron science.

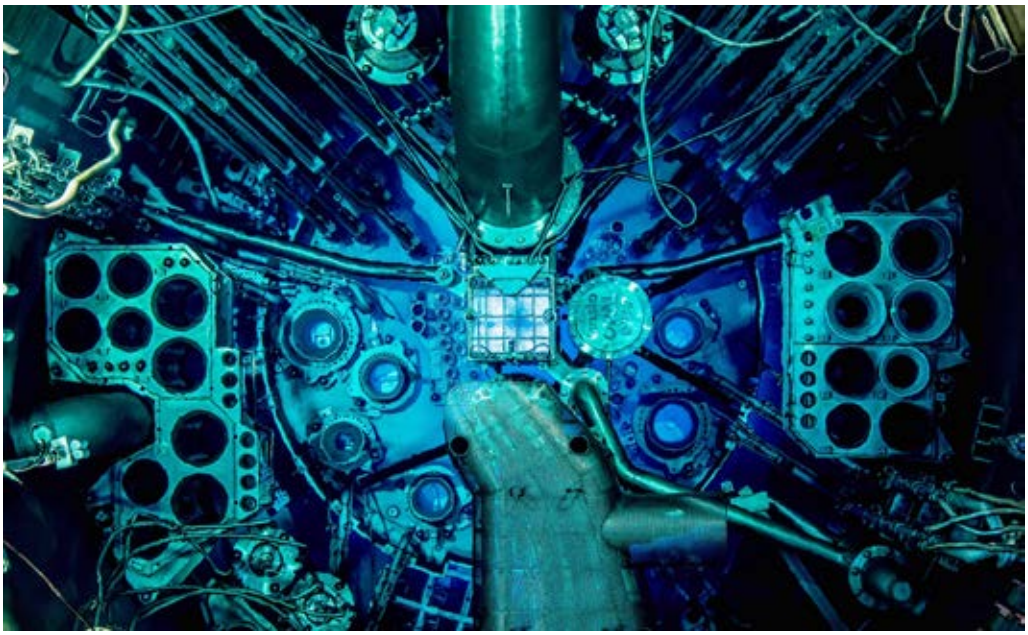
The four world-class ion accelerators at CAS exceeded their performance target for the reporting period, operating at 121.5 per cent. This was predominately driven by increased demand for availability from the user community.

The Australian Synchrotron has maintained its position in the leading class of synchrotron facilities around the world that deliver machine reliability at better than 99 per cent. A comprehensive asset management program, supported by the Australian Government's $520 million commitment as part of the National Innovation and Science Agenda (NISA) to secure operations at the facility through to 2026, underpins this result.

During 2017-2018, ANSTO secured capital investment commitments totalling more than $94.1 million, enabling the development of new beamlines at the Australian Synchrotron. Over the coming years, the facility will nearly double the number of beamlines available to users, providing new world-class capability and much-needed capacity. Funding has been provided from a range of contributors including Australian universities, research institutions, and government agencies and New Zealand government, research institutes and universities.

The production of nuclear medicines remained a high priority for the organisation, with a number of advances in 2017-2018 to support the new ANM facility coming online. Existing facilities continued to manufacture, process and distribute nuclear medicines for domestic and international patients. An increase in the number of doses over 2017-2018 compared to the criteria can be attributed to additional production runs.

ANSTO has supported several clinical trials in Australia by providing Lutetium-177 (Lu-177) for the treatment of cancers such as neuroendocrine tumours and advanced stage prostate cancer. In 2017, ANSTO committed to supplying Lu-177 to support the TheraP trial, a partnership between ANZUP Cancer Trials Group Limited (ANZUP) and the Prostate Cancer Foundation of Australia (PCFA). The TheraP study is an Australian multicentre trial, with the first patient receiving treatment in early 2018.



The OPAL multi-purpose reactor is used for a range of nuclear medicine, research and industrial applications.

Improving the health of Australia

PET and simulations verify dose accuracy and range in advanced heavy ions therapy.

In recognition of Australia's upcoming proton therapy facility and a proposed National Particle Treatment and Research Centre, a core group of ANSTO human health and radiation measurement specialists are undertaking research relating to these advanced techniques.

Particle therapy uses a targeted beam of high-energy particles - using protons or other charged ions, such as carbon - that can kill cancer cells without damaging surrounding healthy tissue. It is a more effective treatment for a range of cancers than techniques currently used in Australia, and is especially beneficial to patients suffering from brain cancer, and infants and children whose organs are still developing.

ANSTO is collaborating with the Centre for Medical Radiation Physics at the University of Wollongong (UOW) and the National Institute of Radiological Sciences (NIRS) in Japan on carbon ion therapy research.

The research group is focused on in-beam PET imaging - in which PET imaging is used for quality assurance during irradiation of the target (tumour).

PET is the only clinical imaging method which can verify that the correct dose has been delivered accurately to the target. When the patient is receiving therapy, you can produce PET images of the secondary particles, positron-emitting radionuclides, which are created by the primary beam due to nuclear fragmentations.

Different species that are created and emit positrons at different rates can be used to estimate the dose profile indirectly. What is displayed and quantified in the image allows the treating doctor to determine the depth at which the dose was deposited, and confirm that it conforms to the tumour site. The measured activity from the target activation of carbon comes from the decay of secondary particles.

Computer modelling and simulation of the process is also necessary to validate range estimation methods and plan experimental work.

Image opposite page: The Heidelberg Ion Therapy Center (HIT), Heidelberg Germany.

Particle therapy requires fewer procedures because of the stronger effective radiation dose and sparing of the healthy surrounding tissue. In turn, with less time in care the burden on both patients and the health system is reduced.

3D structure of a molecular scaffold with role in cancer

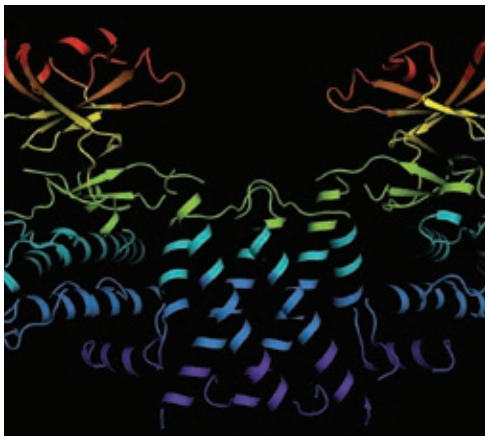
Melbourne researchers have used the Australian Synchrotron to produce the first three-dimensional structure of a molecular scaffold known to play a critical role in the development and spread of aggressive breast, colon and pancreatic cancer.

Armed with the structure, the research team is looking at ways of targeting parts of the scaffold molecule critical for its function. They hope the research will lead to novel strategies to target cancer.

The research was the result of a long-standing collaboration between Walter and Eliza Hall Institute (WEHI) and Monash University Biomedical Research Institute researchers.

The study was published in the journal *Nature Communications*.

The world-class facilities at the Australian Synchrotron in Melbourne were instrumental in the discovery. The facility has the specialised technology required to provide the detailed knowledge essential for seeing molecules at an atomic level. This is essential for the discovery and development of drugs that target and interfere with molecules that drive cancer and other diseases.



Highlight: Lutetium-177 supplied for advanced prostate cancer clinical trials

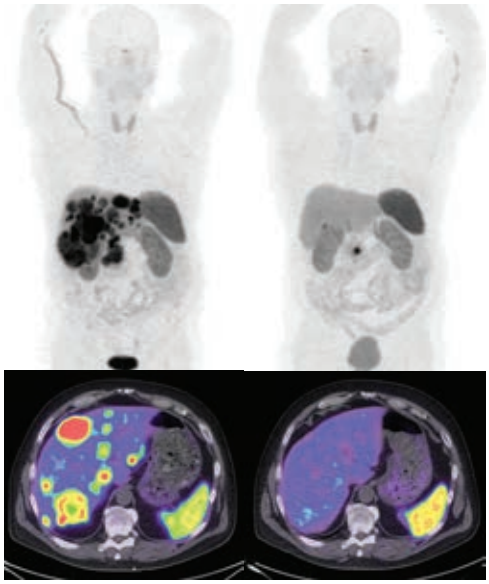
ANSTO supplied the nuclear medicine lutetium-177 for an advanced stage prostate cancer clinical trial by the Peter MacCallum Cancer Centre.

The therapy, LuPSMA, combined lutetium-177 with a radiolabelled molecule that recognises and attaches to prostate cancer cells for biomedical imaging and as radiation treatment.

This is the first prospective phase 2 study to provide compelling evidence that radionuclide treatment with LuPSMA has promising anti-tumour activity, a favourable toxicity profile, and improves quality of life in men with advanced stage prostate cancer who have progressed after standard treatments including chemotherapy.

Results of the study and an editorial were published in the *Lancet Oncology* in 2017.

The evidence from this pilot study supports the need for further clinical trials to compare LuPSMA against the current standard of care. ANSTO committed to the support of a follow-on clinical trial, which will be expanded to include ten Australian sites.



Baseline Post Lu-177

Highlight: New leukaemia drug Venetoclax

The Australian Synchrotron's Macromolecular Crystallography beamlines played a crucial role in the discovery of a successful new drug for chronic lymphocytic leukaemia (CLL) that has now received regulatory approvals for use by Australian, European and American patients.

The drug, Venetoclax, is a major advance for CLL patients who don't respond adequately to currently available treatments.

The Medical Imaging (MX2) beamline was used to provide highly detailed 3D images of protein structures. The level of detail was important in developing a drug that targets a single protein and critical for minimising potential side-effects.

The research was led by researchers at the Walter and Eliza Hall Institute (WEHI) in partnership with two major international pharmaceutical companies. The WEHI has secured up to US$325 million from the partial sale of royalty rights for the anti-cancer treatment.

CLL is the nation's most common leukaemia.

Potential new treatments and tools for understanding depression

ANSTO and University of Texas researchers are investigating new treatments for depression. This research, published in the *European Journal of Medicinal Chemistry*, evaluated antidepressant-like properties of novel compounds in preclinical behavioural and pharmacological studies.

This study sets the stage for further exploration of new compounds that will help researchers to develop new treatments for depression; treatments with therapeutic outcomes that improve upon selective serotonin reuptake inhibitors (SSRIs), the most commonly prescribed antidepressants, which are ineffective in many patients.

The new compounds are analogues of decynium-22 (D-22), a compound that blocks transport of "mood controlling" chemicals, called neurotransmitters, into neurons. D-22 does so by blocking transporters distinct from those blocked by SSRIs.

Numerous underlying biochemical mechanisms are thought to contribute to depression, and much research has focused on serotonin transporter (SERT). The research suggests that substantial uptake of serotonin by non-SERT transporters contributes to poor therapeutic outcomes following treatment with classic antidepressant medications.

Not only has the team potentially discovered a new treatment for depression, but the compounds are helping unravel the underlying mechanisms that contribute to poor antidepressant efficacy and treatment of other related mood disorders through the use of nuclear science and technology.

SSRIs, such as citalopram and fluoxetine, block SERT but do not work for everyone with depression, suggesting there is another mechanism depleting extracellular serotonin.

It is strongly suspected the ANSTO compounds inhibit this other mechanism, contributing to their antidepressant-like effects.

Our new compounds may not only help treat depression, but in the future we could develop a first-in-class tool to study these transporters in humans. This could help doctors tailor treatment for individuals, which would be an enormous benefit to patients as it can take months to conclude that an antidepressant is not working adequately.

Solutions for Australian industry

Investigations of food authenticity using nuclear techniques to benefit industry and consumers

The Australian fisheries and aquaculture industries generate billions of dollars in revenue. However, many companies are thought to be affected by food fraud.

ANSTO, together with the University of NSW and Macquarie University, held a successful seafood provenance research workshop in February 2018.

Representatives from industry, government and universities attended and shared their interests and needs with respect to origin of seafood and quality assessment.

Industry and consumers want to be certain that the seafood they distribute or consume does in fact come from the place identified on its packaging, whether Australia or overseas.

ANSTO's nuclear research techniques, including stable isotope analysis, X-ray fluorescence using ITRAX, and neutron activation analysis, provide great precision in determining geographical locations and production methods such as farmed or wild-caught.

Specific isotopic signatures and elemental fingerprints can be linked to particular locations where the species have been produced.

The aim of the workshop and ANSTO research in this area is to develop a quick, cost-effective analytical tool that will best serve the needs of the seafood producers, import and export industry bodies.

Although seafood is the initial area of focus, the provenance research can be applied to other types of food.

The research is closely aligned with the Australian Government Science and Research Priorities.

Radioactive phosphorus for implantable medical device for pancreatic cancer clinical trial

There are over 280,000 new cases of pancreatic cancer worldwide every year, and 265,000 people die of the disease annually.

ANSTO is providing expertise and irradiation services for Australian ASX-listed biomedical company OncoSil Medical. The company's device OncoSil™ is an implantable radiotherapy device containing a phosphorus radioisotope which is used to treat patients with inoperable pancreatic cancer tumours.

Evaluation of OncoSil™ is currently underway in a global clinical trial being conducted in Australia, the US and UK, with 25 patients now successfully implanted.

The company's approach involves the delivery of concentrated and localised radiation from microscopic sources which are inserted directly into a tumour via an ultrasonically guided endoscopic procedure.

The OPAL multi-purpose reactor is providing "activation" of the microparticles through the production of phosphorus-32 (32P), a radioisotope which is encapsulated within the microparticles.

Preliminary results reported by OncoSil Medical at the European Association of Nuclear Medicine in October 2017 showed that the device was able to control the spread of disease by 100 per cent up to 16 weeks post implantation, while also reducing tumour volumes by ~70 per cent up to 12 weeks following the procedure.

These results are particularly impressive given the lack of breakthroughs in recent decades treating pancreatic cancer, and were favourably received by the nuclear medicine global community.

Measurement research undertaken to ensure safe, well-engineered nanoparticles

Neutron scattering at ANSTO has provided detailed information about the interface and structure of the stabilising ligand layer of gold nanoparticles. The information is important for understanding measurements obtained using routine particle sizing techniques.

A collaboration between the National Measurement Institute (NMI), UNSW and ANSTO recently evaluated six different measurement techniques, including small angle neutron scattering (SANS) on the Bilby instrument, to quantify the thickness of surface-stabilising layers around nanoparticles.

Such layers may be intentionally applied to provide stabilisation or other functionality in a product, or may be passively attached to a particle as it enters different chemical environments (such as the human body or a river system).

Characterisation using multiple techniques was necessary, as currently there is no single method that is able to simultaneously provide information on the size of both the particle core and its stabilising layer.

In addition to neutron scattering, the study used dynamic light scattering, particle tracking analysis, differential centrifugation sedimentation, transmission electron microscopy and resonant mass measurement to characterise particle size and shape distribution.

The results suggested that the distribution of mass in particles capped with polymers is not homogenous. The layers in the cap, which are comprised of trains, loops and tails, become denser towards the particle surface.

Industry engagement

In line with the National Innovation and Science Agenda, ANSTO has implemented a number of initiatives, including:

- aligning ANSTO research themes and capability development to the national science and research priorities
- establishing the nandin Deep Technology Incubator which hosts the nandin innovation network, a knowledge transformation and innovation network to enhance collaboration between ANSTO, industry and the broader research community
- working with AINSE to increase the number of research training opportunities for Australian students and design planning towards an ANSTO Graduate Institute to deliver formal research training programs
- maximising the value and effectiveness of ANSTO's research infrastructure through the development of a new user access portal
- actively participating with the NISA-supported ON Prime program to engage with industry and explore commercialisation opportunities on material science and cancer therapeutic applications.

ANSTO has continued to engage with industry to develop solutions to business challenges and increase the commercial competitiveness of our research partners.

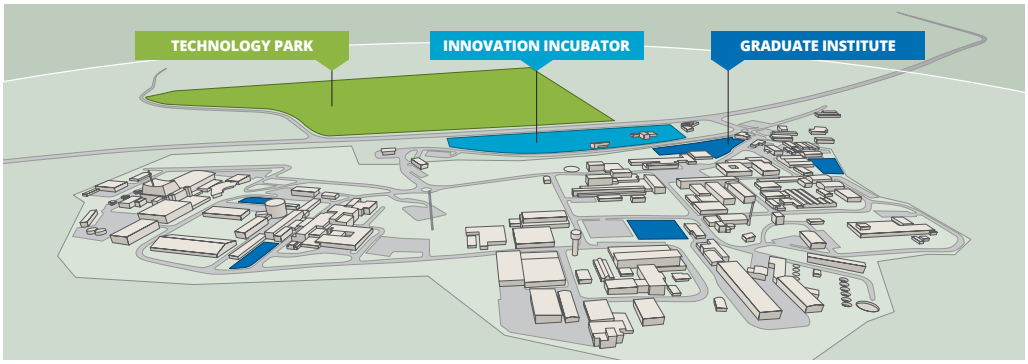
Noteworthy successes include the irradiation and manufacturing of the OncoSil implant in collaboration with OncoSil Medical (see details on page 18).

Over the year, two internal ventures incubating technologies based on ANSTO research, Synroc and Border Technologies, continued to be developed. There are several technical concepts also in development through this program concentrating on enhanced particle therapy, machine learning and behaviour analysis in nuclear security.

ANSTO has also adopted a new knowledge exchange and commercialisation strategy to best translate ANSTO's world class research outcomes into new products and services. This new approach draws upon the community; network and innovation programs being run within the nandin Deep Technology Incubator which opened in late 2017.

nandin is the first initiative in the ANSTO Innovation Precinct and is the home for innovation and entrepreneurship at ANSTO and the whole southern Sydney district. The incubator provides a dynamic co-working space, an entry point into the ANSTO Innovation community, including startup support and innovation programs, challenge based innovation and access to world-class research outcomes.

nandin also hosts a knowledge transformation and innovation network that supports engagement between innovative industry and the research community through regular community events such as forums, debates and hackathons. Key players in the network are industry clusters, particularly small to medium enterprises, university student accelerator programs, entrepreneurs and startups and industry groups.



Concept layout for the proposed ANSTO Innovation Precinct at the Lucas Heights campus.

Businesses

ANSTO Health

ANSTO Health is the commercial division of ANSTO responsible for the reliable production and distribution of critical radiopharmaceuticals, radiochemicals, cold kits and accessories for use in research, industry and the health sector across Australia and globally.

ANSTO Health plays an important role in the health of Australians, supplying over 12,500 patient doses of potentially lifesaving nuclear medicines each week.

The ANSTO Health business continues to grow with revenues increasing by 5.1 per cent compared to the previous year, driven by increased sales of key products.

Lutetium-177

ANSTO Health is licensed by the Therapeutic Goods Administration (TGA) to manufacture lutetium-177 (Lu-177) for supply under the special access scheme and to clinical trials within Australia and New Zealand. This is an exciting addition to our current portfolio. ANSTO is currently providing Lu-177 for two key multi-centre clinical trials including the treatment of neuro endocrine tumours and combined with a PSMA (Prostate Specific Membrane Antigen) for the treatment of prostate cancer.

ANSTO Nuclear Medicine

ANSTO Nuclear Medicine Pty Ltd (ANM) is a subsidiary that was established to own and operate the new Mo-99 Production Facility that only uses low enriched uranium (LEU). The facility is based at ANSTO's Lucas Heights campus, and is co-located on the site where SyMo will be built. The latter is a waste management facility that will utilise ANSTO's Synroc technology; construction is expected to commence in the second half of calendar year 2018.

The ANM Mo-99 project continued throughout the 2017-2018 year, with the completion of the building mid-year. Mechanical testing, qualification and cold (non-radioactive) commissioning were completed by the end of the year.

A submission was made to Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) for a facility licence to operate the new Mo-99 production facility and this was received in the 2017-2018 year. Hot (radioactive) commissioning will need to be completed prior to the commencement of production, which is expected in 2018-2019.

The TGA granted ANM a GMP (Good Manufacturing Practice) licence during 2017-2018. This licence allows the production of Mo-99, which is a therapeutic product. Once the facility is commissioned, the product itself will also require TGA approval

The ANM facility will position Australia as a global leader in the high-end manufacturing of nuclear medicine and secure Australia's supply of nuclear medicines for the domestic market.

Exported Low Enriched Uranium Molybdenum-99 (Mo-99)

Mo-99 is produced at ANSTO via a process starting with LEU that is irradiated in the OPAL reactor. OPAL also uses LEU fuel, and together with the LEU used for producing Mo-99 ensures that ANSTO is consistent in its support of non-proliferation.

In 2017-2018 ANSTO provided all of Australia's domestic Mo-99 requirements, and additional product was provided to customers overseas. This export Mo-99 was sold by ANSTO Health to a number of countries, with the key ones being the USA, Japan and China.

PETTECH Solutions

PETTECH Solutions Pty Ltd is a wholly owned subsidiary of ANSTO that operates two medical cyclotrons for radiopharmaceutical production located at the Lucas Heights campus.

PETTECH routinely supplies NSW and ACT hospitals and other facilities, and continues to hold a strong market share, acquiring new customers entering into the NSW 18F-FDG market during the period.

This is a result of consistently reliable supply of quality products and ongoing commercial support to customers to maximise their business. PETTECH delivered increased doses and revenue for 2017-2018 compared to the previous year.

ANSTO Silicon

ANSTO remains the leading provider of neutron transmutation doping (NTD) silicon irradiation services globally, with 46 per cent of market share. Revenue from NTD in 2017-2018 was slightly lower than the prior year.

The end use of this irradiated product, after further processing by the manufacturers, is in high-end electronic switching devices. These devices are used in a range of applications such as power infrastructure, high-speed trains and to facilitate the development of energy from renewable sources such as wind. The long-term outlook for NTD silicon remains strong.

ANSTO Minerals

ANSTO Minerals provides consultancy and process development services for the minerals industry undertaking industry-funded research to develop and improve processes for the treatment of ores containing uranium, rare earths and other critical metals.

ANSTO Minerals also provides consulting services to minerals processing operations managing naturally occurring radioactivity (NORM), focusing on the management and mitigation of risks that may be associated with NORM.

ANSTO Minerals has established a strong reputation with its clients for high quality technical development, utilising its excellent facilities to allow the scale up of a range of metallurgical unit operations. The benefits accrue from both the technical expertise applied as well as the strong focus on delivering improved energy efficiency and overall economics of processing. ANSTO Minerals also has the only rare earth solvent extraction pilot plant outside of China capable of producing individual rare earth products of greater than 99.9 per cent purity.

The team within ANSTO Minerals continues to diversify its consultancy work, undertaking a number of technology trade-off studies and providing input to pre-feasibility and feasibility studies covering a wide range of metals including zirconium, uranium, rare earths including niobium, copper and lithium.

ANSTO has been providing practical solutions and innovative technologies for the Australian mining and mineral processing industries for 40 years.

ANSTO Radiation Services

Comprising of the Radiation Consultancy, Radiation Safety Training and Instrument Calibration groups, ANSTO Radiation Services is the leading provider of radiation protection services and advice in Australia.

There has been a commercial downturn in many sections of the radiation protection industry, but with a strong reputation and extensive practical experience across a broad range of radiation protection issues in industry, this year ANSTO Radiation Services has maintained its strong revenue and profitability achieved in recent years. Much of the focus has been on establishing longer-term contracts with key clients including the larger scale characterisation and remediation of legacy buildings and sites, and the management of high activity sources, utilising a range of ANSTO's resources.

Understanding our environment

Radon research leads to new technique to improve global climate models

An investigation that set out to resolve some of the uncertainty in the sources and quantities of atmospheric pollutants found in Antarctica has produced a new experimental technique to identify and characterise air reaching the frozen continent from distant land masses.

The research, which was published in the *Journal of Geophysical Research: Atmospheres*, was undertaken in collaboration with the Korea Polar Research Institute, the University of Bologna in Italy, and the Brazilian National Institute of Space Research, and was funded in part by the Australia-Korea Foundation.

Antarctic research provides opportunities to understand long term changes in global climate and gain a better understanding of atmospheric circulation at hemispheric and global scales.

The study relied on radon measurements collected using dual-flow-loop two-filter radon detectors, made and installed by ANSTO, that were located at two Korean stations in Antarctica. The detectors are considered the best in the world.

The research sought to improve our understanding of atmospheric pollution reaching Antarctica, including the different atmospheric transport pathways, where it comes from, how it is diluted on the journey and how much is lost through mixing and diffusion.

Most of the pollution that reaches Antarctica comes from southern hemisphere regions; however, a small percentage of northern hemisphere pollutants also reach Antarctica.

While the initial study was focused on radon measurements, a follow-up study recently submitted to *Frontiers in Earth Science* (Atmospheric Science) demonstrates that the analysis technique can be applied to characterise concentrations of other gases, such as methane, CO2, ozone or mercury, within the Antarctic troposphere and marine boundary layer. This information is crucial to improving understanding of chemical processes happening in the unique environment of the Antarctic Plateau.

The Jang Bogo station operated by the Korea Polar Research Institute, where there is a radon detector built and installed by ANSTO.

Using isotopes to understand saltwater intrusion into Rottnest Island groundwater

Research by ANSTO and UNSW environmental scientists on Rottnest Island, off the coast of Western Australia, has provided invaluable information about groundwater systems that may be relevant for the sustainability of many other islands around the globe.

Rottnest Island has a freshwater lens under it that sits atop seawater. Such lenses, described as such because of their oval shape, are formed from rainwater seeping down through soil. The seawater stays below the freshwater because it is denser.

There has been a decline in rainfall in southwest Western Australia since the 1970s, which is causing a change in the equilibrium of the lens and reducing the volume of freshwater.

Any change in equilibrium in the system will also change the environment of the microorganisms that live in the soil zone.

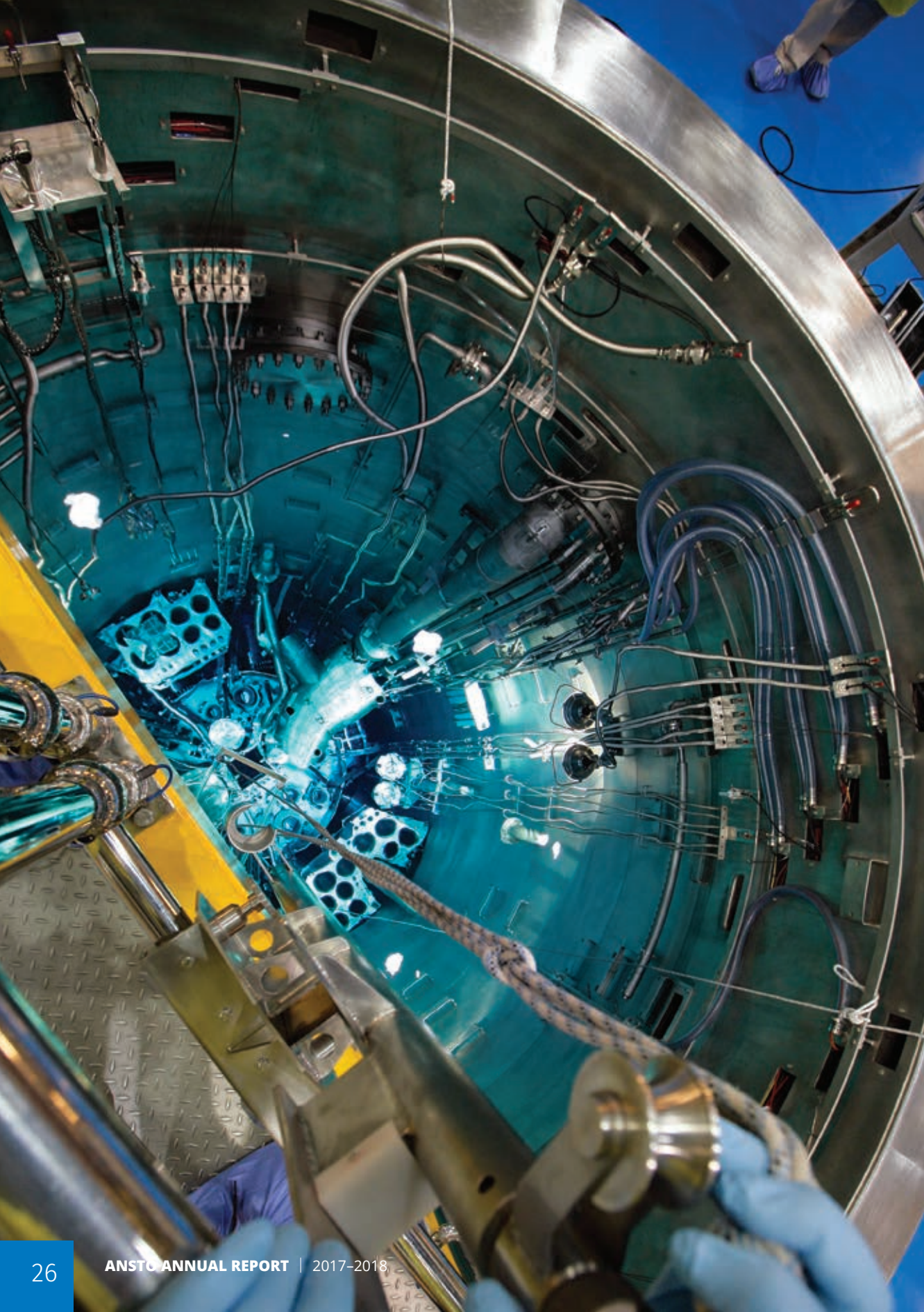
In addition, the freshwater lens also feeds natural springs on the island, which are used by the island's fauna such as quokkas and reptiles.

There is a threat of not only losing an important resource but potential harm to the ecosystem that relies on the groundwater.

The phenomenon of a freshwater lens becoming salty is expected to become a world-wide problem as climate change impacts island settings. This is especially important when groundwater is recharged predominantly by rainfall, which is the case on Rottnest Island.

Using isotopic techniques and other methods, the study involved field work over three years, sampling and monitoring of groundwater from 30 sites across the island, as well as rainwater and seawater collection.

A similar study is taking place on Milingimbi Island in the NT, which also has a freshwater lens.



Australia's research infrastructure

OPAL

At the heart of ANSTO's research capabilities is the state-of-the-art OPAL reactor, which is one of the world's most effective multi-purpose reactors.

OPAL is used for scientific research, the production of medical radioisotopes, and the irradiation of silicon for use in microelectronics and other specialised irradiations for research and industry.

During the financial year, OPAL continued to build on its reputation as one of the world's most reliable and available multi-purpose reactors. In 2017, Reactor Operations celebrated the achievement of three consecutive calendar years of OPAL operations above the target of 300 safe days at power.

In the 2017-2018 financial year, the OPAL reactor operated for 299 days out of a scheduled 304 days. This equates to a planned availability of 98 per cent and reliability of 96.5 per cent.

Sustained safe operations and improved business continuity have been achieved through strategic upgrades and embedding of the OPAL Asset Management Program. ANSTO's investment in electrical supply and OPAL plant upgrades has paid dividends in increased operational resilience, strengthening the continuity of supply of medical radioisotopes and neutrons for research.

The OPAL reactor has been utilised in the development of new radioisotope products that are being trialled for brachytherapy treatment of cancer. ANSTO's collaboration with researchers to produce the irradiated products supports the global development of treatments that better target tumours while reducing damage to healthy tissue.

OPAL's reputation for high reliability continues to attract international researchers, Australian scientists and industry clients to use ANSTO's world-class neutron capabilities for developing research outcomes. The Cold Neutron Source has operated with 96.5 per cent reliability, providing low energy neutrons to further insights into the molecular structure and dynamics of molecules such as proteins and polymers.

ANSTO now has a complete 'end-to-end' spent fuel management plan in place for the lifetime of the OPAL reactor. Under this plan, OPAL's spent fuel will be progressively sent to France for reprocessing, with residual waste returned to Australia for long-term storage at the National Radioactive Waste Management Facility (NRWMF).

ANSTO has set a 300+ day target in 2018–19 for the safe operation of the OPAL reactor to meet the increasing national and international radioisotope supply requirements. OPAL's multipurpose design also allows for a sustained and high availability of neutrons to support ANSTO's research objectives.

Australian Synchrotron

ANSTO's Australian Synchrotron is one of the nation's best performing research facilities and supports a broad range of high-quality research, with applications ranging from medicine and nanotechnology through to manufacturing and mineral exploration.

The facility uses accelerator technology to produce a powerful source of light (X-rays and infrared radiation) many times brighter than the sun. Its 10 beamlines harness this light to see the invisible structure and composition of materials from the macroscopic to the atomic, with a level of detail, speed and accuracy not possible in conventional laboratories.

The Synchrotron supports over 5000 researcher visits annually, including representatives from almost every Australian and New Zealand university as well as over 200 companies, government agencies and departments, art galleries, museums and medical research institutes.

Following the installation of the Australian Cancer Research Foundation (ACRF) Detector in 2017, significant time efficiencies have been realised on the MX2 beamline, leading to improved outcomes for users.

Highlight: Funding and infrastructure boost for Australian Synchrotron

ANSTO's BR—GHT project secured $94.1 million in new funding to significantly expand the scientific capacity and capability of the Australian Synchrotron by increasing the number of beamlines.

The first stage of the expansion will see the construction of the Micro-computed Tomography (MCT) beamline and the Medium Energy XAS (MEX) beamline:

- The MCT beamline will complement the Imaging and Medical Beamline (IMBL), by allowing 3D structures to be studied in close detail, which will enable advanced research in the fields of biological and health sciences.
- The MEX beamline will enable mapping of lighter elements such as sulphur, phosphorus, chlorine, calcium and potassium, with applications across sectors including aiding in the development of cancer treatment.

These beamlines will be closely followed by a Small Angle X-ray Scattering (BioSAXS) beamline. Supported by the New Zealand Synchrotron Group's significant $25 million investment, the beamline will allow for detailed protein studies focussed on improving drug design and validation processes.

By the end of the financial year the first two new beamlines were in detailed design, and the BioSAXS beamline had commenced design.

The new funding will expand the number of beamlines at the Synchrotron from 10 to 18, increasing research output at the facility and helping keep up with significant researcher demand for the state-of-the-art facility.

Contributing organisations will receive special access to the new beamlines, enabling them to undertake world-leading research that delivers real-life benefits including better energy solutions, better health treatments, and better environmental management.

The new funding will be supported by the Australian Government's significant operational investment made via the National Innovation and Science Agenda (NISA). The NISA provides $520 million to 2026 in operational funding to the Australian Synchrotron, which includes operational funding for the new beamlines.

Australian Centre for Neutron Scattering

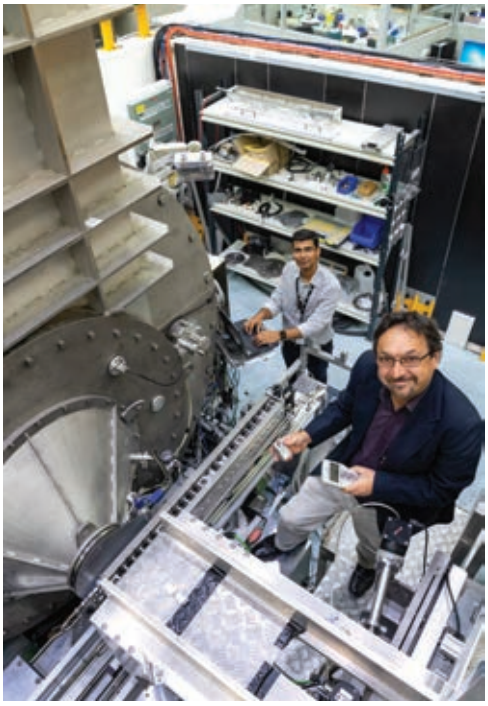
The Australian Centre for Neutron Scattering (ACNS), which is partially funded through the National Collaborative Research Infrastructure Strategy (NCRIS), is home to 15 neutron-beam instruments, where scientists apply neutron scattering techniques to solve complex research and industrial problems.

Neutron scattering is a non-destructive research technique that enables scientists to see the internal structure of materials, helping researchers understand why materials have the properties that they do, providing new insights that can be applied to problems such as the development of renewable, clean energy technologies or new battery materials, and studying the structural integrity of materials such as airplane turbines.

During the period, ACNS hosted in excess of 480 users over 1350 visits, including 18 commercial projects.

ACNS also hosted three IAEA scientific visitors from Indonesia's National Nuclear Energy Agency (BATAN), providing an overview of the technical capabilities and research possible on the Kowari, Taipan and Dingo instruments.

Improvements to several instruments, including adjustments to laser alignment systems and shielding, along with a new carbon fibre sample positioning probe, provided significant operational efficiencies. In some cases, these improvements reduced the time taken to complete standard activities from several hours down to several minutes.



ACNS is home to 15 neutron-beam instruments

Centre for Accelerator Science

The Centre for Accelerator Science (CAS), which is partially funded through NCRIS, consists of four megavolt ion accelerators - the 2MV Small Tandem for Applied Research (Star), the 10MV Australian National Tandem Research Accelerator (Antares), a 1MV low energy multi-isotope accelerator (Vega) and a 6MV tandem accelerator (Sirius) - with 17 beamlines and end stations, 10 ion sources and a suite of sample processing laboratories.

These facilities provide researchers with access to a suite of tools in one location including ion beam analysis and accelerator mass spectrometry for isotopic dating, air pollution, climate science, modification of materials for future nuclear reactors, radiation damage studies, forensic science, nuclear detector characterisation and microbiological studies.

National Deuteration Facility

The National Deuteration Facility (NDF), which is partially funded through NCRIS, produced nearly 140 deuterated molecules and supported more than 100 scientific users from 40 institutions during the period.

Sixteen Australian universities and research institutes as well as the CSIRO used the NDF's capabilities to enable world-class research.

Leading international organisations accessing the NDF included BioNTech (Germany), Moderna Therapeutics (USA), Japan Proton Accelerator Research Complex (Japan), Helmholtz Zentrum Berlin and Forschungszentrum Jülich (Germany), and Institut Lau-Langevin (France) as well as the universities of Copenhagen, Ibaraki, Leeds, Bath, Edinburgh, Glasgow, École Polytechnique Fédérale de Lausanne, Canterbury and Otago.

NDF offers molecular deuteration using *in vivo* biodeuteration or chemical deuteration techniques.

Outreach

Highlight: Visitors

Over 17,000 people visited ANSTO's main Lucas Heights campus on close to 800 educational and community tours in 2017-2018.

This included several information tours for community members of the possible host towns for the National Radioactive Waste Management Facility. Additionally, students from those towns have visited the Lucas Heights campus of ANSTO for a four-day experience of nuclear science and the types of careers available in the industry.

Education

The 2017-2018 year saw continued growth of ANSTO's key education programs.

The introduction of a new syllabus in each senior science course in 2018 necessitated the development of new resources and tour structures to assist teachers and students in fulfilling the syllabus outcomes. This caused a dramatic increase in the already well-established and popular tour program, with over double the number of school groups touring the Lucas Heights campus in the first half of the 2018 school year compared with the same time last year.

Delivery of ANSTO's Teacher Professional Development continued in the majority of states, with over 200 science teachers gaining knowledge and resources for teaching nuclear science. Regular videoconferencing sessions have provided students and teachers across Australia and in Korea with the opportunity to interact with some of ANSTO's inspiring scientists and engineers and to remotely perform radiation experiments with resources not available in high school science laboratories. The formation of a partnership between ANSTO and Swinburne University for the delivery of educational programs at the Australian Synchrotron has led to a promising growth in engagement with Victorian schools.

The year has been one of growth, expansion and increasing outreach to education and teacher organisations around Australia. The team at ANSTO is committed to continuing this development in the coming year.

STEM program

Throughout the year new activities have been added to the Next Gen STEM program. New science workshop incursions for primary students have been very well received by teachers, students and parents. Other activities within the program continue to generate considerable interest, particularly the immersive science experiences offered to students. The Girls in the Lab Workshop gives nearly 30 selected female secondary students within the Sutherland Shire the opportunity to experience the work life of a scientist or engineer. Students from across Australia undergo a competitive application process to participate in the Big Ideas Forum, a week-long experience at the Lucas Heights campus. These programs have once again been very successful.

The school holiday program, which offers a wide variety of STEM activities and a careers-focused school holiday tour, also remains very popular.

Sponsorship

ANSTO's sponsorship portfolio focuses on three key categories: science, industry and community.

ANSTO's sponsorship and event program is strategically positioned to build upon the reputation of the ANSTO brand, develop relationships with key stakeholders and influencers, and amplify the important role ANSTO plays in contributing to health, the environment and supporting industry.

Industry sponsorships and events are selected for the purpose of positioning ANSTO as the Australian leaders in nuclear science and technology. These sponsorships give ANSTO employees an opportunity to connect with innovative networks, key stakeholders and industry bodies.

From a community perspective, sponsorships specifically target the Sutherland Shire local community, where ANSTO's main campus at Lucas Heights is situated. A key objective of the community sponsorships is to raise awareness of the organisation, including showcasing the activities of ANSTO, benefits and outcomes of nuclear science and career opportunities at ANSTO and in STEM.

A record number of people toured ANSTO's Lucas Heights in 2017-2018

ANSTO's Dr Simone Ritcher (centre) with the FREO2 froup from the University of Melbourne, winners of the 2017 ANSTO Eureka Prize for Innovative Use of Technology during the Australian Museum Eureka Prizes

ANSTO's Dr Suzanne Hollins speaking at the 2018 Science meets Parliament event which offers STEM professionals the chance to build a profile for their important work with Australia's Federal politicians

ANSTO supported events that highlight the organisation's role in health the Sutherland Shire Relay for Life event

ANSTO's highly popular school holiday workshops provide children with a fun and interactive introduction to science

International Engagement

IAEA

The Regional Cooperative Agreement (RCA) is an intergovernmental agreement of 22 IAEA Member States in East and South Asia and the Pacific, under which people from developing member countries are educated and trained in the safe and peaceful uses of nuclear science and technology for a range of applications in health, environment, industry and agriculture. Australia is represented on the RCA by ANSTO. During the past year, ANSTO demonstrated the breadth of its capabilities in the application of nuclear techniques in technical cooperation projects in the areas of marine radioactivity monitoring, land degradation, sustainable groundwater resource management, and air pollution characterisation, and joined a new research project investigating the impact on the atmosphere of industrial activities in the Asian Region.

During the year, ACNS hosted three IAEA from Indonesia's National Nuclear Energy Agency (BATAN), who are being provided with an overview of the Kowari, Taipan and Dingo instruments. The visit is part of the IAEA's Technical Cooperation Programme (TCP).

Forum for Nuclear Cooperation in Asia (FNCA)

The FNCA is another multilateral forum of importance to ANSTO, Australia and the Asia-Pacific region. Like the RCA, the FNCA facilitates technical cooperation using nuclear science and technology amongst the 12 member countries. In October 2017, ANSTO initiated a project on climate change science with the aim to undertake nuclear and isotopic-based analyses that support research into past climate change, and provide the expertise to interpret the new knowledge to better understand the mechanisms and processes of past climate variability. This will in turn contribute to understanding and responding to current climate change. The project has attracted much enthusiasm and contribution from the other ten participating countries, with the next workshop and field trip planned in Indonesia in September 2018.

GICNT Destiny Elephant

ANSTO continued its leadership in the Global Initiative to Combat Nuclear Terrorism (GICNT) by co-hosting the Destiny Elephant regional nuclear forensics workshop in conjunction with the Thailand Office of Atoms for Peace, the Australian Department of Foreign Affairs and Trade and the New Zealand Ministry of Foreign Affairs and Trade. The GICNT – a joint US and Russia initiative – is the preeminent multilateral forum for practical cooperation on nuclear security issues, and support of events such as Destiny Elephant maintains Australia and ANSTO's position as leaders in the global effort to continue to strengthen nuclear security.

Generation IV International Forum (GIF)

GIF is a consortium of 13 advanced countries and the European Union, working together to develop the next generation of nuclear reactor technologies that will provide enhanced safety, security and non-proliferation characteristics, and improved efficiency and economics. ANSTO was the lead agency for the treaty process for Australia to accede to the GIF.

Following support for accession by the Joint Standing Committee on Treaties (JSCOT), Australia deposited its Instrument of Accession to the GIF Framework Agreement on 14 September 2017; the Agreement entered into force for Australia on 13 December 2017.

ANSTO's contribution to the Forum will focus on the Very High Temperature Reactor (VHTR) and Molten Salt Reactor (MSR) systems, utilising ANSTO's extensive experience and expertise in materials engineering and structural integrity research. ANSTO staff are also leading and coordinating a cross-cutting GIF activity investigating how Advanced Manufacturing and Materials Engineering could be used to reduce the deployment time of Generation IV reactors.

CEO of ANSTO, Dr Adi Paterson, was in France for the ceremony to officially welcome Australia to the Generation IV International Forum (GIF) Framework Agreement

France Intergovernmental Agreement

ANSTO facilitated the negotiation, signature, consideration by JSCOT, ratification and entry into force of an Agreement between the Government of Australia and the Government of the French Republic Concerning the Reprocessing in France of Australian Irradiated Nuclear Fuel Elements. This treaty-level document supports the reprocessing of spent fuel from OPAL by the French company Orano (formerly known as Areva), and was required under French law before spent fuel can be shipped to France. Under the agreement, Australia undertakes to facilitate the eventual return of the waste arising from the reprocessing operation to Australia.

Sri Lanka CKDu

ANSTO continues to work with Sri Lanka to battle chronic kidney disease of unknown aetiology (CKDu). In November 2017, we facilitated the first workshop in Colombo, bringing together Australian and Sri Lankan experts to look at the medical and physiological, environmental, and public health aspects of the disease. That bilateral work continues. We are also reaching out to other groups researching this disease in Sri Lanka and other parts of the world. In recognition of the importance of this work, the Department of Foreign Affairs and Trade has provided financial support for the project.

Support to Government

As mandated by the ANSTO Act, ANSTO plays a vital role in providing expert and technical advice to the Australian Government on all matters relating to nuclear science, technology and engineering. ANSTO also plays a critical role in contributing to and informing policy making in these areas.

ANSTO's support for government and policy making is achieved through various mechanisms.

ANSTO maintains ongoing engagement with the Minister for Jobs and Innovation, the Assistant Minister for Science, Jobs and Innovation, the Department of Industry, Innovation and Science, other relevant Ministers and their departments, as well as other key agencies and stakeholders.

Throughout 2017-2018, the Minister's Office and the Department were kept informed of significant events and critical developments in a timely manner. ANSTO works with the Department on a daily basis, keeping them abreast of ANSTO's operations, achievements and activities, responding to requests for expert or technical advice regarding nuclear science and technology, and providing input into the formation of science, research and innovation policy.

ANSTO also regularly and proactively engages with the Chief Scientist of Australia, federal and state parliamentarians and local councillors, to update them on ANSTO activities as well as relevant developments in nuclear science and technology. In March 2018, ANSTO hosted a breakfast briefing for more than 100 NSW parliamentarians, university partners, and industry representatives on its plans for an Innovation Precinct.

ANSTO also made significant contributions to major policy inquiries and expert working groups to support Australian science and innovation policy making. These included the Senate inquiry into the selection process for a NRWMF in South Australia, the Greater Sydney Commission's 2018 South District Plan and a parliamentary inquiry into the Australian Government's role in the development of cities.

ANSTO also continued to provide technical support and advice to the Federal Government regarding the establishment of a NRWMF. This included the provision of expert advice around the development of the Australian Radioactive Waste Management Framework which was released in April 2018 and will guide the principles, policies and institutional arrangements of radioactive waste management in Australia. ANSTO's expertise stems from decades of experience in safely managing radioactive waste from the production of lifesaving nuclear medicines. Throughout 2017-2018, ANSTO welcomed more than 15 delegations from the local communities surrounding nominated sites to its Lucas Heights campus to help them gain a better understanding of Australia's nuclear industry and the kinds of wastes that will be managed at the NRWMF. Several ANSTO staff, including ANSTO CEO, Dr Adi Paterson, also joined the Department on visits to areas surrounding nominated sites to provide further information and answer questions.

Additionally, ANSTO has supported and led a number of important Parliamentary processes to support Australia's accession to the Generation IV Framework Agreement and the Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology 2017. These are important milestones that have enabled ANSTO and Australia to benefit from the activities of these important multilateral collaborative forums. ANSTO also led the governmental and parliamentary processes to conclude an Intergovernmental Agreement between Australia and France to enable the reprocessing of OPAL spent fuel by the French company Orano from 2018.

ANSTO also continued to provide expert advice to the Foreign Affairs and Trade portfolio in relation to the peaceful uses of nuclear energy, nuclear security and nuclear non-proliferation.

Minister Matt Kean (far right), Minister for Innovation and Better Regulation, by the OPAL multi-purpose research reactor pool

Minister Zed Seselja (right), Assistant Minister for Science, Jobs and Innovation, with ANSTO CEO Dr Adi Paterson

Partnerships and collaborations

Asia Oceania Forum for Synchrotron Radiation Research (AOFSRR)

AOFSRR is an association of all synchrotron operating and user nations in the Asian region. Its mission is to strengthen regional cooperation in, and to promote the advancement of, synchrotron research.

ANSTO has had a close association with the AOFSRR since its inception in 2006, when the then ANSTO-operated Australian Synchrotron Research Program joined as a foundation member representing Australia. Since 2012, ANSTO has served as the financial manager of the AOFSRR to facilitate the payment of membership fees by the eight full member nations.

ANSTO, as owner of the Australian Synchrotron and provider of financial services, was represented at the 2017 AOFSRR meeting, held in Harima, Japan in October 2017, and at the 2018 meeting held in Taipei, Taiwan, in June 2018.

ANSTO's Andrew Peele, Director of the Australian Synchrotron, is the current AOFSRR President. He and Richard Garrett, the AOFSRR Secretary-Treasurer, organized a one day workshop "Advanced Light Sources in the AOFSRR Countries", held in Taipei as a satellite to the 2018 International Synchrotron Radiation Instrumentation conference, which featured presentations from all major synchrotron and X-ray Free Electron Laser light source facilities in the region.

Austin Health

ANSTO's partnership with Austin Health established a state-of-the-art PET Solid Targetry Laboratory at the Austin Hospital. The laboratory enables research into new nuclear imaging techniques to benefit patients affected by different types of cancers. The partnership provides a reliable and cost-effective system for the production of relevant long-lived PET radionuclides which are suitable for the radio-labelling of biomolecules for research and clinical imaging applications. A collaboration agreement was renewed by ANSTO and Austin Health in February 2018 for a period of three years, with a view to increasing scientific impact and benefit to end-users through the joint capabilities.

Australian Collaboration for Accelerator Science (ACAS)

ACAS was established in 2010, between the four major accelerator centres in Australia: ANSTO, the ANU, the Australian Synchrotron and the University of Melbourne.

The mission of ACAS is to become an umbrella organisation for all megavolt accelerator systems in Australia. Its aim is to promote and grow the use and understanding of accelerator science activities in Australia, and to link with major international accelerator centres. Internationally, collaborative research projects with European Organization for Nuclear Research (CERN), and with the Japanese free-electron laser facility at the Japan Synchrotron Radiation Research Institute (SPring-8), are ongoing.

Australian Institute of Nuclear Science and Engineering (AINSE)

AINSE provides a platform for training and cooperation in the nuclear science and engineering fields. Its membership comprises 44 Australian and New Zealand universities and scientific organisations, including ANSTO, making it one of the few scientific institutions with such a wide membership. AINSE facilitates world class research and education in nuclear science and engineering and promotes the use of ANSTO and other associated nuclear capabilities by offering scholarships in early career research and supporting training programs such as schools, conferences and workshops. New programs include a PhD internship with AINSE, ANSTO and the Embassy of France in Australia and a residential student scholarship for PhD students undertaking research for more than 6 months per year at an ANSTO facility. AINSE also offered an educational tour in Japan in September 2017 to inform delegates about particle therapy treatments in Japan, with a focus on carbon-ion therapy. AINSE is working in collaboration with ANSTO to provide assistance with ANSTO's development of a Graduate Institute.

European Organization for Nuclear Research (CERN)

ANSTO has a formal agreement with CERN which allows respective scientists to collaborate together and receive reciprocal use of research infrastructure.

The agreement has enabled collaborative research in accelerator science, health and life sciences, information technology and radiation detection. By engaging with CERN, ANSTO and Australia are benefiting from cutting-edge research and are able to develop expertise in areas such as particle-therapy platforms and large-scale accelerator facilities.

Defence Science and Technology Group (DST)

ANSTO and the DST (formerly the Defence Science and Technology Organisation) continue to engage on joint activities and projects, including ongoing cooperation to strengthen Australia's capability to deter, detect and respond to incidents that involve nuclear or other radioactive material. The DST has made a significant contribution to the BR—GHT project to construct new beamlines at the Australian Synchrotron. Both organisations are committed to ensuring DST obtains full value from their investment, and this will help further strengthen the relationship.

Helmholtz-Zentrum Berlin (HZB)

In October 2016, ANSTO renewed its Memorandum of Understanding (MOU) with the renowned large-scale German research organisation, HZB, which further advances a program of collaborative scientific research on energy materials. The collaboration opportunities between ANSTO and HZB were further explored at a joint workshop on 'Perspectives for energy and materials science research within large scale facilities' at the HZB BESSY II site in Berlin in March 2017.

In February 2017 ANSTO transferred the BioRef neutron reflectometer from the BER-II Reactor to ANSTO under a donation agreement that was signed in October 2015. The reflectometer is the 14th neutron beam instrument at the OPAL reactor and has been named SPATZ.

For four months commencing in January 2018, the BILBY small-angle neutron scattering instrument was shut down to enable the installation of SPATZ. During this period the CG2B neutron guide, which will deliver neutrons to SPATZ, was installed. Significant modifications to the BILBY sample enclosure area to accommodate SPATZ were also made. SPATZ will double the overall capacity for neutron reflectometry experiments at OPAL, and is expected to commence normal operations in early 2019.

ITER

The ITER project, located in southern France, is a collaboration by 35 nations to build the world's largest tokamak, a magnetic fusion device that has been designed to prove the feasibility of nuclear fusion as a large-scale and carbon-free source of energy. ITER will be the first fusion device to produce net energy and to maintain fusion for long periods of time.

ANSTO, ANU and the ITER Organisation have initiated two collaborative research projects under the agreements concluded in 2016-17: a project to install a unique ANU designed and developed plasma diagnostic imaging instrument on the ITER reactor, and a continuation of materials investigations related to plasma-wall interactions in ITER. ANSTO has signed two Implementing Agreements with the ITER Organisation to formalise these projects: an agreement to install a remote ITER design node at ANSTO as an initial step in the design of the diagnostic instrument; and an ANU-led investigation of tungsten first wall materials.

Japan Atomic Energy Agency (JAEA)

ANSTO continues its collaboration with the JAEA for research and development regarding materials testing. The ongoing shutdown of Japan's research reactors following the Fukushima accident in 2011 has led JAEA to seek increasing cooperation with international neutron scattering facilities, including the ACNS at ANSTO.

Japan Proton Accelerator Research Complex (J-PARC)

ANSTO undertook several activities under the MOU with J-PARC, which was signed in July 2015. In March 2017, an ANSTO expert participated in both a welding workshop and welding trials for the fabrication of the next generation target for the J-PARC spallation neutron source. ANSTO also assisted in J-PARC's efforts to establish chemical deuteration capabilities for the Japanese neutron scattering community by hosting a J-PARC staff member at the NDF three times in the second half of 2017. The J-PARC staff member was trained in the chemical deuteration labs at the NDF and established a project to produce some deuterated materials for the Japanese users. Two NDF staff participated at the deuteration workshop held at J-PARC in October 2017, and the NDF was asked and accepted to be an observer on J-PARC's recently established deuteration community.

Jilin University

ANSTO and Jilin University, located in Changchun, China, have a research collaboration MOU to pursue joint research in areas including palaeontology, engineering, environmental materials and medical sciences. In particular it is aimed at promoting the application of ANSTO's neutron and synchrotron imaging capabilities to palaeontology in collaboration with Jilin University's Dinosaur Evolution Research Center.

Macquarie University

An agreement between ANSTO and Macquarie University is helping geologists and scientists better understand everything from where earthquakes might occur to where gold is deposited. The partnership is promoting work to replicate environments located 400 kilometres beneath the Earth's surface. The study of the physical and chemical processes at these depths will provide a better understanding of the Earth, including how mineral deposits are formed. Furthermore, by providing a fuller working model of the processes that occur in the Earth's interior, scientists hope to better understand how to predict and anticipate geologic events such as earthquakes and volcanic eruptions.

This research makes complementary use of the ANCS's neutron beam instruments and high energy X-rays at the Australian Synchrotron. The team has commissioned a high pressure sample press on the X-ray Absorption Spectroscopy beamline at the Australian Synchrotron and conducted the first experiments.

Monash University

ANSTO's agreement with Monash University is helping facilitate knowledge sharing and creating new training and development opportunities for researchers in the areas of biomedical imaging, cancer therapy, accelerator science and neutron science.

National Institute for Radiological Sciences (NIRS)

NIRS, a laboratory of Japan's National Institutes for Quantum and Radiological Science and Technology (QST), has been a world leader in particle therapy for over two decades, and has pioneered the development and use of carbon ion therapy. ANSTO's collaboration with NIRS has been developing in recent years with increased use of NIRS facilities by ANSTO researchers, and with NIRS providing advice on the development of particle therapy in Australia. A draft research collaboration MOU has been agreed between the two organisations, and is expected to be signed early in FY2019.

RIKEN SPring-8 Centre

ANSTO has an MOU with the Japanese SPring-8 Centre that gives Australian scientists access to its world leading photon science facility – the SPring-8 Angstrom Compact free-electron Laser. The MOU was signed by ANSTO on behalf of the ACAS, so that its benefits extend to ANSTO's ACAS partners, namely the University of Melbourne, the Australian National University and the Australian Synchrotron.

ANSTO sent two representatives to the SPring-8 20th Anniversary Celebration which was held in October 2017, and was attended by the senior leadership from most of the world's major synchrotron light sources. It was immediately followed by the annual meeting of the Asia Oceania Forum for Synchrotron Radiation Research (see above).

Shanghai Institute for Applied Physics (SINAP)

ANSTO and SINAP have an ongoing MOU to recognise and enhance the mutual research links between two of the region's key nuclear science and technology organisations.

ANSTO and SINAP submitted proposals in Australia and China respectively to establish a "Joint Research Center for Low Emission Energy Generation and Storage Systems" to the 2017-2018 round of the Australia China Science and Research Fund Joint Research Centre (JRC) program. If funded, this centre would build on the success of the ANSTO-SINAP Materials Research JRC which operated from 2013-15. The successful JRC's are expected to be announced in FY2019.

Taiwanese Ministry of Science and Technology

ANSTO has a partnership with the Taiwanese Ministry of Science and Technology who funded the construction of a cold neutron triple-axis spectrometer, Sika, which was constructed by National Central University in 2012. The National Synchrotron Radiation Research Centre (NSRRC) commissioned and operates the instrument, introduced it into the Australian Centre for Neutron Scattering user program and promotes its use to users in Taiwan.

University of New South Wales (UNSW)

A collaboration between ANSTO, UNSW and the Centre for Nuclear Engineering at Imperial College, London, is delivering a nuclear engineering program, the only one of its kind in Australia. UNSW's Master of Engineering Science degree with a specialisation in Nuclear Engineering provides graduate students with the opportunity to train for a career in the nuclear industry. The program features contributions from national and international specialists in the nuclear engineering sector, including staff from ANSTO.

University of Sydney

ANSTO has a long standing MOU with the University of Sydney that covers a broad range of collaborative activity. One key area of collaboration is with the University's Brain and Mind Centre, with which ANSTO is a joint partner in a node of the National Imaging Facility. ANSTO operates the National Medical Cyclotron Research Facility as well as sharing advanced imaging capability. A key focus for the collaboration is to develop new radiotracers, instruments and scientific methods that extend the potential applications of molecular imaging in the future.

University of Tokyo

The Institute for Solid State Physics (ISSP) at the University of Tokyo and ANSTO have a MOU covering access by Japanese researchers conducting collaborative non-proprietary research, intended for publication in the open refereed literature, at the neutron beam facilities at the ACNS. The ISSP acts as a central funding agency for Japanese researchers to assist them in accessing international neutron scattering facilities.

University of Tsukuba

ANSTO and the University of Tsukuba in Japan have a formal collaboration which enables both to benefit from each other's expertise and experience in the areas of physics, materials science, nuclear science and technology, mathematical modelling and scientific computing, and allied disciplines. Materials science is a particular focus of this collaboration.

University of Wollongong (UoW)

An ANSTO- UoW Steering Committee was established in 2014–2015 to coordinate and develop their relationship. An annual research seed funding scheme is jointly funded by the two organisations, to assist UoW and ANSTO researchers to form substantial research partnerships with visibility and prominence, both nationally and internationally. Four projects were funded for 2018, with a total of $90,000 awarded. An annual workshop is held, hosted alternately, which includes status reports from the projects which have received seed finding in the past.

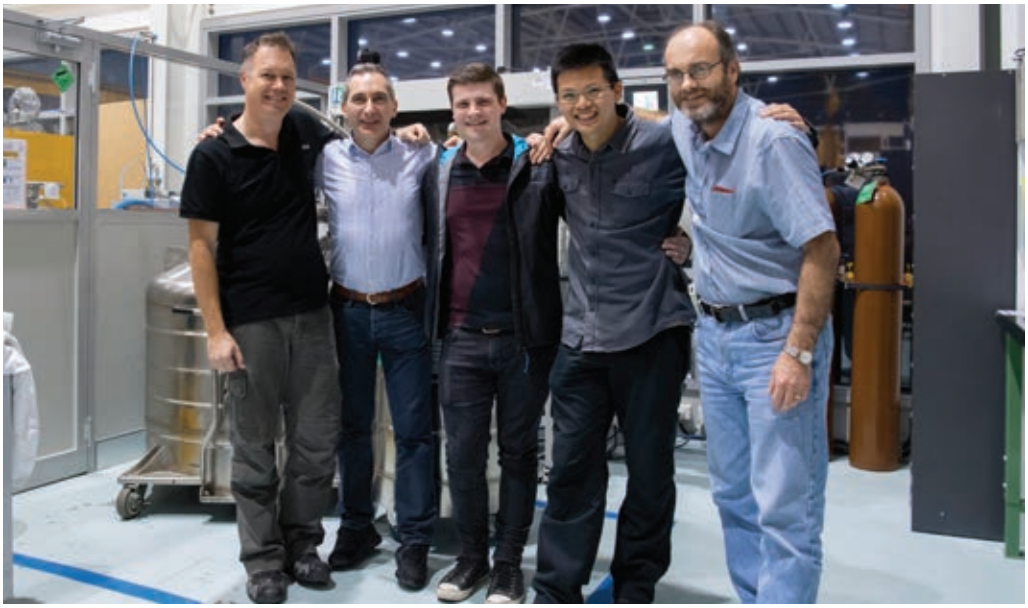
The UOW has also agreed to the temporary transfer of a cryogenic electron microscope to ANSTO's microscopy facility. The new instrument is state of the art in microscopy and enables samples to be studied at cryogenic temperatures (approximately -196 C). This technique avoids the use of staining or fixing, which can provide extraordinary insights in structural biology.

Awards and achievements

ACNS Sample Environment team

The ACNS Sample Environment team received the *2017 ANSTO Nuclear Science and Technology Award - George Collins Award* for Innovation for providing innovative solutions to the national and international scientific community allowing the execution of challenging and non-standard neutron beam experiments at ACNS resulting in high impact science and technological advances.

2017 ANSTO Nuclear Science and Technology Award – George Collins Award for Innovation



Members of the ACNS Sample Environment team

Dr Joseph Bevitt

Dr Joseph Bevitt received the *2017 ANSTO Nuclear Science and Technology Award - Excellence in Science Communication and Outreach Award* for his skills in translating complex scientific ideas and concepts for broad audiences – from the general public, government and the next generation of researchers.

2017 ANSTO Nuclear Science and Technology Award – Excellence in Science Communication and Outreach Award

Michael Druce

Michael Druce received the *2017 ANSTO Nuclear Science and Technology Award - Sustained Contribution Award* for his role in the development of Australia's capabilities to manufacture and distribute nuclear medicine to hospitals and clinics around Australia.

2017 ANSTO Nuclear Science and Technology Award – Sustained Contribution Award

Professor Lyndon Edwards

Iain Finnie Memorial Award

The international residual stress research community recognised ANSTO's National Director of Australian Gen-IV Research, Professor Lyndon Edwards for his 'excellent contribution to the advancement of applied residual stress applications and control' at a ceremony in the US on 25 October.

The *Iain Finnie Memorial Award* recognises leading engineers and researchers who have made seminal contributions to applied residual stress technology through either major practical innovations or pivotal theoretical advances.

Peter Kabakov

Young Innovator Scholarship

Dr Peter Kabakov was awarded the $10,000 *Young Innovator Scholarship* at the Pacific 2017 Maritime Conference and Trade Show for his work that contributes to the defence industry and Australia's security.

Dr Kabakov was presented the scholarship by Minister for Defence Industry, Christopher Pyne, at the Pacific 2017 Maritime Conference and Trade Show.

He received the award for his work on single crystal piezoelectric ceramics, which are being developed as the next generation of underwater acoustic systems transducers. Transducers such as these are used as part of the communication, mapping and navigation systems of submarines.

Dr Jessica Veliscek-Carolan

2017 ANSTO Nuclear Science and Technology Award – Early Career Award

Dr Jessica Veliscek-Carolan received the *2017 ANSTO Nuclear Science and Technology Award - Early Career Award* for her role in looking for improvements in the safe and sustainable management of radioactive waste.

Dr Nigel Lengkeek

ANSTO radiochemist, Dr Nigel Lengkeek, received the *Shimadzu Award for Radiopharmaceutical Scientist Member of the Australian and New Zealand Society of Nuclear Medicine (ANZSNM)* at the Annual Scientific Meeting (ASM) in Melbourne for his work on the development and delivery of the innovative cancer diagnostic agent, [67Ga]MILGa.

The radiopharmaceutical is currently being assessed as part of a phase 1 clinical trial using SPECT/CT imaging at Macquarie University Hospital for the detection and diagnosis of metastatic prostate, bladder and pancreatic cancers.

The development was undertaken in partnership with Sydney-based immuno-oncology company Minomic International, the developer of the parent antibody, MIL-38, and Auspep, an Australian pharmaceutical manufacturer.

Shimadzu Award for Radiopharmaceutical Scientist Member of the Australian and New Zealand Society of Nuclear Medicine (ANZSNM)

ANSTO's Nigel Lengkeek

Our Organisation

Organisational chart

Members of the Board

Mr James (Jim) McDowell

(Chair)
LL.B (Hons)

Independent business person with 35 years' experience in aerospace and defence, and former CEO BAE Systems Saudi Arabia.

Appointed
12 December 2013

Appointed Chairman
21 August 2014

Resigned effective
31 August 2018

Ms Penelope J Dobson

(Deputy Chair)
Dip Pharm, MPS, MBA, GAICD

Global pharmaceutical executive and business person.

Appointed
24 April 2014

Appointed Deputy Chair
14 March 2018

Term concludes
23 April 2019

Dr Adrian (Adi) Paterson

BSc, PhD

Chief Executive Officer and materials engineer.

Appointed
1 March 2009

Reappointed
1 March 2014

Reappointed
1 March 2017

Term concludes
28 February 2022

Emeritus Professor Stephen Buckman AM

BSc (Hons), PhD, FAPS, FAIP, FinstP

Academic and researcher at ANU.

Appointed
13 August 2015

Term concludes
12 August 2020

Professor Brigid Heywood

BSc (Hons), PhD

Deputy Vice-Chancellor (Research) University of Tasmania.

Appointed
28 June 2016

Term concludes
27 June 2021

Ms Carol Holley

(Risk and Audit Committee Chair)
BA, FCA, FAICD

Non-executive Director and Chair of various Risk and Audit Committees.

Appointed
25 February 2016

Appointed Risk and Audit Committee Chair
14 March 2018

Term concludes
24 February 2021

Professor Andrew Scott AM

MBBS (Hons), MD, FRACP, DDU, FAICD, FAANMS

Nuclear medicine physician, scientist, and academic.

Appointed
26 September 2007

Reappointed
29 September 2011

Reappointed
26 September 2016

Term concludes
28 September 2021

Professor Margaret Sheil AO

BSc (Hons), PhD, FRACI, FTSE, FANZSMS

Vice-Chancellor and President of QUT.

Appointed
28 June 2016

Term concludes
27 June 2021

Ms Erica Smyth AC

(Deputy Chair and Risk and Audit Committee Chair)
MSc, FAICD, FTSE

Scientist and business person.

Appointed
12 December 2008

Reappointed
14 March 2013

Appointed Deputy Chair
21 August 2014

Term concluded
13 March 2018

ANSTO Executive Leadership Team

Dr Adrian (Adi) Paterson

Chief Executive Officer

Peter Arambatzis

Group Chief Financial Officer Group Executive, Business Operations Systems

Michael Beckett

Group Executive, Asset Management and Services Group

Robert Blissett

Group Executive, People, Culture, Safety and Security

Shaun Jenkinson

Group Executive, Transformation and Engagement

Con Lyras

Group Executive, Capital Programs and Chief Engineer

Pamela Naidoo-Ameglio

Group Executive, Nuclear Operations

Dr Simone Richter

Group Executive, Nuclear Science & Technology, and Landmark Infrastructure

Jayne Senior

Group Executive, Customer Advocacy and Value Chain

Corporate governance

ANSTO statement on corporate governance

ANSTO is an Australian Government Corporate Commonwealth entity with its own Board that is established and constituted under the provisions of the *Australian Nuclear Science and Technology Organisation Act 1987* (ANSTO Act). ANSTO forms part of the portfolio responsibilities of the Minister for Jobs and Innovation and the Assistant Minister for Science, Jobs and Innovation.

The ANSTO Act defines the organisation's functions and powers, details the responsibilities and duties of the ANSTO Board and the Chief Executive Officer (CEO) to manage the organisation, and defines staffing, financial management and governance arrangements necessary for the efficient and effective management of the organisation and its subsidiaries.

As a Corporate Commonwealth entity, ANSTO's operations and governance arrangements are subject to the provisions of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act) and the Rules issued pursuant to that Act.

The PGPA Act promotes and mandates high standards of governance, performance and public accountability and establishes a core set of obligations that apply to an entity's accountable authority (i.e. the governing Board) and 'officials' employed or otherwise engaged by a Corporate Commonwealth entity.

Over the 2017–18 financial year, ANSTO continued to ensure its operational framework and corporate governance arrangements met the requirements of the PGPA Act and the associated Rules.

These arrangements are underpinned by ANSTO's core values and Code of Ethics, which are reviewed and adapted to accommodate organisational change and to reflect national and international best practice.

Ministerial oversight

From 1 July 2017 until 20 December 2017, the Minister responsible for ANSTO was the Minister for Industry, Innovation and Science. On 20 December 2017, the Minister for Jobs and Innovation and the Assistant Minister for Science, Jobs and Innovation took over responsibility for ANSTO.

Under the ANSTO and PGPA Acts, the relevant Minister and the Finance Minister may provide the ANSTO Board with Directions with respect to the performance of the functions or the exercise of the powers of the Board or the organisation, including a need to comply with a specific Government Policy Order.

No Ministerial Directions, issued under either the ANSTO Act or PGPA Act, were received by the ANSTO Board in 2017–18.

In June 2015, the Minister for Industry and Science provided the ANSTO Board with a Statement of Expectations (SOE) covering the government's policy context; partnerships and collaboration; science assets and staff; and communication with the Minister's office and the Department. This SOE still applies.

At the time, the ANSTO Board provided a response to the SOE in the form of a Statement of Intent that sets out how the ANSTO Board will meet the Minister's expectations as articulated within the SOE. That Statement of Intent also still applies.

Under section 19 of the PGPA Act and in accordance with the Minister's SOE, ANSTO is required to provide its responsible Minister with written notification of specified events and, more generally, to keep the Minister informed of its operations and those of its subsidiaries.

During the 2017–18 financial year, notices of two significant decisions under section 19 and one event under section 72 of the Act regarding ANSTO or its subsidiaries were provided to the Minister or the Assistant Minister:

1. On 26 September 2017, ANSTO provided notice to the Assistant Minister of a proposed new collaborative venture for ANSTO subsidiary, PETTECH Solutions Pty Limited.
2. On 16 February 2018, ANSTO advised the Minister that ANSTO had acquired additional shares in ANSTO subsidiary, ANSTO Nuclear Medicine Pty Limited (ANM) as a result of the transfer of ownership of the ANM manufacturing facility from ANSTO to ANM, and the Minster tabled a statement in both houses of parliament notifying the Parliament of the event.
3. On 22 February 2018, ANSTO provided an update to the Minister on the planned collaborative venture for ANSTO subsidiary, PETTECH Solutions Pty Limited.

In addition, 37 briefs on ANSTO's operations were provided to the Minister and/or the Assistant Minister.

ANSTO Board

ANSTO is governed by a Board which is the 'accountable authority' responsible to the Australian Government under the PGPA Act for the overall direction, performance and governance of the organisation.

ANSTO's operational framework and corporate governance arrangements support the effective operation of the ANSTO Board in the execution of its statutory and fiduciary duties under relevant legislation, particularly the ANSTO and PGPA Acts.

The general functions of the Board, as set out in the ANSTO Act, are to ensure the proper and efficient performance of the functions of the organisation and to determine the policy of the organisation with respect to any matter, having regard to the current policies of the Commonwealth Government.

The responsibilities and duties of the Board and its relationship with Executive Management are set out in a Board Charter. These responsibilities reflect the mandatory duties that apply to accountable authorities under sections 15 to 19 of the PGPA Act.

The principal governance responsibilities of the Board are to:

- select, appoint and monitor the performance of the CEO;
- establish and monitor the strategic direction of the organisation;
- determine and approve 'major' policies of the organisation;
- oversee the operations of the organisation, ensuring the organisation operates in a safe, responsible and ethical manner, and is compliant with legal and regulatory obligations;
- monitor financial performance; and
- ensure the establishment of effective organisational governance, risk management, compliance, and assurance mechanisms.

The effectiveness and performance of the Board and the individual members of the Board are evaluated annually as part of a structured annual review process. During 2017-2018, Board members completed an online questionnaire regarding Board and Committee performance. The results of the survey were discussed by the Board as a group. The Chair also held individual discussions with each Board member.

The remuneration and allowances payable to members of the Board, including the CEO, are determined by the Commonwealth Remuneration Tribunal.

Disclosure of interests and related entity transactions

Board members declare material interests in accordance with the ANSTO and PGPA Acts as appropriate.

The Board has processes for managing conflicts of interest, including a requirement that members absent themselves from discussions and voting where a member has declared a material personal interest, or where a potential or actual conflict of interest or duty arises. For the 2017–18 financial year, the Board is satisfied that it has discharged its duties and obligations in accordance with relevant requirements.

ANSTO follows the Government Procurement Guidelines and has a system of delegated powers for all transactions that enables transactions to be appropriately considered.

There have been 94 transactions above $10,000, which came to a total combined value of $11.0 million.

Composition of the Board

As of 30 June 2018, ANSTO's Board comprised the CEO and seven non-executive members drawn from the broader community who are not involved in the day-to-day management of the organisation. All non-executive members are appointed by the Governor-General in Council. The CEO is appointed by the ANSTO Board, in consultation with the Minister.

The CEO manages the affairs of ANSTO, subject to the directions of, and in accordance with, policies determined by the Board. Executive management attend Board meetings as required to report on matters relevant to their individual areas of responsibility. ANSTO has a Company Secretary who assists with the running of the Board and advises on governance matters. The Company Secretary attends Board meetings. Each Board member brings complementary skills and experience to the Board relevant to the principal activities and operations of ANSTO.

Board members are able to seek independent professional advice in accordance with their duties, responsibilities and obligations as members of the Board. Board members have access to all relevant information, including discussions with Management and subject matter experts. The Board participates in regular site visits. Newly appointed Board members are inducted in the organisation's operations and activities, and their duties and responsibilities as a member of the Board of a Corporate Commonwealth entity.

The Board meets regularly in accordance with a formally approved timetable and agenda. Six Board meetings were held during the 2017–18 financial year. Details of the number of Board meetings attended by each member during the 2017–18 financial year are outlined in **Table 1**.

Table 1

Member	Eligible to attend	Attended
Mr Jim W McDowell (Chair)	6	6
Ms Erica Smyth, AC (Deputy Chair)[1]	4	4
Ms Penelope J Dobson (Deputy Chair)[2]	6	5
Dr Adrian (Adi) Paterson (CEO)	6	6
Emeritus Professor Stephen Buckman, AM	6	5
Professor Brigid Heywood	6	6
Ms Carol Holley	6	6
Professor Andrew M Scott, AM	6	6
Professor Margaret Sheil, AO	6	4

1. Term ended on 13 March 2018 2. Appointed Deputy Chair from 14 March 2018

Board committees

The ANSTO Board delegates certain functions to a Risk and Audit Committee (RAC), in accordance with the *PGPA Act* and Rules and corporate governance best practice. It also operates a Remuneration and Nominations Committee and a Commercial Committee.

Risk and Audit Committee

The Risk and Audit Committee (RAC) assists the ANSTO Board in the discharge of its responsibilities by providing independent oversight, advice and assurance to the Board on the appropriateness of ANSTO's systems of risk oversight and management, financial reporting processes, performance reporting arrangements, systems of internal control, and systems to ensure compliance with relevant laws and policies. The role, purpose and responsibilities of the RAC are set out in the RAC Charter.

The Board is responsible for the appointment of RAC members, including the RAC Chair.

The RAC consists of at least three members drawn from the Board who are required to have appropriate qualifications, knowledge, skills or experience to assist the RAC to perform its functions, including an understanding of systems of risk oversight and management and systems of internal control. At least one member should have accounting or related financial management experience and/or qualifications, and a comprehensive understanding of accounting and auditing standards.

The Chair of the Board, the CEO, and the ANSTO Group Chief Financial Officer cannot be members of the RAC. However, the Chair of the Board and other Board members may attend RAC meetings, as observers. Members of the ANSTO management team (including the Group Chief Financial Officer, Deputy Chief Financial Officer, Head of Internal Audit and the Group Legal Counsel) attend meetings of the RAC as advisors and observers, by invitation of the RAC Chair. The Company Secretary is the secretary to the RAC and attends RAC meetings.

Representatives from the Australian National Audit Office (ANAO) and their contracted service provider (currently KPMG) also attend RAC meetings, by invitation of the RAC Chair.

The RAC meets four times a year. Details of the number of RAC meetings attended by each member during the financial year 2017–18 are provided in **Table 2**.

Table 2

Member	Eligible to attend	Attended
Ms Erica Smyth, AC (Chair) [1]	3	3
Ms Carol Holley (Chair) [2]	4	4
Emeritus Professor Stephen Buckman, AM	4	4
Ms Penelope J Dobson	4	3
Professor Brigid Heywood	4	4
Professor Andrew M Scott, AM	4	4
Professor Margaret Sheil, AO	4	3

1. Term ended on 13 March 2018
2. Appointed Chair from 14 March 2018

Remuneration and Nominations Committee

The Remuneration and Nominations Committee assists the Board in fulfilling its responsibilities with regard to overall remuneration policy and strategy; performance and remuneration of the CEO; the approach to performance and remuneration of the Senior Executive Team; and succession planning and nominations for Board Members and the CEO. The objectives, duties and responsibilities of the committee are set out in the Remuneration and Nominations Committee Charter.

The Remuneration and Nominations Committee consists of the Board Chair, the CEO and one or more non-executive Board members appointed by the Board. The Board Chair is the Chair of the Committee. The Group Executive – People, Culture, Safety and Security attends Committee meetings by invitation, as do other relevant persons by invitation of the Committee Chair. The Company Secretary is the secretary to the Committee and attends Committee meetings.

The committee met on four occasions during the 2017–18 financial year. Details of the number of Remuneration and Nominations Committee meetings attended by each member during the financial year 2017–18 are provided in **Table 3**.

Table 3

Member	Eligible to attend	Attended
Mr Jim W McDowell (Chair)	4	3
Dr Adrian (Adi) Paterson	4	4
Emeritus Professor Stephen Buckman, AM	4	4
Ms Penelope J Dobson	4	4

Commercial Committee

The Commercial Committee provides independent oversight, review and evaluation of particular commercial activities. The objectives, duties and responsibilities of the Committee are set out in the Commercial Committee Charter.

The Commercial Committee consists of at least three non-executive members of the Board. The Chair of the Board is the Chair of the Committee unless the Chair delegates this role to another non-executive member. Senior Management attends Committee meetings by invitation, as do other relevant parties by invitation of the Committee Chair. The Company Secretary is the secretary to the Committee and attends Committee meetings.

The Committee did not meet during the 2017–18 financial year.

External audit

The Commonwealth Auditor-General, through the Australian National Audit Office (ANAO), is the external auditor for ANSTO and its Australian based subsidiaries. The auditors of ANSTO's USA based subsidiary, ANSTO Inc, is WIPFLi LLP. For the financial year 2017–18, the ANAO contracted KPMG to assist with the ANSTO and Australian based subsidiaries external audits. Apart from hosting ANSTO's 'whistleblower' reporting service (FairCall), KPMG did not provide any other services to ANSTO during the financial year.

Risk management

Under section 16 of the PGPA Act, the ANSTO Board is responsible for the establishment and maintenance of an appropriate system of risk oversight and management and an appropriate system of internal control.

Management is accountable to the ANSTO Board for designing, implementing and monitoring the risk management framework and its integration into the day-to-day activities of the organisation. ANSTO's risk management framework is based on the following key principles:

- adoption of a common risk management approach and language;
- positioning risk management as an integral part of all organisational processes, including decision making processes;
- applying a systematic and structured risk management process that is responsive to change;
- establishing a comprehensive and effective internal control system that provides 'reasonable assurance' regarding the effectiveness and efficiency of operations, the reliability of financial and nonfinancial reporting, and compliance with applicable laws and regulations;
- the delegation of responsibility and accountability;
- promotion of an enterprise-wide philosophy that seeks to identify and exploit opportunity responsibly; and
- anticipation and treatment of risks before they materialise.

The ANSTO Board determines the nature and extent of the risk it is willing to accept in achieving the organisation's strategic objectives, consistent with ANSTO's risk appetite and the prudent, proper and ethical use and management of public resources. The ANSTO Board has a particular interest in those risks that may negatively impact the sustainability and reputation of the organisation.

The RAC receives regular reports and briefings on ANSTO's top risks and risk management activities, as well as the risk management maturity and risk culture of the organisation.

Internal control

The ANSTO Board is ultimately responsible for the establishment and maintenance of a system of internal control that provides 'reasonable assurance' that ANSTO's objectives will be achieved relative to the effectiveness and efficiency of its operations, the reliability of financial and non-financial reporting and compliance with applicable laws and regulations.

The RAC assesses, reviews and monitors ANSTO's internal control systems on an ongoing basis and provide advice to the ANSTO Board on the adequacy and effectiveness of such arrangements.

Fraud control

Section 10 of the PGPA Rule places a legal obligation on the ANSTO Board to take all reasonable measures to prevent, detect and deal with fraud, including by:

- conducting fraud risk assessments;
- developing and implementing a fraud control plan;
- having an appropriate mechanism for preventing fraud;
- having an appropriate mechanism for detecting incidents of fraud or suspected fraud;
- having an appropriate mechanism for investigating or otherwise dealing with incidents of fraud or suspected fraud; and
- having an appropriate mechanism for recording and reporting incidents of fraud or suspected fraud.

In accordance with the above obligations, ANSTO conducts risk assessments of its exposure to possible fraud, corrupt conduct and other forms of unacceptable behaviour, and is consistently strengthening its fraud control arrangements through the implementation of a comprehensive Fraud Control Plan. Within the context of this plan, ANSTO has established or enhanced fraud control and ethics policies, standards and procedures that serve to minimise the incidence of fraud and other forms of unacceptable behaviour, including procedures and processes for fraud prevention, detection, reporting and investigation.

In addition, ANSTO operates a public interest disclosure scheme that meets the requirements of the *Public Interest Disclosure Act 2013*. Complementary to this scheme ANSTO has a confidential, independent and externally hosted reporting service (FairCall) which provides another avenue for staff and contractors to report any concerns about unacceptable, unethical or illegal activities in the workplace.

All instances of fraud are to be reported to the RAC.

Business ethics

ANSTO's Code of Ethics provides all ANSTO employees and contracted staff with a framework for ethical decision-making and articulates the standards of behaviour, values and actions expected of all individuals who work for or on behalf of ANSTO. The Code explains the principles covering appropriate conduct in a variety of contexts and informs employees on how to deal with their work colleagues, stakeholders, other organisations and the community in an appropriate manner.

The Code is supported by a range of policies, guidelines and instructions that specifically address matters canvassed within the Code, including managing conflicts of interest, harassment and bullying, gifts and benefits, hospitality, email and internet usage, and insider trading.

ANSTO's ethical values and standards are reinforced through various means, including training and awareness, staff engagement surveys, and the ANSTO Enterprise Agreements.

Business resilience

The continuity of ANSTO's operations is critical and is a key focus area of the Board, the CEO and Executives. Many of the services delivered by ANSTO are critical to the economic and social well-being and health of the Australian community.

ANSTO regularly reviews and tests all aspects of its Business Resilience Framework to ensure its continued robustness, reliability and readiness. This includes response planning in relation to ANSTO's OPAL reactor and other critical infrastructure.

Legal and regulatory compliance

ANSTO operates within a complex and highly regulated business environment. In recognition of this environment, ANSTO has established a range of strategies, policies, systems and responsibility and accountability arrangements that mitigate the risk of non-compliance with relevant laws and regulations. The continuing development and improvement of ANSTO's compliance framework remains a key focus.

Internal audit

The ANSTO Board has established an Internal Audit function as a key component of ANSTO's governance framework.

The primary purpose of Internal Audit is to provide the ANSTO Board and CEO with independent and objective assurance and advisory services that 'add value' and help improve operational performance. The scope of Internal Audit's activities encompasses all financial and non-financial functions, systems, programs, projects, activities and processes, across the ANSTO Group. Internal Audit engagements generally involve:

- appraising the adequacy and effectiveness of the internal control environment;
- reviewing the adequacy and effectiveness of arrangements established by management to ensure compliance;
- assessing the adequacy of risk management activities as they relate to specific business functions, systems, programs, projects or activities;
- reviewing the means of safeguarding physical and intangible assets;
- reviewing the reliability and integrity of financial and non-financial information; and
- appraising the economy, efficiency and effectiveness with which resources are acquired and deployed relative to the achievement of business objectives.

The Head of Internal Audit prepares strategic and annual work plans that are risk based, and which reflect focus areas that may be highlighted by the RAC and executive management. These plans are updated, as appropriate, in line with ANSTO's dynamic business environment. The annual Internal Audit Plan is reviewed by the RAC and approved by the ANSTO Board.

Significant internal audit findings are presented to the RAC. Follow-up reviews are conducted to ensure that all internal audit recommendations are properly carried out.

In order to ensure the independence of the Internal Audit function, the Head of Internal Audit reports directly to the RAC and has unrestricted access to the RAC Chair and members, as well as the Chair of the Board. The Head of Internal Audit reports for administrative purposes to the Group Chief Financial Officer and has access to Board and Committee minutes and submissions.

The role, purpose, scope and authority of the Internal Audit function is set out in the Internal Audit Charter. This Charter is reviewed by the RAC and approved by the ANSTO Board.

Judicial decisions and reviews by outside bodies

There were no judicial decisions or decisions of administrative tribunals that had a significant impact on the operations of ANSTO during the financial year.

There were no specific reports issued by the Commonwealth Auditor-General, other than their report issued in relation to 2017–18 financial statements.

There were no reports on the operations of ANSTO by a Parliamentary Committee or the Commonwealth Ombudsman or findings by the Office of the Australian Information Commissioner during the financial year.

Amendments to the Australian Nuclear Science and Technology Organisation Act 1987

In September 2017, the Australian Parliament passed legislation amending ANSTO's governing legislation, the *Australian Nuclear Science and Technology Organisation Act 1987* (ANSTO Act). The amendments came into force on 19 September 2017. The amendments (in sections 3 and 5) provide greater flexibility to ANSTO in its activities, including the use of its property, facilities and resources for science, technology, innovation and training purposes. This includes enabling the establishment of an Innovation Precinct at ANSTO's Lucas Heights campus, and the potential establishment of similar precincts in association with other ANSTO campuses. More broadly, the amendments facilitate enhanced collaboration between industry, universities and ANSTO across all its sites. The amendments also update and expand the constitutional references in the ANSTO Act to better reflect ANSTO's current and proposed activities and developments in constitutional law since the adoption of the Act in 1987 (the repeal of subsection 5(5) and insertion of section 6A).

Indemnities and insurance premiums for officers

ANSTO's insurance coverage with Comcover includes professional indemnity and directors' and officers' liability. Certain sections of the PGPA Act contain prohibitions against ANSTO giving indemnities and paying insurance premiums relating to liabilities arising from conduct involving a lack of good faith by officers.

There have been no exceptions to these provisions and no claims were made against ANSTO in respect of such liability that required a claim on ANSTO's insurer, Comcover. It should be noted that ANSTO subsidiaries are fully covered under ANSTO's overarching Comcover policies. Workers compensation coverage is dependent on whether employees of a subsidiary are Commonwealth Government employees or employed under State labour legislation.

Nuclear liability

ANSTO has a Deed of Indemnity with the Commonwealth until April 2026 which commits the Government to meeting any damages awarded against ANSTO and ANSTO Nuclear Medicine Pty Ltd, their employees and their contractors for damage caused by ionising radiation. This provides comfort to the local community and to ANSTO's suppliers, who cannot be covered by ANSTO's normal insurance arrangements and are not accustomed to being exposed to risks of this nature. Any claim would first attach to the general $50 million nuclear cover that ANSTO has with Comcover to the extent that it was insured under that policy, with the remainder covered by this indemnity agreement as applicable and subject to its exclusions.

2017–2018 financial statements

Australian National Audit Office

INDEPENDENT AUDITOR'S REPORT

To the Minister for Industry, Innovation and Science

Opinion

In my opinion, the financial statements of the Australian Nuclear Science and Technology Organisation and its controlled entities (together the consolidated entity), for the year ended 30 June 2018:

(a) comply with Australian Accounting Standards – Reduced Disclosure Requirements and the *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015*; and

(b) present fairly the financial position of the Australian Nuclear Science and Technology Organisation as at 30 June 2018 and its financial performance and cash flows for the year then ended.

The financial statements of the Australian Nuclear Science and Technology Organisation, which I have audited, comprise the following statements as at 30 June 2018 and for the year then ended:

- Statement by the Accountable Authority, Chief Executive Officer and Chief Financial Officer;
- Consolidated Statement of Comprehensive Income;
- Consolidated Statement of Financial Position;
- Consolidated Statement of Changes in Equity;
- Consolidated Statement of Cash Flows; and
- Notes to the financial statements comprising a summary of significant accounting policies and other explanatory information.

Basis for Opinion

I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. My responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of my report. I am independent of the Australian Nuclear Science and Technology Organisation in accordance with the relevant ethical requirements for financial statement audits conducted by the Auditor-General and his delegates. These include the relevant independence requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants* (the Code) to the extent that they are not in conflict with the *Auditor-General Act 1997*. I have also fulfilled my other responsibilities in accordance with the Code. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Accountable Authority's Responsibility for the Financial Statements

As the Accountable Authority of the Australian Nuclear Science and Technology Organisation the directors are responsible under the *Public Governance, Performance and Accountability Act 2013* for the preparation and fair presentation of annual financial statements that comply with Australian Accounting Standards – Reduced Disclosure Requirements and the rules

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

made under that Act. The directors are also responsible for such internal control as the directors determines is necessary to enable the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the directors are responsible for assessing the Australian Nuclear Science and Technology Organisation and the consolidated entity's ability to continue as a going concern, taking into account whether the entity's operations will cease as a result of an administrative restructure or for any other reason. The directors are also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the assessment indicates that it is not appropriate.

Auditor's Responsibilities for the Audit of the Financial Statements

My objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian National Audit Office Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.

As part of an audit in accordance with the Australian National Audit Office Auditing Standards, I exercise professional judgement and maintain professional scepticism throughout the audit. I also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Australian Nuclear Science and Technology Organisation's internal control;
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Accountable Authority;
- conclude on the appropriateness of the Accountable Authority's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Australian Nuclear Science and Technology Organisation's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the Australian Nuclear Science and Technology Organisation to cease to continue as a going concern;
- evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation; and
- obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Australian Nuclear Science and Technology Organisation to express an opinion on the financial report. I am responsible for the direction, supervision and performance of the the Australian Nuclear Science and Technology Organisation audit. I remain solely responsible for my audit opinion.

I communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

Australian National Audit Office

Lesa Craswell
Executive Director

Delegate of the Auditor-General

Canberra
21 August 2018

Statement by Accountable Authority, Chief Executive and Chief Financial Officer

In our opinion, the attached financial statements for the year ended 30 June 2018 comply with subsection 42(2) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act), and are based on properly maintained financial records as per subsection 41(2) of the PGPA Act.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Australian Nuclear Science and Technology Organisation will be able to pay its debts as and when they fall due.

Signed in accordance with a resolution of the Board of Directors.

James McDowell
Accountable Authority - Chair

21 August 2018

Adi Paterson
Accountable Authority - Chief Executive Officer

21 August 2018

Peter Arambatzis
Group Chief Financial Officer

21 August 2018

AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
New Illawarra Road, Lucas Heights (Locked Bag 2001, Kirrawee DC 2232) T +61 2 9717 3111 F +61 2 9717 9210
www.ansto.gov.au

Consolidated Statement of Comprehensive Income

For the year ended 30 June 2018

	Note	Budget 2018 $'000	Actual 2018 $'000	Actual 2017 $'000
NET COST OF SERVICES				
Expenses				
Employee	1.1A	154,642	141,418	150,043
Suppliers	1.1B	78,968	98,488	85,992
Depreciation/amortisation and impairment losses	2.2A	86,421	132,785	84,300
Write-down of assets	1.1C	-	982	48,297
Grants		5,500	3,614	3,639
Finance costs	1.1D	20,129	18,004	18,366
Foreign currency exchange losses		-	347	671
Total expenses		345,660	395,638	391,308
Own-source revenue				
Sales of goods and rendering of services	1.2A	87,078	92,841	91,494
Interest	5.2b	2,500	3,725	3,665
Grants		9,842	8,591	29,697
Total own-source revenue		99,420	105,157	124,856
Other income				
Assets free of charge	3.3	-	-	191,119
Foreign currency exchange gains		-	1,919	1,023
Gains from asset sales		-	31	407
Other revenue		-	3,907	46
Total other income		-	5,857	192,595
Total own-source income		99,420	111,014	317,451
Net cost of services		(246,240)	(284,624)	(73,857)
Revenue from Government		198,119	198,119	183,334
(Deficit)/surplus for the year before income tax		(48,121)	(86,505)	109,477
Income tax benefit/(expense)	1.1E	-	(437)	156
(Deficit)/surplus for the year after income tax		(48,121)	(86,942)	109,633
Other comprehensive income				
Items that will not be subsequently reclassified to net cost of services				
Changes in asset revaluation reserve	2.4A	-	(57,192)	13,643
Items that may be subsequently reclassified to net cost of services				
Exchange differences on translation of foreign operations	2.4A	-	(13)	(1)
Total other comprehensive income/(expense) for the year		-	(57,205)	13,642
Total comprehensive (deficit)/surplus for the year		**(48,121)**	**(144,147)**	**123,275**

The above statement should be read in conjunction with the accompanying notes.

Consolidated Statement of Financial Position

As at 30 June 2018

	Note	Budget 2018 $'000	Actual 2018 $'000	Actual 2017 $'000
Assets				
Financial assets				
Cash and cash equivalents	2.1A	4,349	7,916	10,154
Trade and other receivables	2.1B	15,644	16,120	15,331
Investments	2.1C	249,916	130,282	126,578
Total financial assets		269,909	154,318	152,063
Non-financial assets				
Property, plant and equipment	2.2A	1,109,672	1,233,742	1,267,463
Intangible assets	2.2A/B	82,459	70,449	86,847
Inventories	2.2C	25,745	30,549	21,539
Deferred tax asset	1.1E	853	652	1,089
Prepayments		13,004	11,775	10,950
Total non-financial assets		1,231,733	1,347,167	1,387,888
Total assets		1,501,642	1,501,485	1,539,951
Liabilities				
Payables				
Suppliers		17,086	17,886	16,896
Employee	4.1	4,853	4,415	4,853
Other payables	2.3A	2,693	10,878	72
Total payables		24,632	33,179	21,821
Revenue in advance	2.3B	86	20,686	3,997
Provisions				
Employee provisions	4.2	38,258	44,192	43,560
Decommissioning	2.3C	324,962	387,124	313,421
Intellectual property payment	2.3C	58,395	43,188	51,152
Other provisions	2.3C	-	578	10,352
Total provisions		421,615	475,082	418,485
Total liabilities		446,333	528,947	444,303
Net assets		**1,055,309**	**972,538**	**1,095,648**
Equity				
Contributed equity		791,214	791,214	770,177
Reserves	2.4A	496,493	452,930	510,135
Accumulated deficit	2.4B	(232,398)	(271,606)	(184,664)
Total equity		**1,055,309**	**972,538**	**1,095,648**

The above statement should be read in conjunction with the accompanying notes.

Consolidated Statement of Changes in Equity

For the year ended 30 June 2018

	Accumulated deficit		Asset revaluation reserve		Other reserves		Contributed equity		Total	
	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
Balance at 30 June 2016	**(294,297)**		**486,481**		**10,012**		**741,336**		**943,532**	
Surplus/(deficit) for the year	109,633		-		-		-		109,633	
Other comprehensive income										
Foreign currency translation	-		-		(1)		-		(1)	
Revaluation increment	-		13,643		-		-		13,643	
Total comprehensive (deficit)/surplus for the year	109,633		13,643		(1)		-		123,275	
Transactions with owners										
Government equity injection	-		-		-		28,841		28,841	
Balance at 30 June 2017	**(184,664)**	**(184,277)**	**500,124**	**486,481**	**10,011**	**10,012**	**770,177**	**770,177**	**1,095,648**	**1,082,393**
Surplus/(deficit) for the year	(86,942)	(48,121)	-	-	-	-	-	-	(86,942)	(48,121)
Other comprehensive income										
Foreign currency translation	-	-	-	-	(13)	-	-	-	(13)	-
Revaluation increment (decrement)	-	-	(57,192)	-	-	-	-	-	(57,192)	-
Total comprehensive (deficit)/surplus for the year	(86,942)	(48,121)	(57,192)	-	(13)	-	-	-	**(144,147)**	**(48,121)**
Transactions with owners										
Government equity injection	-	-	-	-	-	-	21,037	21,037	21,037	21,037
Balance at 30 June 2018	**(271,606)**	**(232,398)**	**442,932**	**486,481**	**9,998**	**10,012**	**791,214**	**791,214**	**972,538**	**1,055,309**

The above statement should be read in conjunction with the accompanying notes.

Consolidated Statement of Cash Flows

For the year ended 30 June 2018

	Note	Budget 2018 $'000	Actual 2018 $'000	Actual 2017 $'000
Cash flows from operating activities				
Sales of goods and rendering of services		87,078	99,858	90,425
Grants received		9,842	24,972	29,635
Interest received		2,500	3,414	3,652
Receipts from Government		198,119	198,119	183,334
Payments to employees		(159,642)	(141,224)	(144,749)
Payments to suppliers		(82,860)	(124,339)	(108,236)
Other payments		(5,500)	-	-
Net cash from operating activities	3.2	49,537	60,800	54,061
Cash flows from investing activities				
Proceeds from sale of property plant and equipment		-	71	433
Proceeds from investment sales/maturity		500,000	492,793	490,310
Purchase of property, plant and equipment		(72,182)	(80,442)	(105,797)
Purchase of investments		(498,392)	(496,497)	(462,091)
Net cash used in investing activities		(70,574)	(84,075)	(77,145)
Cash flows from financing activities				
Government equity injection		21,037	21,037	28,841
Net cash from financing activities		21,037	21,037	28,841
Net increase/(decrease) in cash and cash equivalents		-	(2,238)	5,757
Effect of exchange changes on the balance of cash and cash equivalents held in foreign currencies		-	-	(1)
Cash and cash equivalents at the beginning of the reporting year		4,349	10,154	4,398
Cash and cash equivalents at the end of the reporting year	2.1A	**4,349**	**7,916**	**10,154**

The above statement should be read in conjunction with the accompanying notes.

Overview

Objectives of Australian Nuclear Science and Technology Organisation

Australian Nuclear Science and Technology Organisation (ANSTO) is a not-for-profit Australian Government Corporate Commonwealth Entity. ANSTO's strategic objectives, as set out in its current Corporate Plan, are:

- Putting people first: Equipping and empowering our people to respond to the growing nuclear science and technology needs of Australia and the world;
- World class science and technology outcomes: Creating innovative solutions to complex problems and providing new insights into our world;
- Strategic management of landmark and national infrastructure: Realising opportunities, serving users and creating value;
- Nuclear expertise and advice: Providing expert, science and technology based advice and services to support Australia's nuclear policy; and
- Nuclear business and innovation: Providing services and products to our customers that benefit the broader community.

In the 2017-18 Portfolio Budget Statement ANSTO has only one outcome as reflected below:

Outcome 1: Improved knowledge, innovative capacity and healthcare through nuclear based facilities, research, training, products, services and advice to Government, industry, the education sector and the Australian population.

ANSTO's activities contributing towards the outcome are classified as departmental. Departmental activities involve the use of assets, liabilities, income and expenses controlled or incurred by ANSTO in its own right. The continued existence of ANSTO in its present form and with its present programs is dependent on Government policy and on continuing funding by Parliament for the entity's administration and programs.

Reference to ANSTO means ANSTO and its controlled entities except in notes 1.1E and 6.2.

Basis of Preparation of the Financial Statements

The financial statements are general purpose financial statements and are required by section 42 of the *Public Governance, Performance and Accountability Act 2013*.

The financial statements have been prepared:

a) having regard to the provisions of the *Australian Nuclear Science and Technology Organisation (ANSTO) Act 1987* (as amended); and
b) in accordance with:
   i. *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015* (FRR) (as amended) for reporting periods ending on or after 1 July 2017; and
   ii. Australian Accounting Standards and Interpretations – Reduced Disclosure Requirements issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position. Where necessary the comparative information for the preceding financial year has been reclassified to achieve consistency in disclosure with current financial year amounts.

The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

The financial statements were authorised for issue by the Board of Directors on 21 August 2018.

Overview (continued)

Foreign currency

Transactions denominated in a foreign currency are converted to Australian currency at the rate of exchange prevailing at the date of the transaction. At reporting date, amounts receivable and payable in foreign currency are translated to Australian currency at the exchange rate prevailing at that date and any exchange differences are brought to account in the Statement of Comprehensive Income. ANSTO does not enter into speculative forward exchange contracts.

Principles of consolidation

The consolidated financial statements incorporate the financial statements of ANSTO and the entities it controls. Control is achieved when ANSTO has all of the following:

- power over the investee;
- is exposed, or has rights, to variable returns from its involvement with the investee; and
- the ability to use its power to affect its returns.

Consolidation of a subsidiary begins when ANSTO obtains control over the subsidiary and ceases when they lose control of the subsidiary. All intragroup assets and liabilities, equity, income, expenses and cash flows relating to transactions between members of the Group are eliminated in full on consolidation. Profit or loss and each component of other comprehensive income are attributed to the owners of the entity and to the non-controlling interests. Total comprehensive income of subsidiaries attributed to the owners of the entity and to the non-controlling interests even if this results in the non-controlling interests having a deficit balance. Changes in the Group's ownership interests in subsidiaries that do not result in the Group losing control over the subsidiaries are accounted for as equity transactions. The carrying amounts of the Group's interests and the non-controlling interests are adjusted to reflect the changes in their relative interests in the subsidiaries. Any difference between the amount by which the non-controlling interests are adjusted and the fair value of the consideration paid or received is recognised directly in equity and attributed to ANSTO.

Significant accounting judgements and estimates

In the process of applying the accounting policies listed in this note, the judgements made that have the most significant impact on the amounts recorded in the financial statements are:

- The fair value of property, plant and equipment and their useful lives;
- Decommissioning provision; and
- Recoverable amount of the intangible asset relating to intellectual property and fair value of the associated liability.

Apart from these assumptions and estimates no other accounting assumptions or estimates have been identified that have a significant risk of causing a material adjustment to carrying amounts of assets and liabilities within the next accounting period.

Overview (continued)

Adoption of new Australian Accounting Standard requirements

No accounting standard has been adopted earlier than the application date as stated in the standard.

At the date of authorisation of the financial statements, the Standards and Interpretations listed below were on issue but not yet effective. These new or revised standards will be adopted and their implementation are not expected to have a material financial impact on the entity in future reporting periods, though they will require enhanced disclosure.

Standard/Interpretation	Effective for annual reporting periods beginning on or after	Expected to be initially applied in the financial year ending
AASB 9 'Financial Instruments', and the relevant amending standards	1 January 2018	30 June 2019
AASB 15 'Revenue from Contracts with Customers and AASB 2014-5 'Amendments to Australian Accounting Standards arising from AASB 15'	1 January 2018	30 June 2019
AASB 16 'Leases'	1 January 2019	30 June 2020

1. Financial Performance

This section details the financial performance of ANSTO.

1.1 Expenses

1.1A Employee

	2018	2017
	$'000	$'000
Wages and salaries	106,588	114,510
Superannuation	21,228	20,559
Leave and other entitlements	12,887	14,745
Separation and redundancies	715	229
Total employee expenses	**141,418**	**150,043**

Accounting Policy

Liabilities for 'short-term employee benefits' (as defined in AASB 119 *Employee Benefits*) and termination benefits expected within twelve months of the end of reporting period are measured at their nominal amounts.

Other long-term employee benefits are measured as the total net present value of the defined benefit obligation at the end of the reporting period minus the fair value at the end of the reporting period of plan assets (if any) out of which the obligations are to be settled directly.

Leave

The provision for employee entitlements encompasses annual leave and long service leave that ANSTO has a present obligation to pay resulting from employee services provided up to reporting date. The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will be applied when leave is taken, including employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The Enterprise Agreement provides under the heading General Leave for an employee entitlement which combines sick leave, 'carer's leave and leave for 'other' prescribed purposes. No provision has been made for general leave as all such leave is 'non-vesting'.

The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Separation and redundancy

Provision is made for separation and redundancy benefit payments. ANSTO recognises a provision for termination when it has developed a detailed formal plan for the termination and has informed those employees affected that it will carry out the termination.

Superannuation

ANSTO's staff are members of the Commonwealth Superannuation Scheme (CSS) and the Public Sector Superannuation Scheme (PSS) or the PSS accumulation plan (PSSap), or other superannuation funds held outside of the Australian Government that provide retirement, death and disability benefits to employees. The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported in the Department of Finance's administered schedules and notes.

ANSTO makes employer contributions to the employees' superannuation scheme at rates determined by an actuary to be sufficient to meet the current cost to the Government. ANSTO accounts for contributions as if they are contributions to defined contribution plans.

1. Financial Performance (continued)

1.1A Employee (continued)

The staff of the subsidiaries are members of various defined contribution schemes and receive the Superannuation Contribution Charge.

The liability for superannuation recognised as at 30 June represents outstanding contributions for the final fortnight of the year.

1.1B Suppliers

	2018	2017
	$'000	$'000
Goods from external entities	32,481	25,244
Services from related entities	16,682	23,800
Workers compensation premiums – related	800	940
Service from external entities	48,525	36,008
Total supplier expenses	**98,488**	**85,992**
Commitments for minimum lease payments in relation to non-cancellable operating leases are payable as follows:		
One year or less	137	151
From one to five years	685	603
Over five years	81	389
Total operating lease commitments	**903**	**1,143**

1.1C Write-down of assets

Financial assets:		
Write-down of receivables/(reversal of write-down)	8	-
Non-financial assets:		
Materials – write-off obsolete stock	931	1
Property, plant and equipment write-down	-	25,771
Intangibles write-down	43	22,525
Total write-down of assets expenses	**982**	**48,297**

1.1D Finance costs

Unwinding of discount on decommissioning and royalty costs	18,004	18,366
Total finance costs	**18,004**	**18,366**

1. Financial Performance (continued)

1.1E Income tax benefit/(expense)

	2018 $'000	2017 $'000
1.1E Income tax benefit/(expense)		
Prima facie tax on results of taxable subsidiaries	546	177
Under/(over) provision in respect of prior years	-	(21)
Deferred tax asset write off	(1,043)	-
Impact of origination and reversal of temporary differences	77	-
Effect of non-deductible items	(17)	-
Total income tax benefit/(expense)	**(437)**	**156**

ANSTO is exempt from income tax. Synchrotron Light Source Australia Pty Ltd (SLSA) and Australian Synchrotron Holding Company Pty Ltd (ASHCo) were exempt from income tax until 28 February 2017. Unbooked deferred tax assets in relation to un-recouped tax losses including timing difference in ANSTO Inc., is $681,483 (2017: $1,154,906) and ANSTO Nuclear Medicine Pty Ltd (ANM) is $921,458 (2017: $nil). The total deferred tax assets recognised as at 30 June 2018 in relation to controlled entities are: $651,864 (2017: $1,088,509), from PETTECH Solutions Pty Ltd at $651,864 (2017: $526,485) and ANM at $nil (2017: $562,024).

Accounting Policy

ANSTO is exempt from all forms of Australian taxation except fringe benefits tax (FBT) and the goods and services tax (GST). ANSTO is not exempt from any foreign taxation laws relative to its overseas operations.

Revenues, expenses and assets are recognised net of GST except:

- where the amount of GST incurred is not recoverable from the Australian Taxation Office; and
- for receivables and payables.

Subsidiaries

ANSTO's subsidiaries are subject to normal taxation except for Synchrotron Light Source Australia Pty Ltd and Australian Synchrotron Holding Company Pty Ltd which were tax exempt entities for the period to 28 February 2017 as they were charitable institutions.

ANSTO Inc. is a USA company and is subject to US tax laws. No deferred tax asset has been recognised at 30 June 2018 (2017: nil) in relation to ANSTO Inc. as the directors do not believe it is probable that sufficient profits will be generated to utilise the tax losses.

No deferred tax asset has been recognised at 30 June 2018 (2017: $562,024) in relation to ANM as the directors do not believe it is probable that sufficient profits will be generated to utilise the tax losses in a reasonable time frame.

In respect of the subsidiaries, current tax assets and liabilities for the current and prior periods are measured at the amount expected to be recovered from or paid to the taxation authorities based on the current period's taxable income. The tax rates and tax laws used to compute the amount are those that are enacted or substantively enacted by reporting date.

Deferred income tax is provided on all temporary differences at reporting date between the tax bases of assets and liabilities and their carrying amounts for financial reporting purposes.

The PETTECH directors believe it is probable that sufficient profits will be generated to utilise the tax losses available.

1. Financial Performance (continued)

1.1E Income tax benefit (continued)

Deferred income tax liabilities are recognised for all taxable temporary differences except:

- when the deferred income tax liability arises from the initial recognition of goodwill or of an asset or liability in a transaction that is not a business combination and that, at the time of the transaction, affects neither the accounting profit nor taxable profit or loss; or

- when the taxable temporary difference is associated with investments in subsidiaries, associates or interests in joint ventures, and the timing of the reversal of the temporary difference can be controlled and it is probable that the temporary difference will not reverse in the foreseeable future.

Deferred income tax assets are recognised for all deductible temporary differences, carry forward of unused tax credits and unused tax losses, to the extent that it is probable that taxable profit will be available against which the deductible temporary differences and the carry forward of unused tax credits and unused tax losses can be utilised, except:

- when the deferred income tax asset relating to the deductible temporary difference arises from the initial recognition of an asset or liability in a transaction that is not a business combination and, at the time of the transaction, affects neither the accounting profit nor taxable profit or loss; or

- when the deductible temporary difference is associated with investments in subsidiaries, associates or interests in joint ventures, in which case a deferred tax asset is only recognised to the extent that it is probable that the temporary difference will reverse in the foreseeable future and taxable profit will be available against which the temporary difference can be utilised.

Unrecognised deferred income tax assets are reassessed at each reporting date and are recognised to the extent that it has become probable that future taxable profit will allow the deferred tax asset to be recovered.

Deferred income tax assets and liabilities are measured at the tax rates that are expected to apply to the year when the asset is realised or the liability is settled, based on tax rates (and tax laws) that have been enacted or substantively enacted at reporting date. Deferred tax assets and deferred tax liabilities are offset only if a legally enforceable right exists to set off current tax assets against current tax liabilities and the deferred tax assets and liabilities relate to the same taxable entity and the same taxation authority.

1. Financial Performance (continued)

1.2 Revenue

1.2A Sales of goods and rendering of services

	2018 $'000	2017 $'000
Sales of goods		
Radioisotope sales	66,122	62,905
Total sales of goods	66,122	62,905
Rendering of services		
Service and contract research	15,245	16,678
Silicon irradiation	5,574	6,791
CSIRO site support	1,216	1,194
Training courses	277	262
Land management	4,407	3,664
Total rendering of services	26,719	28,589
Total sales of goods and rendering of services	**92,841**	**91,494**

Accounting Policy
Funding received or receivable from the Department of Industry, Innovation and Science (DIIS) (appropriated to ANSTO as a Corporate Commonwealth Entity payment item for payment to ANSTO) is recognised as Revenue from Government when the entity gains control of the funding unless it is in the nature of an equity injection, such amounts are recognised directly in contributed equity in the year received.

Operating revenue from sale of goods and rendering of services
Revenue from the sale of goods and rendering of services is recognised when:

- The risks and rewards of ownership have been transferred to the buyer;
- ANSTO retains no managerial involvement nor effective control over the goods;
- The revenue, stage of completion and transaction costs incurred can be reliably measured; and
- It is probable that the economic benefits associated with the transaction will flow to ANSTO.

Receivables for goods and services are recognised at the nominal amounts due less any impairment allowance. Collectability of debts is reviewed at reporting date. Allowance is made when collectability of the debt is no longer probable.

Grant revenue
Government grants and funding are recognised when ANSTO obtains control over the contribution. There are two types of grants being reciprocal grants and non-reciprocal grants.

For reciprocal grants, this is recognised in profit or loss on a systematic basis over the periods in which ANSTO recognises as expenses the related costs for which the grants are intended to compensate. Where the grants also include funds that relate to future related costs for which the grants are intended to compensate, this portion is recognised as revenue in advance.

For non-reciprocal grants, ANSTO is deemed to have assumed control when the grant is receivable or received. Government grants that are receivable as compensation for expenses or losses already incurred or for the purpose of giving immediate financial support to ANSTO with future related costs are recognised in profit or loss in the period in which they become receivable. Conditional grants may be reciprocal or non-reciprocal depending on the terms of the grant.

1. Financial Performance (continued)

1.2A Sales of goods and rendering of services (continued)

Resources received free of charge
Resources received free of charge are recognised as revenue when and only when a fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense.

Resources received free of charge are recorded as either revenue or gains depending on their nature i.e. whether they have been generated in the course of the ordinary activities of ANSTO.

Contributions of assets at no cost or for nominal consideration are recognised as gains at their fair value when the asset qualifies for recognition.

2. Financial Position

This section details the financial position of ANSTO.

2.1 Financial assets

2.1A Cash and cash equivalents

Accounting Policy

Cash is recognised at its nominal amount. Cash and cash equivalents include:

- Cash on hand; and
- Demand deposits in bank accounts with an original maturity of 3 months or less that are readily convertible to known amounts of cash and subject to insignificant risk of changes in value.

2.1B Trade and other receivables

	2018	2017
	$'000	$'000
Goods and services		
Related entities	894	328
External entities	12,321	12,387
Total receivables for goods and services	**13,215**	**12,715**
Less impairment allowance	-	-
Net receivables for goods and services	**13,215**	**12,715**
Other receivables		
Interest accrued	795	483
GST receivable from the Australian Taxation Office	869	1,090
Other	1,241	1,043
Total other receivables	**2,905**	**2,616**
Total net trade and other receivables	**16,120**	**15,331**

Trade and other receivables are expected to be received within 12 months.

a) Net receivables are aged as follows:

Overdue but not impaired:		
Less than 31 days	15,410	11,921
31 to 60 days	136	3,301
61 to 90 days	165	-
More than 90 days	409	109
Total net trade and other receivables	**16,120**	**15,331**

b) No allowance for doubtful debts has been deemed necessary as at 30 June 2018 or 30 June 2017.

Reconciliation of the impairment allowance account:		
Opening balance	-	364
Additional provision	-	-
Amount reversed	-	(364)
Closing balance	**-**	**-**

2. Financial Position (continued)

2.1C Investments

		2018	2017
		$'000	$'000
Term Deposits – held to maturity		130,187	126,483
Southern Radioisotopes Alliance Inc	2.1D	-	-
Clarity Pharmaceuticals Pty Ltd	2.1E	95	95
Total investments		**130,282**	**126,578**

2.1D Investment in joint venture

			2018	2017
Name	**Place of incorporation**	**%**	**$**	**$**
Southern Radioisotopes Alliance Inc.	USA	100	625	625
Total investment in joint venture			**625**	**625**

Investment is USD 600 (2017: USD 600). This company has yet to commence trading.

2.1E Investment – other

Name	**Place of incorporation**	**%**	**$**	**$**
Clarity Pharmaceuticals Pty Ltd	Australia	2.4	95,144	95,144
Total investment – other			**95,144**	**95,144**

Clarity Pharmaceuticals Pty Ltd. was incorporated in New South Wales, Australia on 17 September 2010. The current shareholding is 135,087 shares (2017: 135,087).

2. Financial Position (continued)

2.2 Non-financial assets

2.2A Property, plant and equipment and intangible assets

Movement summary 2017-18 for all consolidated assets irrespective of valuation basis

	Land	Buildings	Plant and equipment	Intellectual property	Software	Other intangibles	Assets under construction	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000	$'000
Gross value as at 30 June 2017	115,688	277,887	804,787	51,210	2,020	4,167	247,251	1,503,010
Additions - new assets	-	2,096	279	-	-	-	80,442	82,817
Transfers/reclassifications	-	(91,061)	230,792	-	24,164	(3,217)	(160,678)	-
Assets written-off	-	-	-	-	(43)	-	-	(43)
Disposals	-	-	(73)	-	-	-	-	(73)
Other adjustments	-	-	(77)	-	-	-	(31)	(108)
Gross value as at 30 June 2018	**115,688**	**188,922**	**1,035,708**	**51,210**	**26,141**	**950**	**166,984**	**1,585,603**
Accumulated depreciation/amortisation and impairment losses 1 July 2017	-	13,864	134,836	-	-	-	-	148,700
Depreciation/amortisation and impairment losses	-	15,047	64,741	20,874	2,392	870	28,861	132,785
Disposals	-	-	(33)	-	-	-	-	(33)
Other adjustments	-	-	(40)	-	-	-	-	(40)
Accumulated depreciation/amortisation and impairment losses 30 June 2018	**-**	**28,911**	**199,504**	**20,874**	**2,392**	**870**	**28,861**	**281,412**
Net book value as at 30 June 2018	**115,688**	**160,011**	**836,204**	**30,336**	**23,749**	**80**	**138,123**	**1,304,191**
Property, plant and equipment	**115,688**	**160,011**	**836,204**	**-**	**-**	**-**	**121,839**	**1,233,742**
Intangibles	**-**	**-**	**-**	**30,336**	**23,749**	**80**	**16,284**	**70,449**

No intangible assets are expected to be disposed of within the next 12 months.

2. Financial Position (continued)

2.2A Property, plant and equipment and intangible assets (continued)

Accounting Policy

Asset recognition threshold

Items of buildings, infrastructure, plant and equipment and major facilities are recorded at cost of acquisition and depreciated as outlined below. Items of plant and equipment with a cost of less than $5,000 (2017: $5,000) are expensed in the year of acquisition (other than where they form part a group of similar items which are significant in total).

The initial cost of an asset includes an estimate of the cost of dismantling and removing the item and restoring the site on which it is located at the end of its useful life. This is particularly relevant to 'make good' or decommissioning provisions on buildings, infrastructure, plant and equipment and major facilities, taken up by ANSTO where there exists an obligation to restore the property to its original condition. These costs are included in the value of the asset it relates to with a corresponding provision for the 'make good' or decommissioning taken up.

Any changes to the initial decommissioning cost attributable to adjustments to the consumer price index (CPI) and discount rate at 30 June each year will be reflected as an adjustment to the provision for decommissioning and asset revaluation reserve.

The cost of assets constructed by the entity includes the cost of materials, direct labour and an appropriate proportion of fixed and variable overheads.

Revaluations

Following initial recognition at cost, buildings, infrastructure, plant and equipment and major facilities are carried at fair value less accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure that the carrying amounts of assets do not differ materially from the assets' fair values as at reporting date. The regularity of independent valuations depends upon the volatility of movements in market values for the relevant assets. Independent valuers are generally used to conduct these scheduled revaluations. Revaluation increases or decreases arise from differences between an asset's carrying value and fair value.

Qualified parties, independent of ANSTO carried out the 30 June 2017 valuations. The independent valuations undertaken effective 30 June 2017 were performed by PP&E Valuations Pty Ltd in relation to the assets at ANSTO's Clayton site and Australian Valuation Solutions for the assets at ANSTO's Lucas Heights and Camperdown sites.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under the heading of asset revaluation reserve except to the extent that it reverses a previous revaluation decrement of the same asset class that was previously recognised through profit and loss. Revaluation decrements for a class of assets are recognised directly through profit and loss except to the extent that they reverse a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date is eliminated against the gross carrying amount of the asset and the asset restated to the revalued amount except for assets relating to decommissioning that are not subjected to revaluation.

Depreciation

Items of buildings, infrastructure, plant and equipment and major facilities, but excluding freehold land, are depreciated over their estimated useful lives to ANSTO using the straight-line method.

The depreciation rates (useful lives), residual values and methods are reviewed during each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

2. Financial Position (continued)

2.2A Property, plant and equipment and intangible assets (continued)

Depreciation and amortisation rates applying to each class of depreciable asset are based on the following useful lives:

	2018	2017
Buildings on freehold land	**5 to 50 years**	5 to 50 years
Plant and equipment	**2 to 30 years**	2 to 30 years
Infrastructure	**20 years**	20 years
Landmark, national and major research facilities	**5 to 40 years**	5 to 40 years

Impairment
All assets were assessed for indications of impairment at 30 June 2018. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to sell and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the entity were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

Derecognition
An item of property, plant and equipment is derecognised upon disposal or when no further future economic benefits are expected from its use or disposal.

2.2B Intangibles

The useful lives of intangible assets are assessed as either finite or indefinite.

Intangible assets with finite lives are amortised over the useful economic life and assessed for impairment whenever there is an indication that the intangible asset may be impaired. Intangible assets with indefinite useful lives are not amortised, but are tested for impairment annually, either individually or at the cash-generating unit level.

Software
Items of software are recorded at cost and amortised as outlined below. Items with a cost of less than $5,000 (2017: $5,000) are expensed in the year of acquisition. Software and licences are reported at cost. There is no material internal software development, though there are significant internal capitalised costs involved in the implementation of purchased software.

Intellectual property
ANSTO and NTP Radioisotopes (SOC) Limited (NTP) signed the Intellectual Property (IP) Licence Agreement on 15 May 2012 for the provision of NTP's IP to ANSTO to enable ANSTO to build a new Mo-99 manufacturing plant at Lucas Heights.

Under the terms of the IP Agreement NTP granted to ANSTO an exclusive, irrevocable, perpetual licence to use, exploit, reproduce and modify the current IP and the future IP.

ANSTO originally recognised the IP right conveyed, at fair value, as an intangible asset with an indefinite life and a financial liability for the future payments required in relation to the asset. This IP is recognised as its initial fair value less impairment, $30,336,000 (2017: $51,210,000).

2. Financial Position (continued)

2.2B Intangibles (continued)

Amortisation
Intangibles are amortised over their estimated useful lives to ANSTO using the straight line method.

Amortisation rates applying to intangibles are as follows:

	2018	2017
Purchased software	**2 to 10 years**	2 to 7 years
Licences	**3 years**	3 years
Intellectual property	**Indefinite life**	Indefinite life

Impairment
All intangible assets were assessed for impairment at 30 June 2018. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

Patents
Due to the uncertain commercial value of patents and because benefits extending beyond one accounting period cannot be assured, the costs associated with the development and registration of patents are expensed in the year in which they are incurred, unless recoverability is assured beyond any reasonable doubt. At 30 June 2018 there were 192 patents (2017: 146) registered to ANSTO and no associated costs are recognised as an asset (2017: nil).

2.2C Inventories

	2018	**2017**
	$'000	**$'000**
Raw materials and stores – not held for resale		
Stores – at cost	24,110	16,754
Cobalt-60 sources – at net realisable value	86	98
Reactor fuel and heavy water – at average purchase price	2,701	2,657
	26,897	19,509
Work in progress – at cost	2,295	1,295
Finished goods – at cost	1,357	735
Total inventories	**30,549**	**21,539**
Inventories expected to be realised within		
No more than 12 months	27,762	18,784
More than 12 months	2,787	2,755
Total inventories	**30,549**	**21,539**

Accounting Policy
Inventories held for sale are valued at the lower of cost and net realisable value. Costs incurred in bringing each item of inventory to its present location and condition, are assigned as follows:

- Raw material and stores (with the exception of reactor fuel) - purchase cost on a first-in first-out basis;
- Reactor fuel - average purchase price; and
- Finished goods and work-in-progress - cost of direct materials and labour plus attributable costs that can be allocated on a reasonable basis.

2. Financial Position (continued)

2.2D Commitments

	2018	2017
	$'000	$'000
Infrastructure, plant and equipment	82,094	84,232
Fuel element purchase	9,227	5,707
Mo-99 plate purchase	10,482	9,216
Total commitments	**101,803**	**99,155**
One year or less	62,635	87,764
From one to five years	39,168	11,391
Total commitments	**101,803**	**99,155**

2.3 Liabilities

2.3A Other payables

	2018	2017
	$'000	$'000
Final monies on construction contract	10,134	-
Other payables	744	72
Total other payables	**10,878**	**72**
Other payables expected to be settled within		
No more than 12 months	10,878	72
More than 12 months	-	-
Total other payables	**10,878**	**72**

Accounting Policy

Financial liabilities are classified other financial liabilities and are recognised and derecognised upon trade date.

Other financial liabilities, including borrowings, are initially measured at fair value, net of transaction costs. These liabilities are subsequently measured at amortised cost using the effective interest method, with interest expense recognised on an effective interest basis.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

2.3B Revenue in advance

	2018	2017
	$'000	$'000
Grants received in advance	18,355	24
Contract revenue received in advance	2,331	3,973
Total revenue in advance	**20,686**	**3,997**
Other payables expected to be settled within		
No more than 12 months	11,458	2,570
More than 12 months	9,228	1,427
Total revenue in advance	**20,686**	**3,997**

2. Financial Position (continued)

2.3B Revenue in advance (continued)

Accounting Policy

Grants and revenue are not recognised in the profit or loss until ANSTO obtains control over the contribution. Until such time that control over the contribution is obtained, the funds received are recognised as revenue in advance.

2.3C Provisions

		2018	2017
		$'000	$'000
Decommissioning	(a)	387,124	313,421
Intellectual property	(b)	43,188	51,152
Other claims		578	10,352
Total provisions		**430,890**	**374,925**
Provisions expected to be settled within			
No more than 12 months		33,813	30,412
More than 12 months		397,077	344,513
Total provisions		**430,890**	**374,925**

(a) This provision includes decommissioning costs relating to property, plant and equipment, and infrastructure and local and overseas legacy waste and current OPAL waste disposition.

(b) The provision of intellectual property relates to the future payments required in relation to the intellectual property asset (Notes 2.2A and 2.2B). The liability is derived from calculating the estimated commission to be paid to NTP based on expected future sales and then discounted back at 5.35% (2017: 4.22%).

Provisions movement reconciliation

	Decommissioning $'000	Intellectual Property Payment $'000	Other claims $'000
Carrying amount 30 June 2016	**311,625**	**58,348**	**47**
Additional provision made	(7,997)	-	10,297
Amounts used	(14,992)	(6,641)	-
Change in accounting estimate	6,607	(743)	8
Unwinding discount	18,178	188	-
Carrying amount 30 June 2017	**313,421**	**51,152**	**10,352**
Addition to/(reversal of) provision	1,914	-	(9,774)
Amounts used	(1,953)	(6,537)	-
Change in accounting estimate	55,842	(1,531)	-
Unwinding discount	17,900	104	-
Carrying amount 30 June 2018	**387,124**	**43,188**	**578**

2. Financial Position (continued)

2.4 Reserves

2.4A Reserves

		2018	2017
		$'000	$'000
Asset revaluation	(a)		
Opening balance		500,124	486,481
Revaluation - realisation		(1,350)	13,643
Revaluation – decommissioning		(55,842)	-
Closing balance		**442,932**	**500,124**
Other reserves			
OPAL depreciation	(b)	**9,061**	**9,061**
Intermediate low level waste (ILLW) return	(c)	**616**	**616**
Foreign currency reserve	(d)		
Opening balance		334	335
Movement		(13)	(1)
Closing balance		**321**	**334**
Other reserves		**9,998**	**10,011**
Total Reserves		**452,930**	**510,135**

(a) Asset revaluation
This reserve represents the revaluation of property, plant and equipment.

(b) OPAL depreciation reserve
This reserve represents unused funding for OPAL depreciation. This was due to a delay in final commissioning of OPAL.

(c) Intermediate low level waste (ILLW) return
This reserve relates to unspent appropriation for ILLW return.

(d) Foreign currency reserve
This reserve relates to foreign currency translation at reporting date.

2.4B Accumulated deficit

	2018	2017
	$'000	$'000
Opening balance	(184,664)	(294,297)
Surplus/(deficit) for the year	(86,942)	109,633
Closing balance	**(271,606)**	**(184,664)**

3. Funding

This section identifies ANSTO funding structure.

3.1 Government funding

	2018	2017
	$'000	$'000
Revenue from Government	198,119	183,334
Government equity injection	21,037	28,841
Total government funding	**219,156**	**212,175**

Appropriations are made to the Department of Industry, Innovation and Science and then paid to ANSTO. ANSTO does not receive any Departmental Capital Budget.

3.2 Statement of Cash Flows reconciliation

	2018	2017
	$'000	$'000
Reconciliation of net cost of services to net cash from operating activities:		
Net cost of services	(284,624)	(73,857)
Revenue from Government	198,119	183,334
Income tax benefit/(expense)	(437)	156
Adjustment for non-cash items		
Depreciation/amortisation and impairment losses	132,785	84,300
Reversal of write-down of receivables	8	-
Net (gain)/loss in disposal of non-financial assets	(31)	(407)
Write-down and impairment of assets	43	48,297
Write-down of inventories	931	-
Unrealised foreign exchange (gain)/loss	(1,448)	529
Unwinding of discount – decommissioning and IP royalty costs	18,004	18,366
Fixed asset revaluation recognition on disposal	(1,350)	-
Asset free of charge	-	(191,119)
Movement in assets and liabilities		
Assets		
Increase in trade receivables	(500)	(1,734)
(Increase)/decrease in other receivables	(198)	619
Decrease/(increase) in GST receivables	221	(205)
Increase in accrued interest receivable	(312)	(13)
(Increase)/decrease in prepayments	(825)	2,054
(Increase) in inventories	(9,010)	(1,094)
Decrease in deferred tax assets	437	92
Liabilities		
Increase/(decrease) in suppliers payables	990	(209)
Increase in employee payables and provisions	194	5,294
Increase/(decrease) in other payables	10,805	(6,619)
Increase/(decrease) in revenue in advance	16,689	1,267
(Decrease)/increase in other provisions	(17,738)	2,921
Decrease in decommissioning provision	(1,953)	(17,911)
Net cash from operating activities	**60,800**	**54,061**

3.3 Non-cash transactions

ANSTO acquired the shares of ASHCo on 1 July 2016 for no consideration. The fair value at the date of acquisition was $191,119,000.

4. People and relationships

This section describes a range of employment and post-employment benefits provided to our people and our relationships with key people.

4.1 Employee payables

	2018	2017
	$'000	$'000
Accrued salaries and wages	945	700
Redundancy payments	-	229
Incentives	3,470	3,924
Total employee payables	**4,415**	**4,853**

All employee payables are expected to be settled within 12 months.

4.2 Employee provisions

	2018	2017
	$'000	$'000
Annual leave	13,426	13,191
Long service leave	30,766	30,369
Total employee provisions	**44,192**	**43,560**
Employee provisions expected to be settled within		
No more than 12 months	36,952	36,203
More than 12 months	7,240	7,357
Total employee provisions	**44,192**	**43,560**

4.3 Key management personnel remuneration

Key management personnel (KMP) are those persons having authority and responsibility for planning, directing and controlling the activities of ANSTO, directly or indirectly, including any director (whether executive or otherwise) of ANSTO. ANSTO has determined the KMP to be the ANSTO Portfolio Minister, the Board and the Executive Leadership Team. KMP remuneration is reported in the table below:

	2018	2017
	$'000	$'000
Short-term employee benefits:		
Salary	3,320	2,989
Performance bonuses	364	552
Motor vehicle and other allowances	2	-
Total short-term employee benefits	**3,686**	**3,541**
Post-employment benefits:		
Superannuation	357	429
Total post-employment benefits	**357**	**429**
Other long-term benefits:		
Annual leave accrued	240	180
Long-service leave	97	87
Total other long-term benefits	**337**	**267**
Termination benefits	-	-
Total key management personnel remuneration	**4,380**	**4,237**

The total number of KMP included is 16.25 (2017: 16.29). Represented by 7.71 non-executive board members (pro-rated) (2017: 8) and 8.54 full time equivalent (FTE) (2017: 8.29 FTE) members of the ANSTO Executive Leadership Team. The above key management personnel remuneration excludes the remuneration and other benefits of the Portfolio Minister. The Portfolio Minister's remuneration and other benefits are set by the Remuneration Tribunal and are not paid by the entity.

4. People and relationships (continued)

4.4 Related party transactions

ANSTO is an Australian Government controlled entity. Related parties to this entity are the Key Management Personnel, the Commonwealth cabinet and other Australian Government entities.

Significant transactions with related parties or entities that they are associated with can include:

- the payments and receipt of grants; and
- purchases of goods and services

Giving consideration to relationships with related parties, their associated entities, and transactions entered into during the reporting period by ANSTO, it has been determined that there are no related party transactions to be separately disclosed.

5. Managing Uncertainties

This section analyses how ANSTO manages the financial risks within its operating environment.

5.1 Contingent assets and liabilities

Contingent assets and contingent liabilities are not recognised in the statement of financial position but are reported in the notes. They may arise from uncertainty as to the existence of a liability or asset or represent an asset or liability in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

Unquantifiable Contingencies

At 30 June 2018, ANSTO still has the likelihood of claims in relation to asbestos related diseases. It is not possible to estimate the amounts of any eventual payments that may be required in relation to these claims. Such claims however are, covered by the Department of Finance provision dealing with asbestos related claims against any Commonwealth Authorities including ANSTO in the event of any litigation or claim for compensation.

5.2 Financial instruments

a) Categories of financial instruments

	Note	Carrying amount 2018	Fair Value 2018	Carrying amount 2017	Fair Value 2017
Financial assets		**$'000**	**$'000**	**$'000**	**$'000**
Loans and receivables					
Cash and cash equivalents		7,916	7,916	10,154	10,154
Receivables for goods and services	2.1B	13,215	13,215	12,715	12,715
Interest accrued	2.1B	795	795	483	483
Other	2.1B	1,241	1,241	1,043	1,043
Investments held to maturity	2.1C	130,187	130,187	126,483	126,483
Investments	2.1C	95	95	95	95
Total financial assets (recognised)		**153,449**	**153,449**	**150,973**	**150,973**
Total financial liabilities					
Amortised cost					
Suppliers		17,886	17,886	16,896	16,896
Employees	4.1	4,415	4,415	4,853	4,853
Other payables	2.3A	10,878	10,878	72	72
Revenue in advance	2.3B	20,686	20,686	3,997	3,997
Total financial liabilities (recognised)		**53,865**	**53,865**	**25,818**	**25,818**

b) Interest revenue from financial assets

	2018	2017
	$'000	**$'000**
Loans and receivables		
Cash and cash equivalents	163	113
Investment held to maturity	3,562	3,552
Net income from financial assets	**3,725**	**3,665**

Interest revenue

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement.*

5. Managing Uncertainties (continued)

5.2 Financial instruments (continued)

c) Net expenses from financial liabilities

There were no expenses from financial liabilities for 2018 (2017: $nil).

Financial assets

The net fair values of cash, deposits on call and non-interest-bearing monetary financial assets are in accord with their carrying amounts. Loans receivable are carried at cost, which is above their net fair value, because it is intended to hold them to maturity.

Financial liabilities

The net fair values for trade creditors and grants received in advance, all of which are short-term in nature, are in accord with their carrying amounts.

Accounting Policy

ANSTO classifies its financial assets in the following categories:

- Financial assets at fair value through profit or loss;
- Held-to-maturity investments; and
- Loans and receivables.

The classification depends on the nature and purpose of the financial assets and is determined at the time of initial recognition. Financial assets are recognised and derecognised upon trade date.

Effective interest method

The effective interest method is a method of calculating the amortised cost of a financial asset or a financial liability and of allocating interest income over the relevant period. The effective interest rate is the rate that discounts estimated future cash receipts through the expected life of the financial asset, or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis except for financial assets at fair value through profit or loss.

Financial assets at fair value through profit or loss

Financial assets are classified as financial assets at fair value through profit or loss where the financial assets have been acquired principally for the purpose of selling in the near future. Assets in this category are classified as current assets.

Financial assets at fair value through profit or loss are stated at fair value, with any resultant gain or loss recognised in the profit or loss. The net gain or loss recognised in the profit or loss incorporates any interest earned on the financial assets.

Where a reliable fair value cannot be established for unlisted investments in equity instruments, cost is used less impairment if applicable.

Held-to-maturity investments

Non-derivative financial assets with fixed or determinable payments and fixed maturity dates that the group has the positive intent and ability to hold to maturity are classified as held-to-maturity investments. Held-to-maturity investments are recorded at amortised cost using the effective interest method less impairment, with revenue recognised on an effective yield basis.

Loans and receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as 'loans and receivables'. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate.

5. Managing Uncertainties (continued)

5.2 Financial instruments (continued)

Impairment of financial assets
Financial assets are assessed for impairment at each reporting date.

- Financial assets held at amortised cost - If there is objective evidence that an impairment loss has been incurred for loans and receivables or held to maturity investments held at amortised cost, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

- Financial assets held at cost - If there is objective evidence that an impairment loss has been incurred the amount of the impairment loss is the difference between the carrying amount of the asset and the present value of the estimated future cash flows discounted at the current market rate for similar assets. The net fair values of cash, deposits on call and non-interest-bearing monetary financial assets are in accord with their carrying amounts. Loans receivable are carried at cost, which is above their net fair value, because it is intended to hold them to maturity.

Financial liabilities
Financial liabilities are classified other financial liabilities and are recognised and derecognised upon trade date.

Other financial liabilities
Other financial liabilities, including borrowings, are initially measured at fair value, net of transaction costs. These liabilities are subsequently measured at amortised cost using the effective interest method, with interest expense recognised on an effective interest basis.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

5. Managing Uncertainties (continued)

5.3 Fair value measurement

The following tables provide an analysis of assets and liabilities that are measured at fair value. The different levels of the fair value hierarchy are defined below.

Level 1: Quoted prices (unadjusted) in active markets for identical assets or liabilities that the entity can access at measurement date.
Level 2: Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly.
Level 3: Unobservable inputs for the asset or liability.

Non-financial assets	Category	Fair value 2018 $'000	Fair value 2017 $'000	Valuation technique[1]	Inputs used[1]
Land	**3**	**115,688**	115,688	Market approach	Adjusted market transactions (zoning, access, existing use, size, topography, location)
Buildings	**2**	**4,579**	-	Market approach	Adjusted market transactions
	3	**155,432**	348,033	Depreciated replacement cost (DRC)	Replacement cost of a new/consumed economic benefit/ obsolescence of asset
Infrastructure, plant and equipment	**2**	**3,410**	4,480	Market approach	Adjusted market transactions
	3	**954,633**	799,263	Depreciated replacement cost (DRC)	Replacement cost of a new/consumed economic benefit/ obsolescence of asset

1. The valuation techniques and inputs used in 2017 and 2018 are consistent.

The highest and best use of all non-financial assets is the same as their current use.

Accounting Policy

For assets that are recognised in the financial statements at fair value on a recurring basis, the determination is made whether transfers have occurred between levels in the hierarchy by re-assessing categorisation (based on the lowest level input that is significant to the fair value measurement as a whole) at the end of each reporting period.

Recurring and non-recurring Level 3 fair value measurements - valuation processes

The Australian Valuation Solutions (AVS) undertook a comprehensive valuation of all non-financial assets located at the Lucas Heights and Camperdown campuses effective 30 June 2017. PP&E Valuations undertook a comprehensive valuation of all non-financial assets located at the Clayton campus effective 30 June 2017. The entity tests the procedures of the valuation model as an internal management review at least once every 12 months (Valuations are conducted with sufficient frequency to ensure that the carrying amounts of assets do not differ materially from the assets' fair values as at reporting date). If a particular asset class experiences significant and volatile changes in fair value (i.e. where indicators suggest that the value of the class has changed materially since the previous reporting period), that class is subject to specific valuation in the reporting period, regardless of the timing of the last specific valuation.

5. Managing Uncertainties (continued)

5.3 Fair value measurement (continued)

Land, Infrastructure, Plant and Equipment
Assets that do not transact with enough frequency or transparency to develop objective opinions of value from observable market evidence have been measured utilising the depreciated replacement cost (DRC) approach. Under the DRC approach, the estimated cost to replace the asset is calculated and then adjusted to take into account its consumed economic benefit/asset obsolescence (accumulated depreciation). Consumed economic benefit/asset obsolescence has been determined based on professional judgment regarding physical, economic and external obsolescence factors relevant to the asset under consideration.

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially measured at their fair value plus transaction costs where appropriate.

Assets acquired at no cost, or for nominal consideration, are initially recognised as assets and revenues at their fair value at the date of acquisition, unless acquired as a consequence of restructuring of administrative arrangements. In the latter case, assets are initially recognised as contributions by owners at the amounts at which they were recognised in the transferor's accounts immediately prior to the restructuring.

6. Other information (continued)

6.1 Deed of indemnity

A new Deed of Indemnity between the Commonwealth Government, ANSTO and ANSTO Nuclear Medicine Pty Ltd (ANM), under which the government has formally agreed to indemnify ANSTO and ANSTO Officers, and ANM and ANM Officers, from any loss or liability arising from claims caused by ionising radiation, was signed by the Minister for Industry, Innovation and Science in April 2016. It will remain in place until April 2026.

6.2 Information relating to ANSTO (the parent entity)

	2018 $'000	2017 $'000
Current assets	180,693	173,871
Non-current assets	1,216,724	1,372,988
Total assets	1,397,417	1,546,859
Current liabilities	124,721	89,906
Non-current liabilities	402,829	351,879
Total liabilities	527,550	441,785
Net assets	**869,867**	**1,105,074**
Contributed equity	791,214	770,177
Asset revaluation reserve	442,077	497,919
Other reserves	9,677	9,677
Accumulated deficit	(373,101)	(172,699)
Total equity	**869,867**	**1,105,074**
Surplus/(deficit) of the parent entity	**(200,402)**	**127,448**
Other comprehensive income/(expense) of the parent entity	**(55,842)**	**11,715**
Total comprehensive income/(expense) of the parent entity	**(256,244)**	**139,163**

The lease commitments shown in note 1.1B only relate to ANSTO.

	Interest rate	Maturity date	2018 $	2017 $
$15 million unsecured loan facility from ANSTO to ANM	CommSec Variable Rate 6.38% (2017: 6.08%)	31.12.20	3,259,798	1,842,638
Total unsecured loan from ANSTO to ANM			**3,259,798**	**1,842,638**
Interest on unsecured loan facility			**163,112**	**83,887**

ANSTO has undertaken to ensure that the payment terms for the purchase of good and services by ANM does not breach the terms of the loan facility. Any such purchases will be paid out of ANM free cash when available.

6. Other information (continued)

6.2 Information relating to ANSTO (the parent entity) (continued)

There are transactions between ANSTO and its subsidiaries for purchases and sales or goods and services. These transactions are on normal commercial terms and conditions no more favourable than those available to other parties.

Investment in subsidiaries

The current carrying value of ANSTO's subsidiaries at 30 June 2018 are set out below. Unless otherwise stated, share capital consists solely of ordinary shares that are held directly by ANSTO, and the proportion of ownership interests held equals the voting rights held by the group. The country of incorporation is also their principal place of business.

Name	Place of incorporation	2018 %	2018 $	2017 $
PETTECH Solutions Pty Ltd (a)	Australia	100	2,965,588	9,474,588
Synchrotron Light Source Australia Pty Ltd (b)	Australia	-	-	1
ANSTO Inc. (c)	USA	100	-	-
ANSTO Nuclear Medicine Pty Ltd (d)	Australia	99.9	13,938,100	100
Australian Synchrotron Holding Company Pty Ltd (e)	Australia	100	-	196,119,000
Total investment in subsidiaries			**16,903,688**	**205,593,689**

(a) ANSTO continues to own 100% of PETTECH Solutions Pty Ltd. Its principal activities are manufacturing, sale and distribution of FluoroDeoxyGlucose (FDG) and Fluorine 18 (F18) for use in the Australian market. FDG and F18 are used in PET scanning which has produced significant advances in the diagnosis of cancer and other medical conditions. On 14 March PETTECH advised that the company had entered into agreements with Cyclotek (Australia) Pty Ltd and Cyclotek NSW Pty Ltd, for the sale of the PETTECH Solutions business and a new business venture collaboration which will allow full use of the cyclotron facilities at Lucas Heights. The transaction is subject to the customary closing conditions and conditions precedent including regulatory, licensing and other approvals.

(b) SLSA was deregistered on 24 June 2018. Until then, ANSTO owned 100% of Synchrotron Light Source Australia Pty Ltd (SLSA). SLSA operated the Australian Synchrotron until 4 September 2016. During financial year 2017 ANSTO funded the operations of SLSA until they were transferred to ANSTO as ANSTO received directly the government and external funding to operate the Australian Synchrotron.

(c) ANSTO continues to own 100% of ANSTO Inc. its principal activity is to promote the commercialisation of ANSTO Technology in the USA. For the financial year ended 30 June 2018 the financial statements of ANSTO Inc. were audited by Wipfli LLC.

(d) ANSTO owns 100% of the B class and C class shares on issue of ANM. The B class shares, 101 are not entitled to any dividends but do have operational control. The C class shares, 110,300,000 were issued as consideration for the Mo-99 manufacturing facility. There was one A class share issued to the Minister of Industry, Innovation and Science on behalf of the Commonwealth. The A class share is entitled to dividends. ANM's principal activities are to own and operate the new Molybdenum 99 (Mo-99) and Synroc Waste Treatment facilities. The Mo-99 facility is currently under construction on the ANSTO Lucas Heights site on the outskirts of Sydney in the state of New South Wales and is scheduled to be operational during financial year 2019. This facility is scheduled to be operational in financial year 2021. At 30 June 2018 ANSTO impaired its investment in ANM by $96.3M

(e) On 1 July 2016 ANSTO was transferred the remaining 97.6% of the shares in the Australian Synchrotron Holding Company Pty Ltd (ASHCo) for no consideration. ASHCo owns the Australian Synchrotron. The net assets of ASHCo were transferred to ANSTO on 30 November 2017. The company will be deregistered and any costs borne by ANSTO.

6. Other information (continued)

6.3 Event after reporting date

On 22 June 2018, ANSTO experienced a mechanical issue with a conveyer belt in the production facility manufacturing technetium-99m (Tc-99m) generators. ANSTO has been importing Tc-99m generators from the USA since the issue was identified. The fault has been fixed and quality control tests finalised. A controlled start-up process that incorporates full equipment checks is in place after which production will ramp up. Full production is scheduled for early September 2018, with generator imports remaining in place until full production is achieved. The cost of importation is approximately $1 million per week, ANSTO is insured for business interruption and is currently working with their insurer.

6.4 Budgetary reports and explanations of major variances

The following tables provide a comparison between the 2017–18 Portfolio Budget Statements (PBS) budget and the final financial outcome in the 2017–18 financial statements. The Budget is not audited and does not reflect additional budget estimates provided in the 2017–18 Portfolio Additional Estimates Statements (PAES) or the revised budget provided as part of the 2018–19 Portfolio Budget Statements (PBS). However, major changes in budget have been explained as part of the variance analysis where relevant.

The ANSTO PBS does not include ANSTO Nuclear Medicine Pty Ltd (ANM), the $168.8M nuclear medicine initiative, as it is a Public Non-Financial Corporation (PNFC) but does contain ANSTO's other controlled entities. PNFC's do not form part of the General Government Sector (GGS) and are outside of the scope of AASB 1055 *Budgetary Reporting*. ANM is included in the Actual figures as it is controlled by ANSTO.

A budget has not been provided for in the PBS, for non-cash items such as asset revaluations, foreign exchange and sale/impairment of asset adjustments. Unless the variance is considered to be 'major', no explanation has been provided.

Explanation of major variances

Event impacting financial statements	Affected consolidated statements and line items
The ANM project is reported differently in the budget compared to the actual figures. ANM is a subsidiary of ANSTO, it is consolidated into the financial statements and the costs associated with the construction of the ANM facilities are reflected in property, plant and equipment net of impairment, $28.9M (2017: Nil). However, for budget purposes ANM does not form part of the Portfolio Budget Statements and is reflected as an investment. As at 30 June 2018 the value of the ANM facilities is $110.5M (2017: $109.4M).	**Statement of Comprehensive Income:** Depreciation/amortisation and impairment losses **Statement of Financial Position:** Investments Property, plant and equipment
As at 30 June 2018 ANSTO undertook a review of its assets for impairment. This review determined that the intangible asset relating to Intellectual property had been impaired, $20.5M as a result of less of the licenced process being used in the ANM Mo-99 manufacturing facility than had been originally intended.	**Statement of Comprehensive Income:** Depreciation/amortisation and impairment losses **Statement of Financial Position:** Intangible assets
In FY17 ANSTO was subject to an unplanned commercial legal claim which was being negotiated as at 30 June 2017 on a commercial-in-confidence basis. The settlement amount and payment date were finalised in FY18. The transaction was not reflected in the PBS 2017-18 which was completed in April 2017.	**Statement of Financial Position:** Other payables Other provisions

6. Other information (continued)

Event impacting financial statements	Affected consolidated statements and line items
As at 30 June 2017 ANSTO undertook a full review of property, plant and equipment, and intangible assets in conjunction with an independent valuation. While the review and valuation were planned, the outcomes could not be reliably forecast and were not reflected in the PBS 2017-18 which was completed in April 2017.	**Statement of Comprehensive Income:** Depreciation/amortisation and impairment losses **Statement of Financial Position:** Property, plant and equipment
ANSTO production and sales of Mo-99 increased to mitigate global demand prior to the transition of production to the new ANSTO Nuclear Medicine facility in 2018-19.	**Statement of Comprehensive Income:** Sales of goods and rendering of services revenue Supplier expenses **Statement of Financial Position:** Provision - Intellectual property payment **Statement of Cash Flows:** Sales of goods and rendering of services Payments to suppliers
ANSTO manages its cash through the use of term deposits. The term of each deposit is dependent on the cash needs of the business and the interest rates prevailing at the time. Changes in either the cash needs or the interest rates impact on the number of times a deposit is 'rolled' in the period. The 2017-18 PBS was completed in April 2017.	**Statement of Cash Flows:** Proceeds from investment sales/maturities Purchase of investments
Each year at 30 June ANSTO assesses its obligation to decommission facilities on its campuses. In accordance with the Australian Accounting Standards, the provision is assessed for the timing of payments, anticipated costs, discount, exchange and inflation rates. Timing of payments has been impacted by the inability of ANSTO to fund planned decommissioning works as scheduled. The 2017-18 PBS was completed in April 2017.	**Statement of Comprehensive Income:** Finance costs Changes in asset revaluation reserve **Statement of Financial Position:** Provision – Decommissioning Reserves
The Australian Synchrotron has secured commitment to $94.1M to fund the development and construction of a suite of new beamlines via a series of grant agreements from Synchrotron users. The grant agreements contain payment in instalments and are reciprocal. The 2017-18 PBS was completed in April 2017.	**Statement of Financial Position:** Cash and cash equivalents Investments Revenue in advance **Statement of Cash Flows:** Grants received
In April 2017 when the 2017-18 PBS was completed ANSTO's anticipated ASL was 1,303 this decreased to 1,277 for FY18 in the 2018-19 PBS. The lower staffing levels were partially offset by increased use of contractors, particularly to deal with a backlog of repairs and maintenance work on ANSTO's aging infrastructure.	**Statement of Comprehensive Income:** Employee expenses Supplier expenses **Statement of Cash Flows:** Payment to employees Payment to suppliers

APPENDIX 1

Equality of employment opportunity

Gender equity and diversity at ANSTO

ANSTO has a commitment to achieve greater diversity and gender equity by 2030. Our Gender Equity Committee aims to make ANSTO an effective leader in gender equity globally, along with creating employment opportunities for all staff. ANSTO is a member of the Science in Australia Gender Equity (SAGE) program, which is designed to improve gender equity and diversity in STEM, and we are developing an action plan to achieve a bronze level Athena SWAN rating by 2018. This includes the development of the Next Gen STEM 'Girls in the Lab' program which invited 25 female students to come and work hands-on with our scientists.

ANSTO continues to partner with Male Champion of Change to collectively learn, benchmark and progress on gender equity. Recent achievements include providing a Prayer and Meditation facility, Domestic Violence support and LGBTI+ support network.

Equality of employment opportunity for 2017-18

	Number Employed	% of Total Staff	Average Salary
Female	376	30%	$92,457
Male	893	70%	$107,753
People with disabilities	7	1%	$106,809
Aboriginal and Torres Strait Islanders	6	1%	$95,952
Non-English-speaking background	236	19%	$109,292

Career paths for research and technical staff

ANSTO is committed to providing a high quality learning environment which facilitates both personal and organisational growth through the Enterprise Agreement. To secure strong career progression for future generations of scientists and engineers, we operate a number of early career programs through paid Vacation and Year in Industry programs at the undergraduate level and Graduate and Post-Doctoral Fellowship Programs at the post-graduate level; additionally ANSTO engages trade apprenticeships and professional traineeships in corporate areas like IT and Human Resources. ANSTO continues to partner with Universities to provide internship opportunities for undergraduate students to assist them in being workplace-ready at the completion of their studies.

In addition:

- 42 per cent of the study support for formal qualifications currently offered to employees is aligned to science and eight per cent is aligned to engineering. The qualifications being undertaken range from Certificate level to PhD;
- 80 per cent of training requests have been received for external operational and technical training courses over the last financial year.

Careers in STEM

In addition to establishing formalised early career pathways, ANSTO's Discovery Centre supplies a number of programs designed to promote careers in STEM disciplines through student engagement and teacher development.

Industry training and engagement

ANSTO has undertaken a number of activities to increase industry-relevant training and increase engagement between researchers and business, including:

- establishment of a Graduate Institute at Lucas Heights as part of ANSTO's new Innovation Precinct aimed at fostering improved industry engagement and research training;
- long term support of AINSE and its programs;
- a neutron scattering industry engagement plan is operational and the proposed structure is being evaluated;
- research accounts to encourage and incentivise researchers;
- the establishment of a research ombudsman office to examine research ethics and governance issues; and
- a 'Developing Your Commercial Acumen' program.

Benefits and performance

ANSTO provides a flexible, supportive and diverse working environment for employees to effectively balance work demands with personal life through initiatives such as individual flexible agreements, part-time, job share, phased retirement, purchased leave, and working from home. ANSTO also encourages employees to pursue development opportunities, secondments both internal and external and to take opportunities to learn different organisational skills and follow different career paths through our Learn and Leap Program.

Health and Wellbeing Programs

ANSTO's Health and Wellbeing Programs offer annual flu vaccines, bowel screening programs, men's and women's health screenings, and lunchtime seminars covering targeted issues that are presented to managers by ANSTO's Employee Assistance Program. ANSTO continues to provide a campus physiotherapy service as part of early intervention for injury management and return to work programs, as well as a fully functioning health centre with a registered nurse and fully functioning treatment room (Monday to Friday).

Disability Strategy

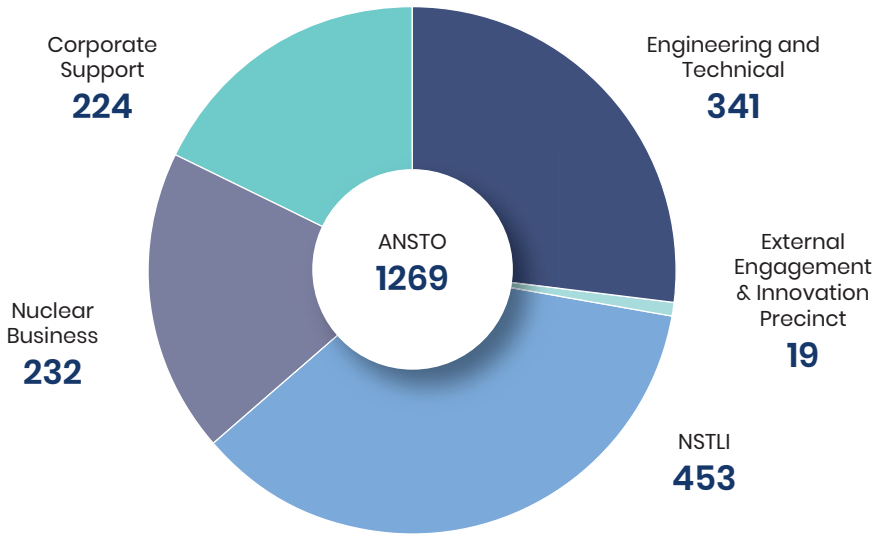
ANSTO supports employees with disabilities and is committed to providing a safe and equitable working environment. ANSTO assists people with disabilities by providing workplace modifications or reasonable adjustments to help them perform their job, including:

- changing when, where and how work is performed;
- ergonomic or specialist equipment; and
- accessibility parking permits and spaces.

All new buildings and areas being renovated at ANSTO must comply with the Disability Discrimination Act 1992. Improvements include widening footpaths and equipping meeting rooms (above 100m2) with hearing loops.

In the event that a workplace design has excluded facilities for people with disabilities or the work environment is unsafe for people with disabilities to fulfil their duties, ANSTO reviews to determine whether the work environment can be modified. ANSTO's policies and procedures align with the requirements of the Equal Employment Opportunity (Commonwealth Authorities) Act 1987 and Disability Discrimination Act 1992, intended to ensure employees with disabilities working at ANSTO and applicants for recruitment who have a disability are not discriminated against. ANSTO also has procedures and support in place to handle complaints and grievances which may be raised by employees and visitors.

ANSTO – Employee Headcount



APPENDIX 2

Functions and powers of the organisation under the ANSTO Act 1987

In September 2017, the Australian Parliament passed legislation amending ANSTO's governing legislation, the *Australian Nuclear Science and Technology Organisation Act 1987* (ANSTO Act). The amendments came into force on 19 September 2017.

The amendments (in sections 3 and 5) provide greater flexibility to ANSTO in its activities, including the use of its property, facilities and resources for science, technology, innovation and training purposes.

This includes enabling the establishment of an Innovation Precinct at ANSTO's Lucas Heights campus, and the potential establishment of similar precincts in association with other ANSTO campuses.

More broadly, the amendments facilitate enhanced collaboration between industry, universities and ANSTO across all its campuses. The amendments also update and expand the constitutional references in the ANSTO Act to better reflect ANSTO's current and proposed activities (the repeal of subsection 5(5) and insertion of section 6A).

The amendments are highlighted in blue italic below.

Section 3: Interpretation

"scientific research, innovation and training" includes the following, whether or not related to nuclear science and nuclear technology:

(a) any activities in the fields of natural or applied science (including engineering and technology) for the extension or application of knowledge;

(b) any activities that involve innovation or high levels of technical risk for the purposes of creating new or improved materials, products, devices or processes;

(c) the education and training of persons in matters related to activities mentioned in paragraph (a) or (b).

Section 5: Functions of Organisation

(1) The functions of the Organisation are:

(a) to undertake research and development in relation to:

(i) nuclear science and nuclear technology; and

(ia) the application and use of nuclear science and nuclear technology; and

(ii) the production and use of radioisotopes, and the use of isotopic techniques and nuclear radiation, for medicine, science, industry, commerce and agriculture; and

(iii) such other matters as the Minister directs; and

(b) to encourage and facilitate the application and use of the results of such research and development; and

(ba) to condition, manage and store radioactive materials and radioactive waste, arising from:

(i) the Organisation's activities (including the production of radioactive materials for other persons); or

(ii) the activities of companies in which the Organisation holds a controlling interest (including the production of radioactive materials for other persons); or

(iii) the use by other persons of radioactive materials produced by the Organisation or such companies; or

(iv) the activities of other persons who are specified in the regulations; and

(bb) to condition, manage and store radioactive materials and radioactive waste generated, possessed or controlled by the Commonwealth or a Commonwealth entity; and

(bc) to condition, manage and store radioactive materials and radioactive waste at the request of:

(i) a law enforcement agency; or

(ii) a Commonwealth, State or Territory agency responsible for the management of emergencies or disasters;

including, but not limited to, radioactive materials or radioactive waste involved in, or arising out of, a radiological incident or a radiological emergency; and

(bd) to condition, manage and store radioactive waste that has been, or is to be, sent to Australia under contractual arrangements relating to the conditioning or reprocessing of ANSTO spent nuclear fuel; and

(c) to produce, acquire, provide and sell goods, and to provide services, that are:

(i) in connection with the production and use of radioisotopes, and the use of isotopic techniques and nuclear radiation, for medicine, science, industry, commerce and agriculture; or

(ia) in connection with the conditioning, management and storage of radioactive materials or radioactive waste; or

(ib) in connection with nuclear science and nuclear technology; or

(ic) in connection with the application and use of nuclear science and nuclear technology; or

(ii) otherwise in connection with matters related to its activities; and

(d) to act as a means of liaison between Australia and other countries in matters related to its activities; and

(e) to provide advice on aspects of:

(i) nuclear science and nuclear technology; and

(ii) the application and use of nuclear science and nuclear technology; and

(iii) other matters related to its activities; and

(ea) to make available to other persons, *whether or not on a commercial basis*, the knowledge, expertise, equipment, facilities, resources and property of the Organisation by:

(i) providing training and management expertise; or

(ii) selling or leasing equipment; or

(iii) leasing land, buildings and facilities; or

(iv) taking any other action that the Organisation thinks appropriate; and

Note: See also subsection (4A) of this section and subsection 6(3).

(f) to co-operate with appropriate authorities of the Commonwealth, the States and the Territories, and with other organisations and institutions in Australia or elsewhere, in matters related to its activities; and

(g) to publish scientific and technical reports, periodicals and papers on matters related to its activities; and

(h) to collect and sell or distribute, as appropriate, information and advice on matters related to its activities; and

(j) to arrange for training, and the establishment and award of scientific research studentships and fellowships, in matters related to its activities; and

(k) to make grants in aid of research into matters related to its activities; and

(m) to make arrangements with universities and other educational research institutions, professional bodies and other persons for the conduct of research or of other activities in matters related to its activities.

(1A) A regulation made for the purposes of subparagraph (1)(ba)(iv) must not have the effect of authorising the premises on which the Lucas Heights Research Laboratories are situated to become a national nuclear waste repository.

(1B) In subsection (1A):

"national nuclear waste repository" means a site chosen by the Commonwealth, after the commencement of this subsection, for the storage of nuclear waste with a view to it never being moved to another site.

(1C) Without limiting paragraph 5(1)(bb):

(a) radioactive materials and radioactive waste generated by a Commonwealth contractor under a contract between the Commonwealth contractor and the Commonwealth or a Commonwealth entity are taken to be generated by the Commonwealth or the Commonwealth entity, as the case requires; and

(b) radioactive materials and radioactive waste possessed or controlled by a Commonwealth contractor under a contract between the Commonwealth contractor and the Commonwealth or a Commonwealth entity are taken to be possessed or controlled by the Commonwealth or the Commonwealth entity, as the case requires.

(2) The Organisation shall not undertake research or development into the design or production of nuclear weapons or other nuclear explosive devices.

(3) In undertaking its functions, the Organisation is to have regard to:

(a) the Commonwealth Government's national science, technology and energy policy objectives; and

(b) the Commonwealth Government's commercialisation objectives for public research institutions.

(4) The Minister shall not give a direction under subparagraph (1)(a)(iii) to the Organisation to undertake research or development in relation to a matter unless the Minister is satisfied that research or development by the Organisation in relation to that matter would be an effective use of the staff of the Organisation, and would not duplicate unnecessarily any activity being carried on, or proposed to be carried on, by any other agency or authority of the Commonwealth.

(4A) Without limiting paragraph (1)(ea), the Organisation may perform its function under that paragraph for the purposes of scientific research, innovation and training.

Section 6: General powers of Organisation

(1) Subject to this Act, the Organisation has power to do all things necessary or convenient to be done for or in connection with the performance of its functions and, in particular, has power:

- **(a)** to enter into contracts;
- **(b)** to acquire, hold and dispose of real or personal property;
- **(c)** to occupy, use and control any land or building owned or held under lease by the Commonwealth and made available for the purposes of the Organisation;
- **(d)** to erect buildings and structures and carry out works;
- **(e)** to form, or participate in the formation of, a company or partnership;
- **(f)** to appoint agents and attorneys, and to act as an agent for other persons;
- **(g)** to engage persons to perform services for the Organisation;
- **(h)** to design, produce, construct and operate equipment and facilities; and
- **(j)** to do anything incidental to any of its powers.

(2) The powers of the Organisation may be exercised within or outside Australia.

(3) To avoid doubt, the Organisation has the power to construct buildings and facilities for the sole purpose of performing the function referred to in paragraph 5(1)(ea).

Subsection 5(5) has been repealed and replaced with:

Section 6A Constitutional limits

(1) *The Organisation may perform its functions only:*

- ***(a)*** *for purposes relating to activities that are peculiarly adapted to the government of a nation and cannot otherwise be carried on for the benefit of the nation; or*
- ***(b)*** *for purposes relating to trade and commerce:*
  - ***(i)*** *between Australia and places outside Australia; or*
  - ***(ii)*** *among the States; or*
  - ***(iii)*** *within a Territory, between a State and a Territory or between 2 Territories; or*
- ***(c)*** *for purposes relating to postal, telegraphic, telephonic or other like services; or*
- ***(d)*** *for purposes relating to the security or defence of Australia; or*
- ***(e)*** *for purposes relating to astronomical and meteorological observations; or*
- ***(f)*** *for purposes relating to statistics; or*

(g) *for purposes relating to weights and measures; or*

(h) *for purposes relating to copyrights, patents of inventions and designs, and trade marks; or*

(i) *for purposes relating to the provision of medical and dental services; or*

(j) *for purposes related to external affairs, including:*

- ***(i)*** *giving effect to any international agreement to which Australia is a party; and*
- ***(ii)*** *addressing matters of international concern; and*
- ***(iii)*** *by way of the performance of its functions in a place outside Australia; or*

(k) *for purposes relating to the relations of the Commonwealth with the islands of the Pacific; or*

(l) *in, or for purposes relating to, a Territory; or*

(m) *in, or for purposes relating to, a Commonwealth place (within the meaning of the Commonwealth Places (Application of Laws) Act 1970); or*

(n) *for purposes relating to matters incidental to the execution of any of the legislative powers of the Parliament or the executive power of the Commonwealth.*

(2) *A term used in subsection (1) and the Constitution has the same meaning in that subsection as it has in the Constitution.*

APPENDIX 3

Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act), section 516A

Environmental protection

ANSTO undertakes education, research and innovation to enhance scientific understanding of the environment and to provide solutions for a sustainable planet.

ANSTO's commitment to environmental protection and sustainability principles is defined in its Corporate strategic plans, Environmental Policy and Organisational core values. We are committed to effective stewardship, the sustainability of our operations and to responsibly interact with the local ecology and biosphere, and to protect it. We minimise our environmental footprint through continuing to apply the principles of Ecologically Sustainable Development (ESD) and by the prevention, minimisation and control of pollution.

These values are integral to ANSTO's Business Management System – the framework that defines how business is conducted to deliver outcomes to our customers and stakeholders in a safe, consistent and environmentally responsible manner. Objectives and targets for safe, secure and sustainable operations are implemented through documented operational and business plans at all levels of the organisation.

Environmental protection is mandated when planning and undertaking major capital works and any proposed activities which may fall under the EPBC Act are assessed for referral to the Department of the Environment and Energy. Proposals for new (or modifications to existing) facilities or activities also undergo a rigorous internal safety, regulatory and environmental assurance process with independent oversight.

Environmental awareness is promoted throughout the organisation through campus inductions, the staff intranet, training and communication programs.

Environmental and quality management systems

To provide assurance that ANSTO is maintaining sound environmental protection practices, we maintain an environmental management system (EMS) that is certified to the International Standard ISO 14001. In May 2017, ANSTO Nuclear Medicine (ANM) was integrated into the wider ANSTO EMS. This standard requires that:

- the environmental context of the organisation and its operations is defined;
- its environmental impacts and compliance obligations are identified, with the risks managed and mitigated;
- an effective measurement and review system is in operation; and
- there is organisational commitment to continual improvement.

Our extensive environmental monitoring program also operates within a quality framework that is certified to the ISO 9001 standard for Quality Management Systems.

The ANSTO Environmental Management System (EMS) Strategy FY14-FY19 was evaluated against a new suite of key performance indicators, targets and action plans established in 2017. The Executive Committee for Workplace Health & Safety and Environment supports the implementation of this strategy and provides oversight of the environmental management system.

Environmental performance

ANSTO aims to reduce its environmental footprint by minimising the generation of waste, monitoring the consumption of resources such as hydrocarbon fuels, paper, electricity and water, and by recycling consumables. We also monitor and annually report our carbon footprint through the National Greenhouse

and Energy Reporting (NGER) Scheme and are participating in the Sustainability Advantage Program run by the NSW Office of Environment and Heritage. A program to assess the biodiversity within ANSTO's Lucas Heights Bushland Perimeter has continued with an improvement on the eradication of invasive weed species.

The performance indicators in **Table 1** incorporate all three campuses where practicable. The electricity data shows that over the past three years ANSTO's total electricity consumption has plateaued. This achievement has been supported by an electricity savings program introduced in FY17.

Table 1. Environmental performance indicators for ANSTO sites

Resource Usage [1]	Units	FY 2016 [1]	FY 2017 [1]	Current year FY 2018 [1]	Change on previous year
Electricity [2]	GWh	67.2	66.6	67.2	+1%
Water	m^3	315,694	320,369	318,438	-1%
Passenger vehicle petrol and diesel [2]	L/100km	8.98	8.65	8.26	-4.5%
Waste Water [2]					
Wastewater discharged to sewer	m^3	89,235	103,024	75,916	-26%
Landfill and Recycled Waste [2]					
Waste sent to landfill	tonnes	226	237	259	+9%
Recycled cardboard + Paper	tonnes	22.3	85.5	114	+33%
Recycled co-mingled containers	tonnes	5.94	16.7	18.2	+9%
Other recycled streams (batteries, ferrous and non-ferrous metal, gardening, E-waste)	tonnes	19.8	12.9	24.8	+92%
Landfill diversion rate	%	17.5	33.2	37.7	+14%

Notes: 1. Data for Lucas Heights, Camperdown and Clayton campuses (excluding all tenants); previously reported excluding ANSTO Clayton.
2. Electricity consumption data for FY16 and FY17 updated to correct error.
3. Data for the Lucas Heights campus only (includes tenants); paper and cardboard recycling were reported separately in previous years

ANSTO continues to invest and plan for the use of renewable energy through small-scale solar photovoltaic (PV) and evacuated tube technologies. A number of pathway and street lights were upgraded at the Lucas Heights campus to standalone integrated solar PV/battery storage systems. Together with existing solar hot water installations at the Lucas Heights campus and ~33 kW of solar hot water and PV electricity installed at Clayton, ANSTO's renewable energy facilities have offset 272 MWh of electricity consumption in FY18. A renewable energy strategy is also being developed for all of ANSTO's campuses.

Water consumption for the three campuses decreased slightly over the FY17 period which should be particularly noted given the extensive dry spell over the year. In FY18, the Lucas Heights campus only received 355 mm of rainfall. As a result, a significant amount of irrigation was required across the campus, partly supported through utilising the rainwater capture system. The need for efficient use of water has been communicated to staff over this period.

ANSTO's landfill diversion rate continues to improve with over 37% of waste being diverted from landfill. The ~9% increase in waste to landfill is attributed to construction activity (ANM facility, the level solid waste (ILSW) store and manipulator workshop) and a 3% staff workforce increase (full-time equivalent staff). ANSTO continues to recycle ferrous metals, garden waste, concrete, batteries, toner cartridges, mobile phones and redundant computer equipment. Many business units within ANSTO have set up recycling stations for alternative reuse/recyclable waste streams such as soft plastics, coffee grounds and compostable food scraps.

In 2017 ANSTO replaced its fleet of inefficient legacy printers with new multi-function printers, which have been manufactured using the highest sustainability standards. This is expected to generate significant electricity savings. A 25% reduction in paper consumption has been observed in FY17. ANSTO now mandates a minimum recycled content of 20% in the standard office paper it procures. ANSTO has been able to achieve an average of 23% recycled content use in FY17. Together with the overall reduction in paper use, the amount of non-recycled content consumed per employee has decreased by ~40% in FY17.

Environmental monitoring program

ANSTO conducts an extensive effluent and environmental monitoring program that measures radioactivity in authorised emissions to air and liquid effluent discharges to the sewer; and in samples of air, surface water, ground water, sediment and biota from the local environment. Local environmental radiation and weather conditions are reported online via the ANSTO webpage. Many of the monitoring results are independently verified.

Results of environmental monitoring in 2017-2018 demonstrate that ANSTO's authorised releases of radioactive material to the air and sewer continue to be effectively controlled, complied with regulatory limits and had minimal impact on humans, wildlife or the environment.

Good water quality

Stormwater runoff from the Lucas Heights campus does not contribute to any public drinking water supply, however ANSTO regularly monitors stormwater leaving the campus, as well as sampling the nearby Woronora River. Results show that concentrations of tritium in water in the local environment have decreased since the HIFAR reactor closed in 2007, and are well below the level considered safe for drinking water by the World Health Organization. Gross alpha and beta measurements were below the radiological levels set for surface waters under the previous NSW Protection of the Environment Operations Act 1997. In fact, the majority of results were below the 0.5 Bq/L screening levels for alpha and beta radioactivity set in the Australian Drinking Water Guidelines.

An extensive network of shallow and deep groundwater wells is designed to monitor potential sources of contamination to groundwater, water quality and groundwater movement. Groundwater from the Lucas Heights campus contains only naturally-occurring radionuclides and low levels of tritium. Groundwater near fuel storage tanks is also analysed for petroleum hydrocarbons to check for evidence of leaks from tanks, however none have been detected to date.

Authorised discharges within limits

Liquid effluent discharged from ANSTO sites into the sewer system complied with the acceptance limits for trade wastewater set by the Sydney Water Corporation. Compliance with these limits, together with effluent dilution studies, ensures that water at the Cronulla wastewater treatment

plant meets World Health Organization drinking water standards for radioactivity.

Air ventilated from laboratories and facilities that handle radioactive materials is treated and/or filtered prior to discharge and continuously monitored. ARPANSA sets limits for airborne radioactive discharges from licenced ANSTO facilities and all airborne emissions were within the annual operating compliance limits.

Detailed reporting

Reports on airborne and liquid effluent discharges are submitted to the relevant regulatory authorities on a quarterly basis. Details of our environmental monitoring program are on the ANSTO website and the results and findings are available on request. In addition, ANSTO reports real-time environmental radiation dose-rates recorded in the nearby suburb of Engadine via the ANSTO webpage. The weather data for Lucas Heights are also available on ANSTO's website and published by the Bureau of Meteorology.

ANSTO reports annually to the Energy Efficiency in Government Operations (EEGO) and National Greenhouse and Energy Reporting (NGER) programs; both of these reports are available on the ANSTO website.

All staff are encouraged to report early and often on any potential or actual safety and environmental incidents. All incidents are subsequently investigated, actioned and mitigation controls evaluated for effectiveness via ANSTO's event management system.

Safe waste management

ANSTO has maintained safe and effective management of its radioactive wastes for many years. There is minimal environmental impact from the storage of solid radioactive waste since there are no ongoing emissions or energy requirements, apart from the packaging process and building footprint. One of the waste minimisation strategies involves concentration of intermediate level liquid waste using a drum dryer; the electricity consumption is offset by the reduction of packaging, handling & storage space required.

Liquid wastewater comprising mainly sewage with some trade waste is tested for compliance within limits for radioactivity before being discharged to the sewer. Concentration limits for non-radioactive materials such as ammonia, zinc and total dissolved solids were also met. Sydney Water conducts independent testing of ANSTO's liquid effluent discharges and the Trade Waste Agreement is periodically reviewed to provide assurance that ANSTO's discharges are fully characterised, remain within authorised limits and pose no threat to the environment. Effluent from the Sutherland Shire undergoes tertiary treatment at the Cronulla wastewater treatment plant and is ultimately discharged to the ocean at Potter Point. Analyses of marine biota (fish, seaweed and barnacles) from Potter Point confirmed that wastewater from ANSTO has a negligible effect on the local marine environment.

Little Forest Legacy Site

ANSTO is responsible for the Little Forest Legacy Site (LFLS) located within the 1.6km buffer zone. This site, formerly known as the Little Forest Burial Ground (LFBG), was used by the Australian Atomic Energy Commission and other government agencies during the 1960's to dispose of waste containing low levels of radioactivity and non-radioactive beryllium oxide, in a series of shallow trenches. There has been ongoing monitoring, maintenance and management of the site since 1966 including routine air, soil and groundwater testing, results of which are publicly available and confirm that the site is being safely managed.

The site is subject to a licence issued by ARPANSA and is managed by ANSTO on behalf of the Government. ANSTO has established a steering committee for the ongoing management of LFLS and continues to conduct detailed scientific studies of the site, in order to investigate options for the final disposition of the radioactive material and to ensure the continued safe management of the site.

Dose levels low

Environmental gamma radiation levels are continuously measured by thermoluminescent dosimeters at the Lucas Heights campus and averaged 1.25 mSv/yr for 2017-18. The environmental dose recorded in surrounding suburbs and at the Cronulla wastewater treatment plant were also at normal background levels with an average of 1.13 mSv/yr (the national average natural background radiation dose is 1.5 mSv/yr).

Studies carried out for ANSTO's liquid effluent discharges have confirmed that the radiological risk to the environment or humans (working at the Cronulla wastewater treatment plant or swimming in the sea near the Potter Point ocean outfall) is negligible.

Computer modelling is used to estimate the potential radiation dose to people from operations at the Lucas Heights campus. The model inputs include the quarterly stack emission results, local weather data and conservative assumptions about environmental exposure pathways. The maximum potential dose to local residents from ANSTO's airborne emissions in 2017-2018 was 0.0027 millisievert (mSv). This is less than 0.3 per cent of the annual public dose limit of 1 mSv established by ARPANSA.

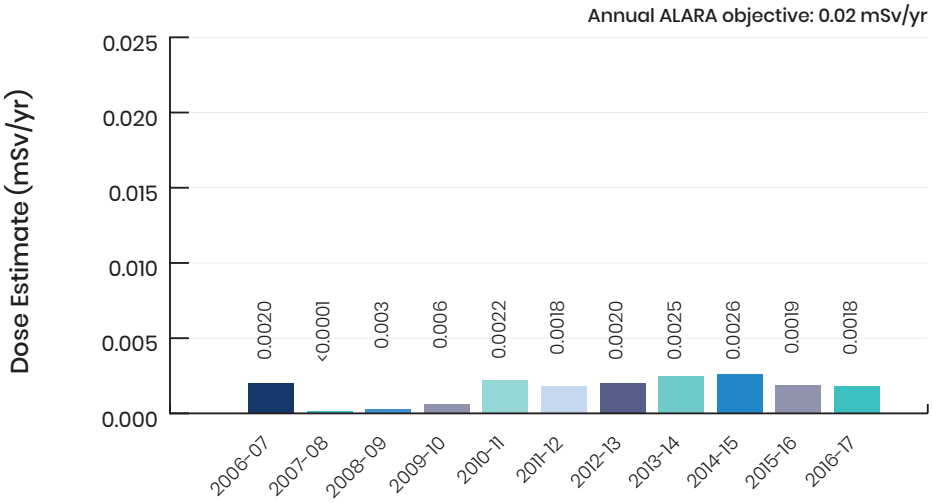


Figure 1: Maximum annual effective dose from LHSTC airborne discharges at the boundary of ANSTO's 1.6 km buffer zone, July 2006 to June 2018.

Doses from ANSTO's airborne emissions in 2017-2018 remained well below the 0.02 mSv ALARA performance objective; despite increased production of beneficial medical isotopes (see Figure 1). For its closest neighbours, ANSTO's activities added less than 0.2 per cent to the 1.5 mSv dose that every Australian receives from natural background radiation each year, as shown in Figure 2.

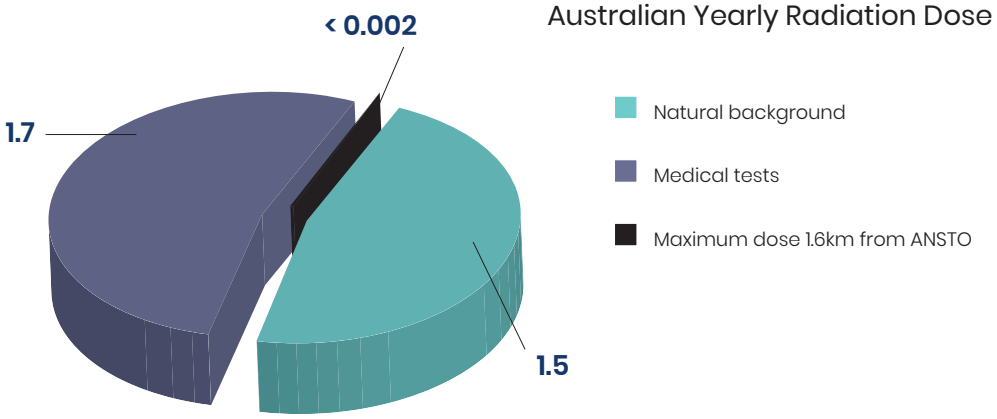


Figure 2: The average annual dose received by Australians from various sources compared to the maximum potential airborne dose to ANSTO's nearest residents in 2017-2018. *Source: ARPANSA Fact Sheet http://www.arpansa.gov.au/pubs/factsheets/IonisingRadiationandHealth.pdf

Managing the ANSTO bushland perimeter

ANSTO manages a section of land with an area over ~450 ha within the 1.6 km buffer zone centred on the existing HIFAR reactor. This area comprises the Lucas Heights Science and Technology Centre, a number of legacy waste disposal sites and ~350 ha of undeveloped native bushland and riparian zones. A qualitative assessment of the biodiversity potential of the ANSTO Bushland Perimeter was performed in late 2017 that assessed 110 sample sites against benchmark criteria for the different vegetation communities, such as native species diversity and density, connectivity, soil exposure and weediness. The results of this assessment are being used to prioritise management actions for the ANSTO Bushland Perimeter Plan of Management including: revegetation and rehabilitation works, stormwater system upgrades, and weed management programs. This assessment will form the baseline for future assessments utilising the same benchmark criteria to evaluate improvement programs and any ongoing impact of ANSTO's operations on the surrounding environment.

The area has numerous bush walking trails, and is actively managed through a program of regular inspections, maintenance, culling of feral animals and weed reduction programs. An ANSTO staff bush care group has been meeting monthly for a number of years to target high risk locations. The work of this group has seen the eradication of noxious weed species such as Crofton Weed, Cotton Bush, African Love Grass and Cassia from over two hectares of riparian vegetation within the ANSTO Perimeter Bushland. ANSTO has also been engaging with the local Dharawal Indigenous Group to identify areas of cultural importance within the ANSTO Bushland Perimeter.

A significant bushfire and hazard reduction event occurred within ANSTO's Bushland Perimeter in April 2018. This event has resulted in ~200 ha of bushland being burnt. ANSTO will monitor the progress of vegetation regrowth and any weed infestations over the coming months and years and will respond according to best practice.

Referrals under the EPBC Act

A referral relating to the transport of spent fuel from the OPAL reactor scheduled for 2018 was submitted in December 2016. The Department of Environment and Energy determined in May 2017 that the transport is not construed as a controlled action provided it is undertaken in accordance with ANSTO's procedures and the Commonwealth and international regulations administered by ARPANSA and AMSA for the transport of spent fuels.

Within this period, the construction activities for the expansion of the solid low-level waste facility continues. Regular independent inspections have been undertaken throughout the project to evaluate conformance with the environmental commitments made by ANSTO in the referral and the measures to be met as stated above by the Department.

Mitigating environmental impacts

ANSTO encourages staff to cycle, carpool or take public transport to get to work and to walk rather than drive around the Lucas Heights campus. ANSTO provides staff with a carpooling website and regular shuttle-bus services to and from the local railway station. Numerous paths, tracks, bike racks, lockers and shower facilities are available for use by the avid walker/cyclist.

The ANSTO online 'swap shop' continues to provide a forum for staff to pass on unwanted goods. From furniture to chemicals to analytical equipment, by exchanging useful products staff can help save time, money and the environment by reducing waste going to landfill. The online Equipment Database tool also allows staff to share resources and knowledge whilst minimising the procurement of new equipment.

ANSTO has implemented a new chemical management system to enable staff in different business areas to more effectively share and track chemical resources, which will reduce the need to procure new chemicals. ANSTO is also utilising the system to better determine its reporting requirements under the National Pollution Inventory and to improve the identification and control of environmentally hazardous chemicals.

In line with ANSTO's focus on the digitisation of records, the implementation of the ANSTO Enterprise (Ae) SAP upgrade project and the continued facilitation of the ANSTO Content Server is progressing our transition to a paperless office environment by providing a secure platform for electronic record control and storage. Many functions such as budgeting, business planning, procurement, maintenance, recruitment, on-boarding, training and waste transfers are now managed through online user interfaces.

ANSTO has adopted an integrated approach to planning and decision making across the business, to optimise the management of all that we do. By managing our people, resources, and infrastructure more effectively, we aim to increase productivity thereby enhancing the environmental sustainability of our operations.

Overall, ANSTO commits significant resources to effectively monitor, manage and report on its environmental impacts and responsibilities.

Accordance with ecologically sustainable development (ESD) principles

Ecologically sustainable development (ESD) is embedded into ANSTO's core values. The ANSTO Building Code (ABC) provides the minimum standard that new buildings and facilities at ANSTO must conform with. Within the ABC, the principles of ESD are mandated through the requirement for all new and refurbished buildings to have an independent ESD consultant involved in the design, achieve a target minimum 4.5 star NABERS rating and comply with the requirements for the Energy Efficiency in Government Operations (EEGO) Policy. Furthermore, minimum standards for the efficient use of water in offices and laboratories, installation of rainwater tanks, re-use of waste water and sub-metering are enforced through the ABC.

ANSTO is integrating environmental protection into management processes by requiring project/construction environmental management plans (P/CEMP) at the project planning phase. All capital projects such as construction of buildings, infrastructure and support facilities must have P/CEMP in place to prevent environmental impacts such as soil erosion, dust, noise and discharges to stormwater. Independent oversight of these projects includes the approval of P/CEMPs, ad-hoc inspections and formal audits.

Other ANSTO activities that contribute to improved social, environmental and economic outcomes include our research into significant environmental issues such as air quality, soil erosion, water resource management, wetland health, biodiversity, climate variability and global warming impacts such as rising sea levels and temperatures on marine ecosystems. ANSTO staff are also involved with the development of environmental management plans for other organisations where specific expertise is required.

ANSTO's support of nuclear non-proliferation ideals and the development of nuclear safeguards also accords with ESD principles; we contribute to the global non-proliferation agenda through the Global Initiative to Combat Nuclear Terrorism and collaborate with bodies such as the International Atomic Energy Agency and the Comprehensive Test Ban Treaty Organisation.

ANSTO continues to support a national approach to safe waste management, including the establishment of a National Radioactive Waste Management Facility.

Finally, ANSTO's commitment to environmental protection means that special emphasis is placed on reducing our environmental footprint by minimising waste and the consumption of resources and by recycling consumables. Our scientific research provides practical, science-based advice to inform decision makers, creating opportunities to conserve resources and sustain our fragile environment. It also ensures that we manage our past and current waste in a manner that protects human health and the environment, now and in the future.

APPENDIX 4

Work Health and Safety Act 2011

ANSTO remains committed to the target of 'towards zero harm' to its workers and ensures that senior leadership in Work, Health and Safety (WH&S) is an important aspect in achieving continuous WH&S improvement. The Executive Work, Health and Safety and Environment (WHSE) Committee provides continued leadership and oversight by monitoring site wide risks and learning from incidents that had the potential of a major impact to people, plant/equipment and environment and by endorsing key safety related projects and foci.

During 2017-2018 the WHSE Committee endorsed the top WH&S priorities for the organisation. These included; WHS Management System, progress towards ISO 45001, chemical management, hygiene and health programs, contractor management, a drug and alcohol management program and emergency preparedness and response.

ANSTO continued to work closely with COMCARE during 2017–2018, with COMCARE gaining additional insights into the ANSTO WHS System and hazards, while ANSTO had access to external agency best practice and gained a better understanding of the role of the regulator. This resulted in improved work health and safety outcomes for the business and key projects. COMCARE continued to provide support to ANSTO's Work Health and Safety (WH&S) team, information and guidance regarding WH&S legislative requirements.

ANSTO was recognised by COMCARE for its innovative Change Management Tool Kit and this was shared with other organisations at COMCARE's regular "Sharing information in our jurisdiction", sessions which was well received.

The Work Health and Safety Group in conjunction with training and development continued to enable and up-skill line management by providing new training programs which included WHS for people managers and rehabilitation requirements. ANSTO recognises that WHS must be owned and managed in the business units where the hazard exists.

The occupational hygiene monitoring program was expanded with the exposure risk reviews being completed for many of ANSTO's facilities. The hygiene monitoring program has now been implemented into routine operations. This program identifies, assesses and implements controls for potential exposures to hazardous agents in line with the legislative requirements. This function provides support across ANSTO operations and projects by characterising these hazards. The Health & Wellbeing Centre and Occupational Hygiene have been working closely to implement a process of Job Demands Analysis (JDA) to better match the task to the worker and assist in preventing injury. The hazards register is a communication tool that lists known hazards, this has been further expanded to include building information and to capture corporate knowledge and incidents. A review of suitable software was undertaken to manage the scheduling, reporting and analysis of hygiene testing results including health monitoring information. This software will be integral to achieving accreditation of the laboratory and providing a service to ANSTO and other agencies in the future.

The Globally Harmonised System of Classification and Labelling of Chemicals (GHS) came into effect in 2017 and compliance with the regulatory requirements was confirmed by audit during 2018. The new chemical database was implemented to allow improved; inventory management, legislative reporting, compliant labelling and Safety Data Sheets (SDS).

ANSTO continued to explore the integration of complementary functions and the sharing of key information during FY18. Radiation Protection Services (RPS) joined the Work Health and Safety (WHS) and Emergency Management (EM) groups in the newly-formed People Culture Safety & Security (PCSS) division. Radiation is considered a hazard under the WHS Act (2011) with identification, risk assessment and controls required by both regulators ie ARPANSA and COMCARE.

A key element of ANSTO's proactive approach to WHS is the review and implementation of the WHS Policy and WHS Strategy. ANSTOs Safety Strategy 2018–2022 was developed further and endorsed by the WHS

Executive Sub Committee during the first quarter 2018. The strategy identifies priority areas and disorders that are ANSTO specific. The identified actions to meet the requirements of the strategy will be monitored by this Committee.

ANSTO continues with the update, development, review and implementation of key WHS guidance and practices. ANSTO is reviewing the Work Health and Safety management system for certification to the international standard, ISO 45001. A preliminary assessment has been conducted against the requirements of ISO 45001 with no major deficiencies identified. A program for certification has been developed and is currently being implemented. As the new standard shares a common structure with existing management standards, a higher degree of integration can be achieved. The focus remains to have a work health and safety management system that exceeds the latest standards and provides practical guidance to workers across all ANSTO campuses.

A comprehensive compliance program was developed and implemented to provide assurance that the Work Health and Safety Management system is effective. This audit program will continue on a risk based approach and cover key aspects of work health and safety. Progress has been made with the rationalization of the Work Health and Safety management system reducing the number of documents. Guidance material has now been included which relates to the NSW WHS jurisdiction. The WH&S group continued to provide safety advice and oversight of the construction and demolition projects across the Lucas Heights campus including the ANSTO Nuclear Medicine (ANM) facility, extension to the Intermediate Low-Level Solid Waste (ILSW) repository, extension to the Low Level Solid Waste (LLSW) repository and manipulator maintenance facility. All projects have been completed without serious injury. Additional WHS support has been provided in the Symo Project, Spent Fuel return and planned OPAL major shut down.

WH&S communication to all workers continued by providing a risk based WH&S focus program combined with safety alerts. Targeted safety topics included: occupational hygiene, safety in design, radiation safety, slips trips and falls, safety culture, hazardous manual tasks and WHS management Systems. Key WH&S alerts during 2017–2018 included: suitability and safety of equipment, traffic safety, contractor management, radiation safety, lifting and height safety and safe travel practices.

The ANSTO Occupational Health & Wellbeing Centre provided advice, services and a comprehensive health program to workers throughout 2018. The Centre is staffed by an Occupational Health Nurse, Rehabilitation Case Manager and, a contracted Physiotherapist and Occupational Physician. The health programs included; men and women's health, influenza vaccinations, travel and work immunization, workplace conditioning programs, ergonomic and work station assessments. The Occupational Health & Wellbeing Centre is a central point of support for all aspects of worker health.

The early intervention strategies implemented by the ANSTO Health Centre continue to support the timely return of workers to pre-injury duties and keep workers engaged with ANSTO during the treatment and rehabilitation processes. The program focuses on providing early assessment and treatment to reduce the consequences of injuries. This has proved successful in meeting ANSTO's goal of returning workers to normal duties, as productive team members as soon as possible. The ANSTO rehabilitation program continues to be compliant with the requirements of the Safety, Rehabilitation and Compensation (SRC) Act demonstrating effective procedures and programs are in place. The extension of the physiotherapy service has seen workers availing themselves of the service, allowing them to be productive members of ANSTO's workforce.

ANSTO Initiatives and the overall performance across all Commonwealth agencies continue to have an overall reduction in ANSTO's Workers Compensation Insurance premiums.

The actual premium for FY 17/18 premium was $736,528, FY 16/17 was $826,655 (increase due to Australian Synchrotron and overall scheme performance) compared to FY15/16 $723,360. COMCARE has advised ANSTO of the FY 18/19 premium, $555,276. This premium is dependent on the aggregate premium pool (the total premium to be charged across all Commonwealth agencies) and ANSTO's claim performance.

ANSTO suspended production of Technetium-99m (Tc-99m) Generators, after a mechanical failure in the plant. ANSTO worked closely with its clients and the wider Australian health community during the period to minimise disruptions. ANSTO will be undertaking a comprehensive mechanical review of the Mo-99 processing and distribution facility.

Accidents and incidents

The ANSTO Incident Management System consolidates all incidents and any associated actions into one location. The system has allowed for improved trending and data analysis for safety related incidents which has supported evidence based decision making. The ANSTO investigation process has ensured that appropriate response and controls have been adopted in each case.

The Work Health and Safety Monthly Dashboard gives a graphical representation on key WH&S performance indicators which include: total number of recorded incidents, type of incidents, percentage of Opportunities for Improvement, LSI/LTI, effective dose rates and the class of injuries.

Emergency Management

The ANSTO Emergency Management function was aligned with the Work Health and Safety Group during 2018 following the integration of Security & Safeguards into PCSS. This amalgamation has seen the Emergency Response Team, Work Health and Safety and Radiation Protection Services working closely together to meet ANSTO's requirements for emergency preparedness and response. Best practice in nuclear and radiological emergency preparedness is documented in IAEA GSR Part 7 (Preparedness and Response for a Nuclear or Radiological Emergency) and Radiation Protection Services have initiated a project to meet the requirements of this guide. The implementation of this plan will be monitored by ARPANSA to completion as part of routine regulatory oversight.

Several incidents occurred during 2018 which tested ANSTO's emergency response capability and inter agency operability. This included: The Moorebank/Menai bush fire, total loss of power to Lucas Heights campus and hazardous materials spill (including chemicals and radiological materials). A major joint exercise was conducted between NSW Ambulance, Toll and the ANSTO Emergency Response Team during 2018. The scenario tested NSW Ambulance's ability to recover a patient from bushland within ANSTO's buffer zone.

Recorded incidents

Workers are encouraged to report all incidents within ANSTO's 'No Blame – Full disclosure' principle. ANSTO continues to promote the reporting of all incident types.

In 2017-2018 a total of 1296 Safety, Environmental and Operational Incidents were reported; compared to 933 (2016–2017), 938 (2015–2016), 1128 (2014–2015), 952 (2013–2014), 795 (2012–2013) and 761 (2011–2012).

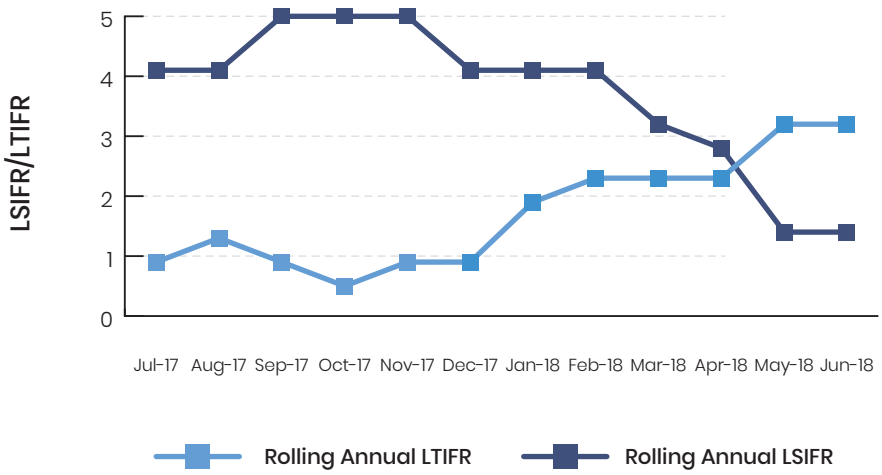
The ANSTO Incident Management System continues to be improved allowing for more detailed analysis and trending of incidents. This includes an update to the classification system that identifies the types of incidents; this has also resulted to the clarification of the definition of an 'Opportunity for Improvement'. The majority of incidents reported continue to be Opportunities for Improvements (OFIs), a key measure of ANSTO's reporting culture. In 2017-2018, 71% of safety incidents were OFIs compared to 80 per cent (2016–2017) and 82.5 per cent (2015–2016).

ANSTO staff continue to report all types of incidents with 43% of incidents being near hits/misses or hazards/observations. The majority of reported incidents were low significant or minor (76%), 22% of incidents were rated as moderate and 1.8% rated as major or severe. The high reporting rate of low significant and minor incidents supports an ongoing positive reporting culture.

Lost shift and lost time injuries

Lost Shift Injury Frequency Rate (LSIFR) and Lost Time Injury Frequency Rate (LTIFR) are a safety performance measure at ANSTO that are used to separate serious injuries (LTI) from less serious injuries (LSI). In 2017-2018 the LSIFR was 1.4, a reduction from 4.2 (2016–2017) and compared to 1.0 (2015–2016) and 3.4 (2014–2015). The LTIFR has increased to 3.2, compared to 1.0 (2016-2017), 0.5 (2015–2016) and 2.9 (2014–2015). In FY18 three Lost Shift Injuries and seven Lost Time Injuries were recorded. Lost Shift injuries are injuries where workers required less than five days off work; Lost Time injuries are injuries that required five or more days off work. In some cases an injury that has been classified as a LSI accrues additional time off at a later date making it a LTI. This occurred in the case of two of the LTIs recorded. The early intervention program managed by the ANSTO Health Centre aims to minimise the time taken off for work related injuries and allows workers to return to work as early as possible. But in some cases, due to the injury this is not possible and extended time off work is taken.

Rolling Annual Lost Shift/Time Injury Frequency Rate



Australian Radiation Protection and Nuclear Safety Regulations 1999, Statutory Rules 1999 No. 37 as amended

Everyone in the world is exposed to ionising radiation from natural sources. People may also be exposed to radiation from non-natural sources, including nuclear medical procedures for diagnosis and treatment of certain illnesses. Personal radiation exposure ('dose') is measured in sieverts (Sv), however, typical annual exposures are so small that they are usually expressed in units of one thousandth of a sievert, known as a millisievert (mSv).

According to the most recent data from ARPANSA, the average dose an Australian receives from natural background radiation (excluding medical sources) is 1.5 mSv per year. Federal and State regulations require that a member of the public should receive no more than 1 mSv per year from radiation sources in addition to background radiation and medical procedures.

The regulatory limit for radiation workers is 20 mSv per year, averaged over five years, with no more than 50 mSv in any one year.

This is derived from recommendations made by the International Commission on Radiation Protection (ICRP) that have specified three basic principles for radiation protection, which are applied at ANSTO:

1. All exposures to ionising radiation shall have a positive net benefit (Justification)
2. All exposures shall be maintained as low as reasonably achievable (ALARA), accounting for social and economic factors (Optimisation)
3. All exposures shall be less than the relevant statutory limit. (Dose Limitation)

The application of these principles requires us to ensure that our occupational exposures are not just less than the statutory dose limit(s), but are as far below them as we can reasonably achieve.

The radiation exposure of ANSTO's workers who are routinely engaged in working with ionising radiation is monitored by our specialist dosimetry service, with records of all exposures maintained.

Monitoring results for 2017 show that the radiation doses received by ANSTO workers remained significantly below regulatory limits. In 2017 the average effective dose across all ANSTO workers was 0.5 mSv.

Table 1: Effective dose

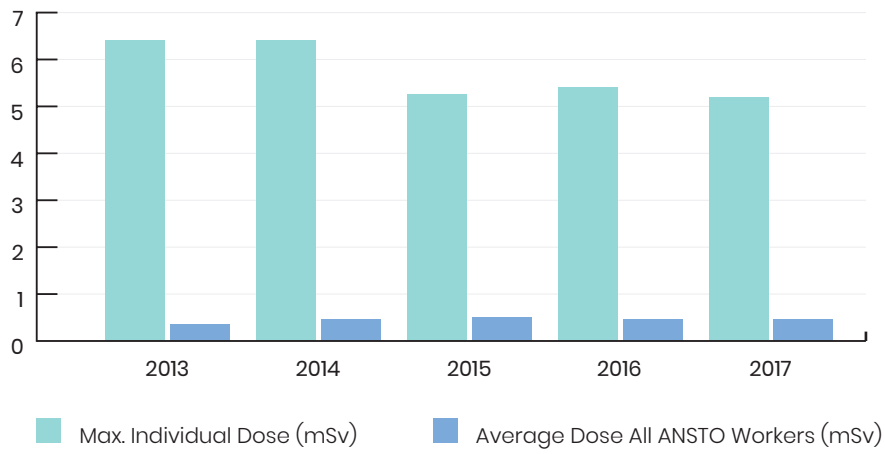
ALL STAFF	Calendar Year				
Effective Dose	**2013**	**2014**	**2015**	**2016**	**2017**
Max. Individual Dose (mSv)	6.44	6.44	5.3	5.4	5.2
Average Dose All ANSTO Workers (mSv)	0.4	0.5	0.5	0.5	0.5
Collective Effective Dose (mSv)	416.4	447	463	529	546

Table 2 shows the distribution of individual effective doses over the same period. The graph in Figure 1 compares maximum effective dose to a single worker and the average effective dose across all relevant ANSTO workers.

Table 2: Distribution of individual effective dose

ALL STAFF	Calendar Year				
Effective Dose Range	**2013**	**2014**	**2015**	**2016**	**2017**
0 to 0.99mSv	893	894	890	902	918
1 to 1.99mSv	40	47	59	78	71
2 to 4.99mSv	20	21	23	19	27
5 to 9.99mSv	2	4	1	3	2
>10mSv	0	0	0	0	0

Figure 1: Comparison of Maximum and Average Effective Doses.



Effective Doses to ANSTO workers for the last year have all been well below all statutory dose limits.

Extremity exposure

The exposure to the hands of ANSTO workers is routinely measured for those operations that require workers to have their hands closer to sources of radiation, such as during radiopharmaceutical product testing. Generally, the radiation exposures to the hands are very low compared to the applicable dose limit of 500mSv. With one exception, the maximum extremity dose to ANSTO operators in 2017 was 116mSv (i.e. slightly more than 20% of the dose limit) with more than 99 per cent of workers extremity exposures being below 50mSv. The exception was caused by an accidental exposure due to a spill of Mo-99 radioactive liquid onto the gloves of a worker. Although the gloves were quickly removed, the resultant dose to the skin of the hands is estimated to be in excess of 20Sv. This radiation exposure has led to tissue reactions and a lost time injury due to the localised radiation exposure.

APPENDIX 5

Freedom of Information Act 1982, subsection 8

The Freedom of Information Act 1982 (FOI Act) provides the public with a general right of access to documents held by Australian Government agencies, by requiring agencies, such as ANSTO, to publish the information and provide a right of access to the documents.

This general right is limited by exceptions to protect essential public interests, including the privacy of individuals and the business affairs of those who give information to the agency.

In the reporting year to 30 June 2018, ANSTO received seven requests for information under section 15 of the FOI Act.

ANSTO is required to publish information to the public as part of the Information Publication Scheme (IPS).

The IPS is designed to promote open and transparent communication of government information.

Set out below is the information required to be published by ANSTO under Part II of the FOI Act.

1. ANSTO's Agency Plan

ANSTO's Information Publication Scheme plan is currently available on the ANSTO website at:
https://www.ansto.gov.au/access-to-information

2. Details of the structure of the Agency's organisation

An organisational chart detailing the structure of ANSTO can be found on ANSTO's website at:
https://www.ansto.gov.au/governance

3. Details of ANSTO's functions, including its decision making powers and other powers affecting members of the public

Information in relation to ANSTO's powers and functions can be found at page 101 of this report. Information about ANSTO's purpose and Values, Board Composition, Corporate Plan and Service Charters can be found on ANSTO's website at:
https://www.ansto.gov.au/governance

4. Details of officer appointments at ANSTO

Details of officer appointments can be found at page 46 of this report and a link to this information can also be found on ANSTO's website at:
https://www.ansto.gov.au/governance

5. ANSTO's Annual Report

A link to this annual report and annual reports of previous years can be found on ANSTO's website at:
https://www.ansto.gov.au/corporate-publications

6. Details of arrangements for members of the public to comment on specific policy proposals for which ANSTO is responsible

ANSTO regularly communicates with its stakeholders, which includes the local community and councils, relevant federal ministers and other government-related personnel, both state and federal, to ensure that they are kept up to date about what is happening at ANSTO. The community is kept informed of ANSTO's operations via the website, which publishes news updates such as media releases. A link to this information can be found on ANSTO's website at:
https://www.ansto.gov.au/governance

7. Information which ANSTO routinely gives access to in response to requests for access under the FOI Act (excluding documents exempt from production under the FOI Act)

During 2017-2018 there was no requested documentation falling within this category.

8. ANSTO's FOI Disclosure Log

The FOI Disclosure Log lists information which has been released in response to a FOI access request. The disclosure log requirement does not apply to:

- personal information about any person if publication of that information would be 'unreasonable';
- information about the business, commercial, financial or professional affairs of any person if publication of that information would be 'unreasonable';
- other information covered by a determination made by the Australian Information Commissioner if publication of that information would be 'unreasonable';
- any information if it is not reasonably practicable to publish the information because of the extent of modification that would need to be made to delete the information listed in the above dot points.

A link to ANSTO's disclosure log can be found on ANSTO's website at:
https://www.ansto.gov.au/access-to-information

9. Information held by ANSTO which is provided to Parliament

A link to the information which ANSTO provides to parliament can be found on ANSTO's website at:
https://www.ansto.gov.au/access-to-information

10. Contact details of ANSTO officers who can be contacted about access to information or documents under the FOI Act

Direct enquiries in relation to FOI process to the:

Mail:
FOI Coordinator
ANSTO
Locked Bag 2001
Kirrawee DC NSW 2232

Email:
foi@ansto.gov.au

Telephone:
+61 2 9717 3111

(request to be directed to the FOI Coordinator)

These contact details can be found on ANSTO's website.

11. Operational information required under section 8 of the FOI Act, that is, information held by ANSTO to assist in the performance or exercise of ANSTO's functions or powers in making decisions or recommendations affecting members of the public.

ANSTO has a range of publications, reports and information available for the public, including our annual reports, information on safety, research reports, educational books and leaflets, and DVDs.

ANSTO also provides access to a searchable database of all of ANSTO's science publications, as well as an online archive for older publications.

APPENDIX 6

Index of compliance with reporting guidelines

Index of compliance with reporting guidelines under various Acts, Regulations and Orders applicable to ANSTO as a Commonwealth authority.

ANSTO Act 1987

Functions and Powers **101–105**

Public Governance, Performance and Accountability Act 2013 (PGPA Act)

Annual Report (section 46) **i-135**

The accountable authority of the entity must prepare and give an annual report to the entity's responsible Minister, for presentation to the Parliament, on the entity's activities during the period, by 15 October; or the end of any further period granted under subsection 34C(5) of the *Acts Interpretation Act 1901*. The annual report must comply with any requirements prescribed by the PGPA Rule. (Section 46)

Annual performance statements (Section 39 (1) and (2)) **11–13**

Includes a copy of the annual performance statements in the entity's annual report that is tabled in the Parliament.

The annual performance statements must:

a. provide information about the entity's performance in achieving its purposes; and

b. comply with any requirements prescribed by the rules Section 39 (1) and (2)

Financial statements (Sections 42 and 43) **60-97**

Includes a copy of the annual financial statements and the Auditor General's report must be included in the Commonwealth entity's annual report that is tabled in the Parliament.

The annual financial statements and the audit report must comply, and must state whether, in the accountable authority's and the Auditor-General's opinion respectively whether, they:

a. comply with the accounting standards and any other requirements prescribed by the rules; and

b. present fairly the entity's financial position, financial performance and cash flows.

If the financial statements do not comply, the accountable authority of the entity must add the information and explanations required to present fairly those matters.

Similarly for the audit report, the Auditor-General must state the reasons, quantify the financial effect and state the amount if possible. Section 42 and 43

Public Governance, Performance and Accountability Amendment (Corporate Commonwealth Entity Annual Reporting) Rule 2016

Section 17BB **i**

The annual report must be approved and signed by the accountable authority, and include details of how and when approval was given. It must state that the accountable authority is responsible for preparing and delivering the annual report in accordance with the section 46 of the PGPA Act.

Section 17BC **i,3**

The annual report complies with the guidelines for presenting documents to the Parliament.

Section 17BD **i-135**

The annual report uses plain English and clear design.

Section 17BE (a)-(b) **3, 50, 101–105**

The annual report must specify the entity's enabling legislation, including a summary of the entity's objects and functions and the purposes of the entity as included in the entity's corporate plan.

Section 17BE (c) **4**

The responsible Minister is specified.

Section 17BE (d)-(f) **50–51**

The annual report provides details of:

- any direction issued by any Minister under an Act or instrument during the period
- any government policy orders that applied to the entity under section 22 of the PGPA Act
- particulars of non-compliance with any of the above directions or orders.

Section 17BE (g) **11–13**

The annual report must include the annual performance statements for the entity for the period in accordance with paragraph 39(1)(b) of the Act and section 16F of this rule.

Section 17BE (h)-(i) **50–51**

The annual report must include a statement of any significant issue reported to the responsible Minister under paragraph 19(1)(e) of the Act that relates to non-compliance with the finance law in relation to the entity.

If such a statement is included, the annual report must include an outline of the action that has been taken to remedy non-compliance.

Index of compliance with reporting guidelines

Section 17BE (j) **46–47, 52–53**

Information about directors is provided, including names, qualifications, experience, attendance at Board meetings and whether the director is an executive or non-executive member.

Section 17BE (k)-(l) **45, 50, 95, 135**

The annual report provides an outline of:

- the organisational structure (including subsidiaries);
- the location of major activities and facilities and provides a statement on governance practices.

Section 17BE (m) **53–55**

The annual report provides an outline of:

- board committees and their responsibilities;
- education and performance review processes for directors;
- ethics and risk management policies.

Section 17BE (n)-(o) **52**

The annual report discloses the decision-making process undertaken by the accountable authority for making a decision if:

- the decision is to approve the entity paying for a good or service from another Commonwealth entity or a company, or providing a grant to another Commonwealth entity or a company;
- the entity, and the other Commonwealth entity or the company, are related entities;
- the value of the transaction, or if there is more than one transaction, the aggregate value of those transactions, is more than $10 000 (inclusive of GST);

If the annual report includes any of the above information:

- if there is only one transaction—the value of the transaction must be included;
- if there is more than one transaction—the number of transactions and the aggregate of value of the transactions must be included.

Section 17BE (p) **50–51, 58**

The annual report details any key activities and changes that affected the operations or structure, which may include:

- significant events, such as forming or participating in the formation of a company, partnership etc.;
- operational and financial results;
- key changes to its status of affairs or principal activities;
- amendments to enabling legislation or any other legislation directly relevant to its operation.

Section 17BE (q)-(r) **58**

The annual report includes particulars of:

- judicial reviews and decisions of tribunals that have had or may have a significant effect on its operations;
- reports about the authority made by the Auditor-General (other than one made under section 43 of the PGPA Act), a Parliamentary committee, the Commonwealth Ombudsman, or the Office of the Australian Information Commissioner.

Section 17BE (s) **96–97**

The annual report includes an explanation if information is missing from a subsidiary that is required to be included in the annual report and states the effect of not having the information in the annual report.

Section 17BE (t) **59**

The annual report includes details of any indemnity that applied during the period given to an officer against a liability, including premiums paid, or agreed to be paid, for insurance against the officer's liability for legal costs.

Section 17BE (u) **122–127**

The annual report provides an index of annual report requirements identifying where relevant information can be found in the annual report.

Index of compliance with reporting guidelines

Minister's Statement of Expectations June 2015

Policy context

Point 1
Boosting Commercial Returns for Research agenda 21

Point 2
Science and Research Priorities (26 May 2015) 27–29

Point 3
STEM 30, 98–99

Point 4
Research Infrastructure Review 27–29

Point 5
Broad spectrum of nuclear related research and development 10–35

Partnerships and collaborations

Point 6
Specialised nuclear advice 32–35

Point 7
Engage with the Chief Scientist of Australia 34

Point 8
Collaborates 36–41

Point 9
Partnerships with business 21, 99

Science assets and staff

Point 10
Maximise use of its national scientific facilities 2, 3, 13, 22–23, 27–29

Point 11
Careers in science 30, 98, 99

Point 12
Research publications openly available 15, 17, 24

Point 13
Encourage its researchers to be entrepreneurial 98–99

Point 14
Support new companies and commercialise ANSTO discoveries 21

Point 15
Maximise its capacity to provide specialised services and products 22–33

Communication with my Office and the Department

Point 16
Working closely with the department 34

Point 17
Keep Minister and department informed 34

Point 18
Corporate plan 3

Acronyms

ACAS	Australian Collaboration for Accelerator Science
ACNS	Australian Centre for Neutron Scattering
ACRF	Australian Cancer Research Foundation
AINSE	Australian Institute of Nuclear Science and Engineering
AM	Order of Australia Award
AMS	Accelerator mass spectroscopy
ANAO	Australian National Audit Office
ANSTO	Australian Nuclear Science and Technology Organisation
ANM ANSTO	Nuclear Medicine
ANU	Australian National University AO Officer of the Order of Australia
AOFSRR	Asia Oceania Forum for Synchrotron Radiation Research
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ATSE	Australian Academy of Technological Sciences and Engineering
BOSTES	Board of Studies, Teaching and Educational Standards
CAS	Centre for Accelerator Science
CEA	French Commissariat à l'énergie atomique et aux énergies alternatives or French Atomic Energy Agency
CEO	Chief Executive Officer
CERN	European Organization for Nuclear Research
CKDu	Chronic kidney disease of unknown aetiology
CRC-P	Cooperative Research Centre for Polymers
CRP	Cooperative Research Project
DST	Defence Science and Technology
EIF	Education Investment Fund
EPA	Environment Protection Agency
FNCA	Forum for Nuclear Cooperation in Asia
FOI Act	Freedom of Information Act 1982
GIF	Generation IV International Forum
HIFAR	High Flux Australian Reactor
HZB	Helmholtz-Zentrum Berlin
I-124	Iodine-124
IAEA	International Atomic Energy Agency
ILW	Intermediate level waste
IRM	Infrared Microspectroscopy beamline

ISSP	Institute of Solid State Physics (University of Tokyo)
J-PARC	Japan Proton Accelerator Research Complex
JAEA	Japan Atomic Energy Agency
LEU	Low enriched uranium
Lu-177	Lutetium-177
Mo-99	Molybdenum-99
MOU	Memorandum of understanding
MSRs	Molten salt reactors
MS	Mass spectrometry
MX	Macromolecular crystallography beamline
MX2	Micro Crystallography beamline
NATO	North Atlantic Treaty Organisation
NCRIS	National Collaborative Research Infrastructure Strategy
NDF	National Deuteration Facility
NIF	National Imaging Facility
NIMS	National Institute of Materials Science
NORM	Managing naturally occurring radioactivity
NPT	Non-proliferation treaty
NRWMF	National Radioactive Waste Management Facility
NTD	Neutron transmutation doping
OPAL	Open Pool Australian Light-water
PET	Positron emission tomography
PGPA	Act Public Governance, Performance and Accountability Act 2013
RCA	Regional Collaborative Agreement
SAXS	Small angle X-ray scattering
SAXS/WAXS	Small and wide angle X-ray scattering
SINAP	Shanghai Institute of Applied Physics
SPECT	Single-photon emission computed tomography
STEM	Science, technology, engineering and mathematics
TC	Technical cooperation
Tc-99m	Technetium-99m
TGA	Therapeutic Goods Administration
UNSW	University of New South Wales
UoW	University of Wollongong

Index

3D structure of molecular scaffold 15
2016 National Research Infrastructure Roadmap 12
2017 ANSTO Nuclear Science and Technology Awards 42–3
2017–18 highlights 10

A

accidents and incidents 116
ACNS Sample Environment Team 42
Annual Performance Statement 11–13
ANSTO
  2017–18 highlights 10
  about 2–3
  benefits and performance 99
  business ethics 56
  Corporate Plan 2017-18 3
  employee headcount 100
  launch 5
  functions 11, 101–5
  internal audit 57
  legal and regulatory compliance 57
  new look 5
  nuclear liability 59
  powers 101–5
  resilience 57
  strategic objectives 3
  vision 3
ANSTO Board
  Commercial Committee 55
  committees 53
  composition 52
  disclosure of interests 52
  external audit 55
  fraud control 56
  functions 51
  governance responsibilities 51
  indemnities and insurance premiums 59
  internal control 56
  meetings 52–3
  members 46–7
  remuneration 51, 54
  Remuneration and Nominations Committee 54
  Risk and Audit Committee (RAC) 53–4
  risk management 55
ANSTO Building Code (ABC) 113
ANSTO bushland perimeter 111
ANSTO Executive Leadership Team 48–9
ANSTO Graduate Institute 21
ANSTO Health 6, 22
ANSTO Minerals 23
ANSTO Nuclear Medicine Pty Ltd (ANM) 22
ANSTO Radiation Services 23
Antarctic research 24
ANZUP Cancer Trials Group Limited (ANZUP) 13
Arambatzis, Peter 48
Areva see Orano
Asia Oceania Forum for Synchrotron Radiation Research (AOFSRR) 36
atmospheric pollution 24
audit requirements 55, 57
Austin Health 36
Australian Cancer Research Foundation (ACRF) Detector 27
Australian Centre for Accelerator Science (CAS) 2
Australian Centre for Neutron Scattering (ACNS) 2, 12, 28, 40
Australian Collaboration for Accelerator Science (ACAS) 36
Australian Institute of Nuclear Science and Engineering (AINSE) 2, 21, 37, 99
Australian Nuclear Science and Technology Organisation Act 1987 11, 50, 58, 101–5
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) 9, 22, 109, 110, 114, 116, 118
Australian Radioactive Waste Management Framework 34
Australian Synchrotron 2, 5, 6, 8, 10, 12, 13, 15, 16, 27–8, 36, 37, 39
awards and achievements 42–3

B

Beckett, Michael 48
Bevitt, Dr Joseph 42
Big ideas Forum 30
BILBY small-angle neutron scattering instrument 20, 38
BioRef neutron reflectometer see SPATZ
BioSAXS (Small Angle X-ray Scattering) beamline 28
Blissett, Robert 48
Board see ANSTO Board
Border Technologies 21
BR–GHT project 6, 28, 37
Buckman, Emeritus Professor Stephen 46

C

Camperdown 3
cancer research 13, 15, 16, 18, 27, 44
capital investment 13
carbon ion therapy research 15

career paths for research and technical staff 98
Cash, Senator Michaelia 4
Centre for Accelerator Science (CAS) 2, 5, 10, 12, 29
Centre for Medical Radiation Physics 15
Chair's report 6–7
chemical labelling 114
chemical management system 112
Chief Executive Officer's report 8–9
chronic kidney disease (CKDu) 6, 33
chronic lymphocytic leukaemia (CLL) treatment 16
Clayton 3
climate change 25, 32
compliance with reporting guidelines 122–7
contact details 137
corporate governance 50–9
Corporate Plan 2017-18 3
Cronulla wastewater treatment plant 110

D

Defence Science and Technology Group (DST) 37
depression treatments 17
Destiny Elephant regional nuclear forensics workshop 33
'Developing Your Commercial Acumen' program 99
disability strategy 100
Discovery Centre 99
diversity 98
Dobson, Penelope 46
Druce, Michael 42

E

ecologically sustainable development (ESD) 113
education programs 30–1
Edwards, Professor Lyndon 43
emergency management 116
environmental impacts, mitigating 112
environmental monitoring program 108–9
environmental protection 106–13
Environmental Protection and Biodiversity Conservation Act 1999 106–13
equality of employment opportunity 98–9
Eureka Prize 31
European Journal of Medicinal Chemistry 17
European Organization for Nuclear Research (CERN) 37

F

financial statements 60–97
food authenticity 18
Forum for Nuclear Cooperation in Asia (FNCA) 32
France Intergovernmental Agreement 33, 34
freedom of information 120–1
Fukushima accident 38
funding 6, 8, 13

G

Garrett, Richard 36
gender equity 98
Generation IV Framework Agreement 34
Generation IV International Forum (GIF) 33
Girls in the Lab Workshop 30
Global Initiative to Combat Nuclear Terrorism (GICNT) 33
Graduate Institute 6, 21, 37, 99
groundwater systems 25

H

hazardous materials spill 9, 116, 119
health and wellbeing programs 99
health improvements 15–17
Helmholtz-Zentrum Berlin (HZB) 38
Heywood, Professor Brigid 47
Holley, Carol 47

I

Iain Finnie Memorial Award 43
industry support 5, 18–23
industry training and engagement 99
Innovation Precinct 5, 6, 7, 8, 21, 34, 58, 99, 101
International Atomic Energy Agency (IAEA) 3, 6, 28, 32
international engagement 6, 32–3
ion accelerators 12
isotope analysis 18
ITER Organisation 38

J

Japan Atomic Energy Agency (JAEA) 38
Japan Proton Accelerator Research Complex (J-PARC) 39
Jenkinson, Shaun 48
Jilin University 39
Journal of Geophysical Research: Atmospheres 24
judicial decisions and reviews 58

K

Kabakov, Peter 43

L

Lancet Oncology 16
Laundy, Craig 4
Lengkeek, Dr Nigel 44
leukaemia drug Venetoclax 16

Little Forest Legacy Site 109
Lucas Heights 3, 30–1, 110–11
    radiation levels 110–11
LuPSMA therapy 16
Lutetium-177 6, 10, 13, 16, 22
Lyras, Con 49

M

McDowell, James 6–7, 46
Macquarie University 18, 39
Male Champion of Change 98
MCT (Micro-computed Tomography) beamline 28
MEX (Medium Energy XAS) beamline 28
Milingimbi Island groundwater 25
ministerial oversight 48–9
Ministers, Responsible 4
Mo-99 Production Facility 9, 22
Monash University 15, 39
    Biomedical Research Institute 15
Moorebank/Menai bushfire 7, 111, 116
MX2 (Medical Imaging) beamline 16, 27

N

Naidoo-Ameglio, Pamela 8, 49
nandin Deep Technology Incubator 6, 8, 21
nandin innovation network 21
National Deuteration Facility (NDF) 2, 12, 29, 39
National Innovation and Science Agenda (NISA) 13
National Institute for Radiological Sciences (NIRS) 15, 40
National Measurement Institute (NMI) 20
National Particle Therapy Symposium 8
National Particle Treatment and Research Centre 15
National Pollution Inventory 112
National Radioactive Waste Management Facility (NRWMF) 27, 30, 34
naturally occurring radioactivity (NORM) 23
Nature Communications 15
neutron activation analysis 18
neutron beam instruments 12
neutron guide instruments 5, 12
neutron scattering 20, 28, 99
neutron transmutation doping (NTD) silicon 23
Next Gen STEM program 30–1, 98
nuclear liability 59
nuclear medicine production 2, 5, 7, 13

O

objectives 3
occupational hygiene monitoring program 114
ON Prime program 21
OncoSil™ 18
OncoSil Medical 18, 21
online ‘swap shop’ 112
OPAL reactor 2, 5, 12, 18, 27
Open Pool Australian Light-water reactor see OPAL reactor
Orano 33, 34
Organisational chart 45
outreach 30–1

P

Pacific 2017 Maritime Conference and Trade Show 43
pancreatic cancer clinical trial 18
particle sizing techniques 20
particle therapy 8, 15, 37, 40
partnerships and collaborations 36–41
Paterson, Dr Adrian 8–9, 34, 46, 48
Peele, Andrew 36
PET imaging 15
Peter MacCallum Cancer Centre 16
PETTECH Solutions Pty Ltd 22–3
Potter Point ocean outfall 110
prostate cancer clinical trials 16
Prostate Cancer Foundation of Australia (PCFA) 13

R

radiation exposure 110–11, 118–19
Radiation protection Services (RPS) 114
radioactive waste see waste management
radon measurements 24
Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology 2017 34
research facilities 3
research infrastructure 2, 12, 27–9
Research Infrastructure Investment Plan 12
research ombudsman office 99
Richter, Dr Simone 49
RIKEN SPring-8 Centre 40
Rottnest Island groundwater 25

S

Science in Australia Gender Equity (SAGE) program 8, 98
Scott, Professor Andrew 47
seafood provenance research workshop 18
selective serotonin reuptake inhibitors (SSRIs) 17
Senior, Jayne 8, 49
Seselja, Senator Zed 4

Shanghai Institute for Applied Physics (SINAP) 40
Sheil, Professor Margaret 47
Shimadzu Award for Radiopharmaceutical Scientist Member of the Australian and New Zealand Society of Nuclear Medicine (ANZSNM) 44
silicon 5
Sinodinos, Senator Arthur 4
small angle neutron scattering (SANS) 20
Smyth, Erica 7, 47
SPATZ 38
spent fuel management 27, 33, 34, 112
sponsorship 30
Sri Lanka CKDu 6, 33
STEM see Next Gen STEM program
STEM careers 99
support to Government 34–5
Sutherland Shire Relay for Life event 31
SyMo 22
Synroc 21

T

Taiwanese ministry of Science and Technology 40
Teacher professional Development 30
TheraP study 13

U

University of NSW (UNSW) 18, 20, 41
University of Sydney 41
University of Texas 17
University of Tokyo 41
University of Tsukuba 41
University of Wollongong (UOW) 15, 41
user access portal 21

V

Veliscek-Carolan, Dr Jessica 43
Venetoclax 16
vision 3
visitors 30

W

Walter and Eliza Hall Institute (WEHI) 15, 16
waste management 8, 27, 30, 34, 109
work health and safety 9, 114–19
    accidents and incidents 116
    emergency management 116
    lost shift and lost time injuries 117
    radiation exposure 118–19
    recorded incidents 116

X

X-ray fluorescence 18

Y

Young Innovator Scholarship 43

Cover images

Clockwise from top left:

The pool of ANSTO's OPAL multi-purpose reactor. OPAL is a the hardest-working and most reliable multi-purpose research reactor in the world. This reliability is critical in supporting the production of lifesaving nuclear medicines as well as the steady supply of neutrons for research.

ANSTO's Kelly Hillard in the minerals leaching laboratory, undertaking copper leach testing for an industrial client.

ANSTO's Australian Synchrotron building. ANSTO's BR—GHT project secured $94.1 million in new funding to significantly expand the facility's scientific capacity and capabilities by increasing the number of beamlines.

On average, one in two Australians will benefit from the nuclear medicines that originate at ANSTO.

Principal Research Scientist, Dr Andrew Smith in the Huon Valley Tasmania. ANSTO's environmental research provides policymakers with information to make informed decisions about the ecosystems we depend upon, and ultimately improves our world.

Contact Details

ANSTO - Sydney

New Illawarra Rd
Lucas Heights NSW 2234

Brown St
Camperdown NSW 2050

ANSTO - Melbourne

800 Blackburn Rd
Clayton VIC 3168

T +61 2 9717 3111

E enquiries@ansto.gov.au

W www.ansto.gov.au

Vienna Counsellor (Nuclear)

Australian Embassy
Mattiellistrasse 2-4
A-1040 Vienna, Austria
T + 43 1 5067 4119

Public information

ANSTO produces regular updates on its science and technology, has available a range of publications and conducts free tours of its Lucas Heights campus. For bookings or information call +61 2 9717 3111 or email enquiries@ansto.gov.au

Australian Government

ANSTO

Locations

Lucas Heights | Camperdown | Clayton

www.ansto.gov.au

Printed October 2018