Australian Government

ANSTO

Corporate Plan

2019-2020

Science. Ingenuity. Sustainability.

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Introduction

A message from the Chair of the Board

On behalf of the ANSTO Board, I am pleased to present ANSTO's 2019-2020 Corporate Plan, which covers the period 2019-2020 to 2022-2023, as required under section 35(1)(b) of the *Public Governance, Performance and Accountability Act 2013.*

As the recently appointed Chair of the ANSTO Board, I am looking forward to the future of ANSTO. For over 60 years, ANSTO has been the centre of nuclear expertise in Australia and the backbone of nuclear medicine, providing millions of doses of nuclear medicines to Australians battling cancer and other diseases. Almost every Australian is touched by the work of ANSTO, whether through the provision of life-saving nuclear medicine, our environmental research, partnerships with industry or our work to help to ensure the security of our region.

Building on the strengths of our past and the opportunities of the future, our Corporate Plan outlines our major projects and key strategies, planned to ensure that ANSTO is in the best position to continue to deliver outcomes for the benefit of all Australians. The successful delivery of these outcomes is only possible when we continue to work collaboratively with our partners, particularly our Minister, Government stakeholders, customers, nuclear medicine practitioners, industry and the research collaborators. Over the next four years, in the spirit of continuous improvement, we will not only be working to further strengthen these relationships, but also looking at the ways in which our organisation responds to opportunities and challenges, and ensuring that we have the right frameworks in place to deliver agility and responsiveness.

ANSTO is a critical part of Australia's innovation system and will partner with business, research and universities from across the globe to solve problems and apply new technologies with the aim of providing real-world benefits in the areas of human health, industry and the environment.

The expansion of the Australian Synchrotron's suite of beamlines, enabled through co-investment by the Australian and New Zealand research communities, will further leverage the $520 million investment made by the Australian Government. The program is on track and maturing with strong user communities, which will enable it to make an even greater contribution to Australian science and innovation.

ANSTO is also pleased to welcome the $12.5 million targeted grant from the NSW Government, which will stimulate innovation and invigorate the development of the nuclear medicine "anchor" of the precinct. This new Innovation Precinct, which operates within the policy framework launched by Government in 2017, has strong stakeholder support and has the potential to generate an estimated 5,000 jobs.

Safe, secure and sustainable is a core value at ANSTO. Rebuilding our reputation for safe and reliable operations will be a focus over the next four years and will be driven through the organisation at all levels. ANSTO is committed to strengthening a culture of continuous improvement, helping to ensure that highest standards of safety are achieved and that our reputation for excellence is maintained.

The Hon Dr Annabelle Bennett AC SC
Board Chair

Introduction

A message from the Chief Executive Officer

The ANSTO Corporate Plan is our strategic planning document for our internal and external stakeholders. It sets out our purpose and mandate over the coming four years. Over the last year, there have been many exciting developments at ANSTO, as well as some challenges. The Corporate Plan seeks to respond to this context and deliver on our core mandate, enhance our partnerships in and services to, science, technology and innovation in Australia, and provide predictable outcomes for our key customers.

The export-scale Mo-99 Manufacturing facility, a key part of ANSTO's nuclear medicine operations, is now providing reliable domestic supply of bulk Molybdenum-99 (the parent radioisotope to the world's most important nuclear medicine, technetium-99m). The Mo-99 Manufacturing facility, known as ANM represents a significant milestone towards ensuring the robustness of Australia's nuclear medicine supply chain. The potential of the new facility, which goes beyond the achievements of the now retired facility can expand Australia's global supply to a market characterised by uncertainty.

A focus of this Corporate Plan is the requisite planning for all aspects of our nuclear medicine operations. This involves consideration of the replacement of the aged nuclear medicine production facility, known as building 23, which produces Tc-99m generators from bulk Mo-99 from ANM, and a number of therapeutic isotopes for weekly patient treatment and world-leading clinical trials.

In the meantime we have expanded support to the current facility and its staff. Our contribution to ground breaking clinical trials in particular, driven by the clinical leadership of the Australian nuclear medicine community, is expanding and bringing life changing outcomes to Australian patients. This result is a direct outcome of our targeted investments in radioisotopes such as lutetium-177, made over the last 8 years, which are now maturing and delivering results for treatment of neuroendocrine and prostate cancer in trials.

The opportunities for the organisation to contribute to innovative next-generation nuclear medicine for theranostics and implantable medical devices, has developed rapidly. Existing and new partnerships between our researchers, instrument scientists and industry will continue as a key focus for the organisation.

Australia has always punched above its weight when it comes to its science outcomes. As important developments occur across the global nuclear technology and scientific landscape, Australia must remain committed to highly-networked international collaborations and major international science projects. In this regard, ANSTO will continue to provide critical engagement with ITER (fusion energy science and technology demonstration) and CERN (particle therapy, next generation accelerators, and support to Australian fundamental physics research) - helping ensure Australia's ongoing status as a highly innovative and engaged global big science player.

Our people, culture and safety are central to everything ANSTO does and are critical to our ability to continue to deliver benefits for all Australians. The safety of our products, radiation safety – including services provided across Australia, and workplace safety remains our top priority. We are committed to a safe workplace, a culture of continuous improvement, elimination of hazards with engineering controls, and product and process re-design so that the highest standards of safety are achieved.

Dr Adi Paterson
Chief Executive Officer

Key documents that have informed the development of this Corporate Plan include:

Australian Nuclear Science and Technology Organisation Act 1987 (ANSTO Act 1987)

Industry, Innovation and Science Portfolio Budget Statements 2019-20

Ministerial Statement of Expectations (dated 4 June 2015)

Vision

To be a global science, research and engineering partner with a reputation for tackling complex problems and delivering outcomes to create a more sustainable world.

Values

ANSTO's values underpin our vision, purpose, capabilities and strategic objectives and are critical to how we carry out our work. They also describe how our people will engage with one another and external stakeholders. Our values extend to the way we partner with universities, industry, communities and other stakeholders.

FIGURE 1

ANSTO's values underpin our work. These were developed by our staff in 2014. Safe. Secure. Sustainable. Is the foundation of all other values.

ANSTO's purpose

ANSTO's purpose is defined by the following functions set out in section 5 of 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 liaise with other countries on behalf of Australia in nuclear-related matters
- Make available to other persons, whether or not on a commercial basis, the knowledge, expertise, equipment, facilities, resources and property of the Organisation for the purposes of scientific research, innovation and training
- Publish scientific and technical reports, periodicals and papers, and provide public information and advice
- 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

ANSTO is a Corporate Commonwealth Entity within the Australian Government's Industry, Innovation and Science Portfolio with accountability to the Minister for Industry, Science and Technology.

ANSTO operates under the oversight of a Board which is appointed by the Governor-General. ANSTO's Chief Executive Officer, who is also a Board member, is appointed by the Board. The Secretary (or a delegate) of the Department of Industry, Innovation and Science attends ANSTO Board meetings as an observer.

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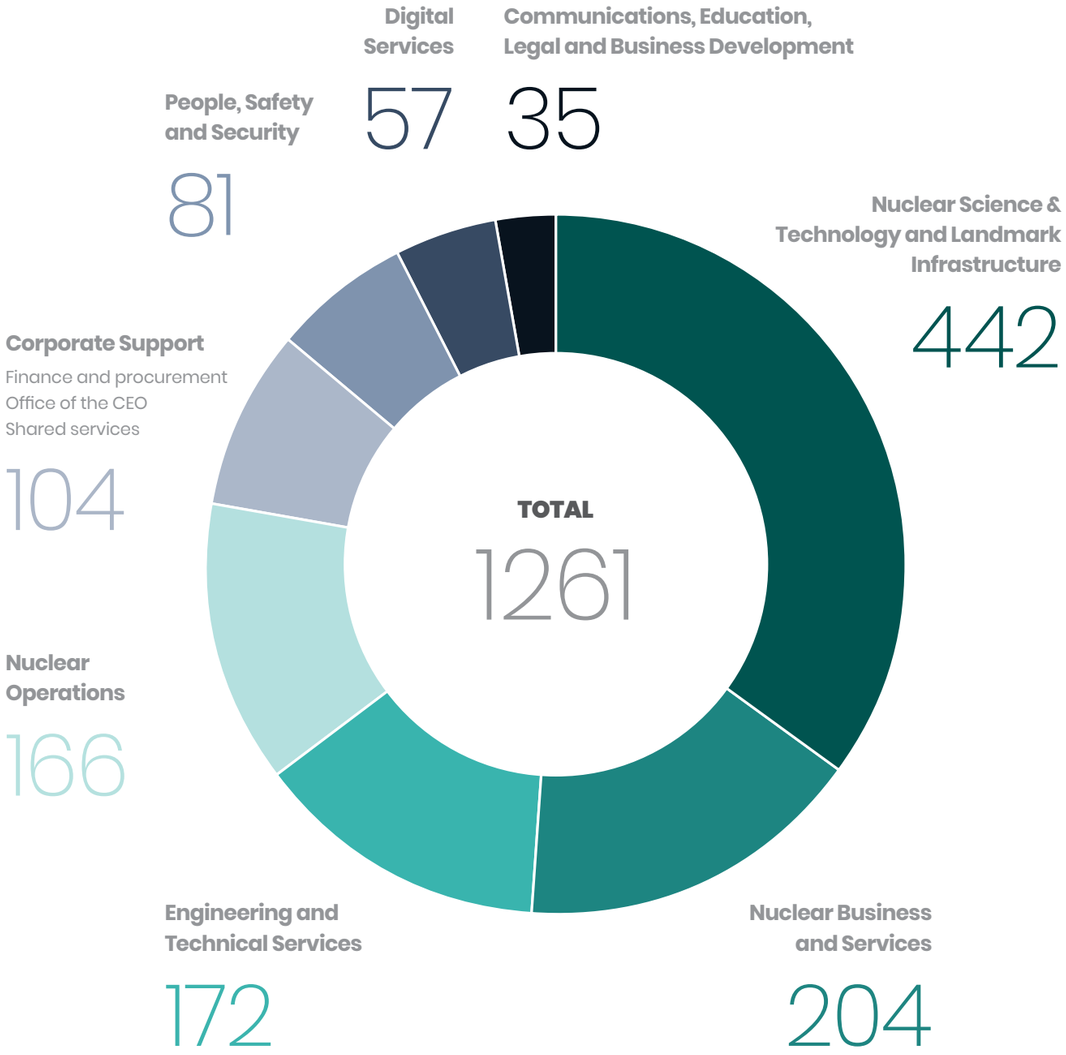
Our people



ANSTO's operating environment

As Australia's national organisation for nuclear science and technology and as the custodian of Australia's national and landmark research infrastructure, we play a vital role in driving and enabling innovative research that responds to some of the greatest challenges of our time.

There are a number of factors that will influence the way we seek to achieve our purpose over the coming four years. These are outlined below.

National priorities and ministerial expectations

As a leading government science agency, ANSTO plays an important role in supporting Australia's science and research priorities, and in addressing national challenges. This includes mission-based research, partnerships with industry and ensuring the accessibility of our landmark infrastructure, which underpins leading Australian research. Over the coming years, ANSTO will respond with agility as the nation faces new challenges and opportunities, including in the areas of energy security and renewable energy, human health and nutrition and the environment.

ANSTO will continue to ensure that its operations and strategy are aligned with the current Ministerial Statement of Expectations and respond to Government policy. ANSTO will also ensure that it works in close partnership with the Department of Industry, Innovation and Science.

State and local communities

ANSTO has established relationships with the NSW and Victoria State Governments, given our significant physical presence in these states. Similarly, as one of the major employers in the Sutherland Shire, ANSTO has deep connections with its local community. ANSTO maintains a strong relationship with key stakeholders including the Sutherland Shire Council, local education and community groups, as well as industry. ANSTO will continue to develop these relationships and be responsive to the evolving social, economic and environmental landscapes at a local and state level.

The establishment of the ANSTO Innovation Precinct has been welcomed and strongly supported by the NSW Government and the Sutherland Shire Council and stakeholders from education and industry sectors, as it responds to the need for highly skilled jobs in Southern Sydney. Over the next four years, the key focus will be on establishing a practical, inclusive and responsive 'Place Strategy' for the Precinct through the Greater Sydney Commission, and delivering the projects under the $12.5 million grant from the NSW Government.

Traditional lands

ANSTO's Lucas Heights' site is located on Dharawal land and the Australian Synchrotron on Kulin land. These lands have unique cultural significance, with the Lucas Heights bushland perimeter being home to many indigenous rock carvings. ANSTO will continue to take active steps to preserve and cherish these cultural sites, and conduct research that supports the preservation of Australian Indigenous cultural heritage. ANSTO will continue to engage meaningfully with indigenous peoples and acknowledges the passing of ANSTO's trusted advisor on Dharawal cultural heritage, Les Bursill OAM, in early 2019.

ANSTO's operating environment

Global developments

Australia has a strong history of engaging internationally on important nuclear issues, including non-proliferation and the peaceful uses of nuclear science and technology. Australia's ability to influence the international dialogue on these and other important issues is underpinned by the nation's nuclear knowledge base at ANSTO.

As important developments occur across the global nuclear technology and scientific landscape, ANSTO is committed to networked collaborations with international multilateral organisations and draw on major international science projects. Australia's engagements with advanced science and infrastructure groups, such as those undertaken via ANSTO with ITER (fusion reactor) and CERN (fundamental physics research) are critical to ensuring Australia's ongoing status as a highly innovative and engaged global player. ANSTO's participation in the Generation IV International Forum (GIF), a key international research program, similarly enables Australia to benefit from a collaborative network that brings together world leading science and research.

Ensuring that there is sustainable support for ongoing active involvement in these activities is key to fulfilling Australia's aspirations in the global science and technology landscape.

Infrastructure

ANSTO is at a challenging time in our history. We are simultaneously responding to the maintenance and safe operation of our aging facilities, such as Building 23 nuclear medicine production facility, whilst also settling in brand new facilities. This includes the ANSTO Nuclear Medicine Mo-99 manufacturing facility, which is very much part of our future. These two facilities, old and new, are both at the heart of our nuclear medicine operations and are therefore critical to Australia's nuclear medicine supply.

Research infrastructure is a core component in facilitating breakthroughs, industrial problem-solving and supporting a highly specialised workforce. ANSTO's capabilities competitively position the country in the broader global science landscape, and enable some of Australia's brightest minds to undertake ground-breaking research. For Australia to lead the innovation drive, our research capabilities must remain world-class through strategic long-term planning, including predictable funding. Three of ANSTO research facilities received additional funding under Research Infrastructure Investment Plan – the Centre for Accelerator Science from 2020-21, and the National Deuteration Facility and the Australian Centre for Neutron Scattering from 2021-22. Over the coming years, ANSTO will be planning for that investment and looking for new opportunities to exploit the capacity of its research infrastructure for the benefit of Australian science.

Collaborations and partnerships

Partnerships and collaborations are at the core of everything we do at ANSTO and shape the way we operate. ANSTO operates national and landmark research infrastructure on behalf of Australia and for the benefit of all Australian researchers. ANSTO hosts approximately 6,500 researcher visits annually, and our partnerships and collaborations include academies and institutions, universities and industry, both domestically and internationally.

As part of enabling a strong national collaborative network, ANSTO is connected to all Australian and New Zealand Universities through the Australian Institute of Nuclear Science and Engineering (AINSE), providing researchers with access to our expertise and landmark infrastructure.

As the science agenda evolves, ANSTO is acutely aware that Australia's economic prosperity rests heavily on its ability to translate research and innovation advancements into high impact outcomes through industry linkages. Advancing Australia's innovation economy, driving greater synergies between industry, researchers and universities, is a key focus area for ANSTO.

Radioactive waste management

Finding a long-term management solution for Australia's radioactive waste is of critical importance to ANSTO. ANSTO has been encouraged by the progress made by the Department of Industry, Innovation and Science toward the establishment of the National Radioactive Waste Management Facility (NRWMF). This includes the publication in 2018 of the *Australian Radioactive Waste Management Framework*, which sets out the principles, policies, and organisational arrangements for radioactive waste management in Australia. With the site selection process for the facility ongoing, ANSTO will commence contingency plans to mitigate against the significant risks to its waste management functions should there be delays in the establishment of the facility. ANSTO will continue to engage with the Department of Industry, Innovation and Science to progress the delivery of the facility.

Representation of what the National Radioactive Waste Management Facility may look like.

Regulatory environment

ANSTO operates within a complex and highly regulated business environment with varying degrees of accountability to over 30 regulators. In recognition of this environment, ANSTO has established a range of strategies, policies and systems that mitigate the risk of non-compliance with relevant laws and regulations. Continuing to develop and improve ANSTO's compliance framework is a key focus.

The *ANSTO Act 1987* and the *Public Governance, Performance and Accountability Act 2013* legislate ANSTO's primary obligations. ANSTO is also governed by other Federal and State legislation and regulations. Our main regulators include:

- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA);
- Therapeutic Goods Administration (TGA);
- Australian Safeguards and Non-proliferation Office (ASNO); and
- Comcare.

Business environment

ANSTO's commercial activities operate within a globally interconnected and often fragile supply chain. Changes or failures in operating plans of our facilities and reactor have a significant impact on our ability to supply the market or place greater demand or strain on our activities. Along with strengthening our internal planning, manufacturing capabilities and facilities (outlined throughout the plan), ANSTO is working to develop a more resilient and sustainable external supply chain. The challenges of the global supply chain for nuclear medicine supply were recently highlighted in the decision to postpone the 2019 OPAL extended maintenance shutdown by up to six months. We decided to delay the extended shutdown as there was no alternative international supply of the commonly used nuclear medicine (Mo-99) available to ensure it would not have an impact on Australian patients. We have undertaken a full risk assessment and the delay will not compromise the safety of operations.

In addition, globally, there has been a shift away from the phasing out or dis-incentivising the use of high-enriched uranium (HEU) based nuclear medicine products. The phasing out of HEU-based products was a global initiative to reduce the amount of weapons-grade uranium in civilian circulation. However, the trend of continued use of HEU nuclear medicine products, due to its lower cost and availability in old infrastructure, will have impacts on ANSTO's nuclear medicine business. ANSTO is one of the only organisations in the world which manufacture its nuclear medicine exclusively from proliferation resistant low-enriched uranium.

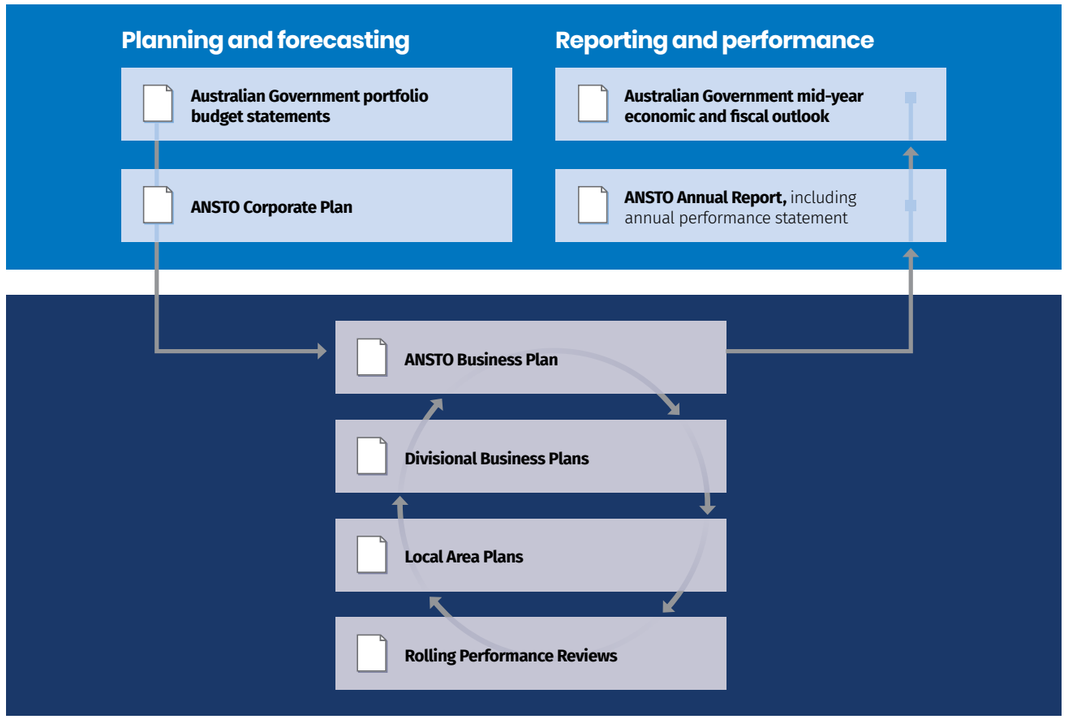
Financial environment

ANSTO relies on a combination of Government appropriations and commercial revenue to sustain its operations. Recently, ANSTO has experienced financial challenges that have been driven by both external and internal factors. In partnership with Government, ANSTO will continue to progress towards an increasingly agile and sustainable organisation for the long-term. Discussions will continue with Government and the Department of Industry, Innovation and Science to ensure ANSTO is on a sustainable footing, particularly in relation to long-term unfunded liabilities such as decommissioning and radioactive waste management. This will build upon existing collaborative work and the financial support provided in the 2019-20 Budget.

ANSTO's planning and performance process

The Corporate Plan is our key strategic planning document, and outlines how we will deliver our purpose over the coming four years. The Integrated Business Planning (IBP) process provides the framework to deliver the Corporate Plan.

ANSTO's planning cycle and framework responds to the requirements of the *Public Governance, Performance and Accountability Act 2013* and has two cycles: planning and forecasting; and reporting and performance.



Our integrated business planning is about achieving alignment of all our operational plans, and delivers a monthly rolling review of our performance and projections against our strategic targets, and ultimately our purpose.

Integrated business planning ensures our commitments to customers, partners and stakeholders are at the centre of our planning activities, and aims to maintain the optimum balance between our commitments and our capabilities. It provides visibility on performance and on current and future challenges; enabling and supporting effective planning practices, scenario planning, improvements and contingency plans.

To improve our planning processes, ANSTO is currently integrating the planning activities for all irradiated products produced by ANSTO, such as silicon and nuclear medicines. Through creating a centralised team of planners and schedulers, ANSTO is seeking to optimise resources and facility utilisation. This will enable us to measure and assess the effectiveness of our plans, equipment and processes in order to drive continuous improvement.

ANSTO measures its performance against its purpose and strategic objectives outlined in its Corporate Plan through a series of processes and structures. The integrated business planning process provides rolling visibility for the coming 24 months and measures performance bottom up against business plans. This monthly review measures performance in areas such as sales and marketing, customer satisfaction, aligned research and science through publications and stakeholder engagement, facilities utilisation and reliability, revenue projections, maintenance plans and financial performance. ANSTO has sought to mature the performance information provided in this year's Corporate Plan compared to previous years. Performance criteria are provided for each strategic objective in this plan.

Strategic objectives

ANSTO has established five strategic objectives that will drive the way we do business, focus our research, strengthen our capabilities and empower our people over the next four years. To reflect ANSTO's evolving context, we have updated our strategic objectives from the previous years.

These objectives respond to ANSTO's purpose and align with our vision and core values. They are supported by ANSTO's five year Business Plan.

1	**Putting our people first**	Provide a safe, sustainable and inclusive environment that empowers our people and supports a culture of collaboration and engagement	*Safe and Secure*	*Transformation and engagement*	*Ingenuity and agility*	*Growth and development*
2	**World leading research and technology outcomes**	Be part of a global network of researchers, delivering innovative solutions to complex problems, through strategic partnerships	*Aligned research*	*Strategic national and global partnerships and collaborations*	*Growing human capital*	*Deliver a safe, secure and sustainable future*
3	**Strategic management of landmark and national infrastructure**	To serve users, enable world-class research and create economic impact and benefit	*Meet user requirements for quality and reliability*	*Operational excellence*	*Asset management and expansion*	*Distinct national and global competencies and capabilities*
4	**Nuclear and related expertise and advice**	To provide expert advice, education, and services to support Australian policy and to strengthen Australia's nuclear science knowledge base	*Trusted advice to Government and key stakeholders*	*Local and International thought leaders*	*Education and engagement*	
5	**Business and innovation**	Deliver nuclear or related products and services to our customers, and partner with others to develop impactful products and services for a sustainable future	*New knowledge, applied ingeniously*	*Customer service*	*Nuclear businesses*	*Engage industry and contribute to the national innovation ecosystem*

1

Strategic objective 1

Putting our people first

Provide a safe, sustainable and inclusive environment that empowers our people and supports a culture of collaboration and engagement.

- **Safe and Secure**
  To provide a safe, secure and healthy workplace through continuous improvement to support holistic delivery of a high reliability culture.

- **Transformation and engagement**
  To support an engaged, flexible, inclusive and empowered workforce with a focus on diversity, inclusion and gender equity initiatives.

- **Ingenuity and agility**
  To equip and empower our people to work effectively in diverse environments and across boundaries, locally, regionally and internationally, with industry, government, researchers and academia.

- **Growth and development**
  To empower our people to take control of their learning and development objectives and support them to reach their full potential.

ANSTO has a diverse workforce who are based at two sites in New South Wales and one site in Victoria. More than one-third of staff undertake activities to support scientific research.

As detailed earlier in the Plan, a comprehensive STEMM Education program offered by ANSTO underpins its organisational commitment to the national objective of building scientific capability and skills. In addition, ANSTO offers a number of early career entry programs to support the transition from education to employment, including trade apprenticeships, business traineeships, university student internships, a highly competitive Graduate Program and Post-Doctoral Fellowships.

ANSTO strives to be a leader in diversity and inclusion, and was recently awarded the Athena SWAN Bronze Institutional Award by Science in Australia Gender Equity (SAGE).

This award recognises the organisation's commitment and progress in advancing the careers of women. The award represents the culmination of a two and a half year self-assessment process and the development of a detailed action plan, which provides a road map for the organisation to achieve gender equity.

Performance criterion

Achieving greater gender diversity in ANSTO's workforce, with the goal of reaching equal representation of male and female in our workforce by 2030.

YEARS	TARGET
2019-2020	**Leadership Teams** - *representation* Male **40%** | Female **40%** | Discretional **20%**
2024-2025	**ANSTO Wide** - *representation* Male **40%** | Female **40%** | Discretional **20%**

ANSTO is also committed to achieving greater diversity more broadly in its workforce. Our organisation has committed to making significant changes over the next four years to build a more inclusive and diverse workplace. Recent advancements include a staff LGBTQI+ support network; a meditation and multi-faith prayer space; a Parental Career Phase Toolkit; a Domestic and Family Violence Support program; and provision of an interactive dashboard with key diversity metrics and targets to monitor progress

An Indigenous Community Engagement Working Group has made progress on indigenous cultural recognition and engagement. In 2019 ANSTO submitted a Reconciliation Action Plan to Reconciliation Australia to formalise its commitment

ANSTO is also taking active steps to ensure that our leadership groups and influential committees have diverse representation. ANSTO understands that a flexible workplace not only enables those with different responsibilities and interests to balance demands, but also leads to better productivity and fosters an environment of innovation. A number of work options are available to staff to facilitate individual flexibility. Employees and managers can be creative in meeting the needs of staff and the business.

Self-awareness and reflective learning are at the forefront of ANSTO's learning and development strategy. Over the next two years, ANSTO will roll out career management tools to assist employees in developing important competencies including collaboration, engagement and science communication. The Nuclear Science and Technology and Landmark Infrastructure (NSTLI) cluster has built and piloted a suite of tools over the past year. A roll out to the Engineering and Capital Programs cluster will follow. Plans are underway for the implementation to the rest of the organisation, including the technical, corporate and commercial areas.

Our safety culture works within the context of a strong regulatory framework, including oversight from the nuclear regulator, ARPANSA, the TGA and Comcare. ANSTO will continue to engage its regulators in proactive dialogue to ensure continuous improvement in its performance across all areas.

ANSTO continues to progress implementation of actions identified to address the recommendations of an independent review of nuclear medicine production. ANSTO has taken steps to reduce risks including re-training, equipment replacement and modifications, incident reporting, process changes and enhancement of our safety culture. Through consistent monitoring and evaluation we will identify further improvements to facility operations, and make more improvements to safety performance.

ANSTO has achieved certification of the work health and safety management system to the international standard, ISO 45001, at its NSW and Victorian campuses. The standard was published in early 2018, and ANSTO is leading the way in its application in Australia. Our focus is to have a work health and safety management system that exceeds the standard and provides practical guidance on maintaining a safe and healthy workplace for all our staff.

Achieving this standard allows for the smooth integration with other existing management systems, such as quality, environment and risk, which have a common structure.

ANSTO will comply with the requirements as described by the International Atomic Energy Agency (IAEA) Safety Standards Series publication No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency (2015). This represents a significant body of work and will ensure we operate under a common framework for radiological emergency preparedness and response.

We recognise that there is no room for complacency with nuclear security, and that a mature nuclear security culture directly contributes to a safe and secure workplace. To achieve this, we will explore innovative solutions to improve preventative and protective security, including greater integration with human resources, learning and development and safety teams.

ANSTO will continue to engage with its nuclear regulators (ASNO and ARPANSA) and other Commonwealth agencies to ensure regulatory requirements are met. At the same time we will identify opportunities for continuous improvement that will make a positive contribution to ANSTO's commercial operations and research endeavours.

Our safety performance is measured by our Work Health and Safety team, who generate monthly reports on key safety indicators.

Performance criterion

ANSTO will continue to strengthen its commitment to providing a safe work environment for its staff. One way to measure this is through the Lost Time Injury Frequency Rate (injuries that require five or more days off work). Our annual goal is no lost time due to injury.

2

Strategic objective 2

World leading research and technology outcomes

Be part of a global network of researchers, delivering innovative solutions to complex problems, through strategic partnerships.

- **Aligned research**
  To engage in research that has scientific and commercial priorities, with a focus on human health, the environment and the nuclear fuel cycle.
- **Growing human capital**
  To develop the next generation of nuclear engineers and scientists using nuclear techniques and the graduate and post-doctoral career pipeline, and to promote STEMM careers in Australia.
- **Strategic national and global partnerships and collaborations**
  To build strategic partnerships and collaborations to leverage more effective research and innovation outcomes for Australia and the world.
- **Deliver a safe, secure and sustainable future**
  To leverage ANSTO's nationally distinctive capabilities for the benefit of Australia.

ANSTO undertakes research and development using its unique nuclear capabilities that addresses important issues and key challenges facing Australia.

Our world-class scientists lead important mission-based research utilising ANSTO's landmark facilities. It reflects the organisation's commitment to providing solutions to some of the greatest challenges facing Australia and our intention to remain at the forefront of international nuclear-based research and innovation.

The 2018 Defence Industrial Capability Plan highlighted strategic collaborations between Defence Science and Technology (DST) and ANSTO, including data sciences, coastal and ocean modelling, energy efficiency, and material science. The partnership has also been strengthened with secondment exchanges and development of staff from both organisations. Additionally, as a founding participant in the Defence Materials Technology Centre (DMTC), ANSTO will continue to look for further research projects, building on a decade of project engagement in the aerospace, land and maritime sectors.

ANSTO continues to develop Synroc technologies for the immobilisation of existing and future waste streams from nuclear processes. ANSTO has designed, built and commissioned an engineering-scale Synroc demonstration facility. The operation of this inactive demonstration plant has increased the technology readiness levels for deployment in the nuclear industry. A Synroc waste treatment plant is now under construction at Lucas Heights. The Synroc facility will immobilise the intermediate level liquid waste which is a by-product from our nuclear medicine facility.

ANSTO will continue to participate in its existing strategic national and international research collaborations to ensure Australian scientists are connected to a global network of experts and important global research projects. These important partnerships give Australian scientists access to international experts and the world's most advanced research infrastructure and techniques.

Conducting research with a wide range of partners where key synergies or shared goals have been identified enables ANSTO to make significant contributions in a range of scientific and engineering fields.

For instance, ANSTO has collaborated with the National Measurement Institute (NMI) since 1960 when ANSTO was given authorisation to maintain the Australian standards in relation to radionuclides and ionising radiation. As two of Australia's leading science organisations, ANSTO and NMI signed a renewed MOU formalising collaboration in March 2019. Both organisations share areas of common interest in both measurement and research, and are primary custodians of national infrastructure and facilities underpinning both Australia's research in nuclear science and technology and metrology. In the coming years, the MOU will strengthen synergies between ANSTO and NMI, such as those between NMI's materials metrology capabilities and international linkages and ANSTO's materials capabilities, for the benefit of Australian industry.

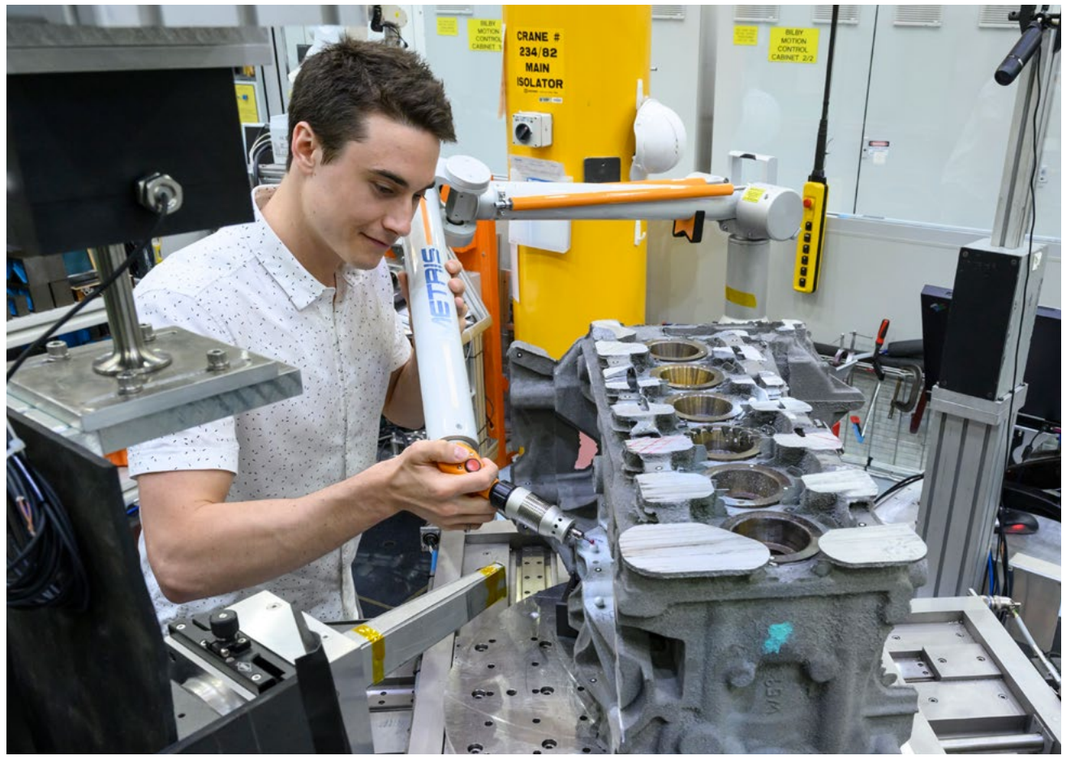
Internationally, ANSTO is applying its expertise in the development and characterisation of advanced materials used in extreme environments, such as nuclear reactors, as well as our capacity to irradiate materials with ions to simulate radiation damage, to the ITER fusion project. The world's largest engineering project, the ITER facility in southern France comprises 35 nations collaborating to build the world's largest tokomak, a magnetic fusion device that will test the useability of fusion technology to produce continuous power. In October 2016 ANSTO signed a cooperation agreement with ITER to formalise participation on diagnostic systems, theory and modelling of advanced materials. In March 2019, researchers from ANSTO and the Australian National University reported to ITER on their plasma diagnostics project. The review was very well received and may lead to an expanded role for Australia in one area of diagnostics for ITER.

In the coming years, ANSTO will continue to mature and grow its partnerships in alignment with its strategic priorities.

Performance criterion

Delivery of research outcomes that have scientific and industry impact, with a focus on health, the environment and the nuclear fuel cycle.

YEARS	TARGET
Annually	This will be assessed by a minimum of eight case studies



2

Strategic objective 2

World leading research and technology outcomes

To undertake and enable research that leads to a society in which all Australians experience good health, addresses some of Australia and the world's most challenging environmental problems and addresses key scientific questions in the nuclear fuel cycle.

Human Health

Human health research aims at understanding the role of key processes that lead to the development of disease, devising strategies that reduce risk and contributing to the development of more effective treatment. Our key areas of focus include:

1. investigation and early mitigation of environmental risk factors, including biological, chemical, physical processes and societal mechanisms that impact health
2. the development of new tools, including novel radioisotopes that lead to the development of improvements in detection and diagnosis and highly effective therapies to save lives
3. generation of knowledge and methods to maintain good health by optimising food quality and production

ANSTO's broad mandate in undertaking research to support human health builds on expertise in the use of nuclear techniques, the production of radioisotopes for diagnosis and treatment and the characterisation of the effects of radiation on living matter.

In collaboration with science organisations, clinical centres and industry, we investigate prevention strategies, develop methods to improve the detection and diagnosis of disease and devise better treatments for illness. Research using our unique nuclear infrastructure, capabilities in radiochemistry and radiation detection and expertise is bringing benefits to human health.

We anticipate future developments using new radioisotopes produced both by our National Research Cyclotron and OPAL multi-purpose reactor that provide more personalised medicine. This includes advances in bioimaging and bioanalytics to detect and monitor disease progression.

Our expertise in the measurement and delivery of therapeutic radiation is contributing to improvements in the delivery of radiation and advanced radiation therapies, such as particle therapy and neutron capture enhanced particle therapy.

Australian and international scientists are using the Imaging and Medical beamline and the Macromolecular Crystallography beamlines at the Australian Synchrotron to characterise disease and develop new therapies and prevention strategies. New beamlines under Project BR—GHT will further enhance capacity in the biological sciences.

ANSTO has two special projects which are expected to impact human health over the coming years. Our health researchers have developed a new hybrid therapy for hard-to-treat cancers. Neutron Capture Enhanced Particle Therapy (NCEPT) magnifies the impact of particle therapy by capturing neutrons - produced internally at the target as a by-product of treatment - inside cancer cells, where they deliver an extra dose to the tumour. The approach boosts the target dose without increasing the dose to healthy tissue and delivers a significant dose to secondary lesions outside the primary treatment area, resulting in more effective treatment and reduced complications. The project, a collaboration between ANSTO and the University of Wollongong, is generating considerable excitement within the radiation oncology communities around the world. Initial discussions regarding the first clinical trials in Japan are currently in progress.

For nearly two years, ANSTO has been working with the Sri Lankan Presidential Taskforce to investigate chronic kidney disease of unknown cause (CKDu), a serious public health issue which is present in many countries. The Department of Foreign Affairs and Trade has provided nearly $700,000 of funding to support ANSTO's efforts. We are investigating kidney function in Sri Lankans, assessing water quality, and studying nutritional transfer between mothers and infants. These projects will establish a paradigm for effective early detection and mitigation strategies which, can be applied as a robust template in other developing countries facing similar health challenges.

Environment

Environmental research applies nuclear-based techniques to fill critical knowledge gaps to inform sustainable environmental management strategies and capacity to respond to environmental challenges. Our key areas of focus:

1. water resources sustainability
2. environmental change
3. contaminant impacts

The **Water Resources Sustainability** program focuses on the delivery of science-based outcomes on the management of groundwater, aquatic ecosystems and hydrological systems for Australian industry with contributions to international projects.

An example of this work is our partnership with the NSW Department of Primary Industries and the University of New South Wales using isotope tracing in research for more sustainable seafood production. Outcomes of this study will contribute to the National Marine Science Plan to help inform sustainable aquaculture management decisions.

Our food provenance research aims to optimise the production of food, increase the efficiency of production methods, and track the physical origin of food for quality, safety and authentication purposes. A key project supports Australia's annual $2 billion aquaculture industry. ANSTO, in collaboration with the University of New South Wales, Macquarie University, the NSW Department of Primary Industries and other stakeholders, is working to develop a quick analytical tool for seafood provenance and authentication of high-value seafood products. ANSTO is now consolidating relationships in the Asia-Pacific and beyond, and has received expressions of interest from researchers in the US, Malaysia, Thailand, Bangladesh and Turkey.

Internationally, we continue to provide targeted expert scientific training to the Asia-Pacific region through the International Atomic Energy Agency-sponsored project on the use of isotopic tools to understand groundwater resources.

The **Environmental Change** program will continue to deliver a better understanding of climate variability in key areas of agricultural production in Australia.

The Southern Ocean and the Antarctic are also crucial in our understanding of the past, present and future climate systems in the Australian region. New partnerships with key research groups in Tasmania as well as the University of Wollongong have strengthened ANSTO's role in climate research and consolidated the research plan for the next four years. This research plan draws upon ANSTO's expertise in the detection of radon-222 in the atmosphere and analysis with our expertise in archival evidence from environmental sources, including lake sediments, as an indicator of past climate.

The research encompasses human impacts on the environment and a reconstruction of the changes to Earth's landscape using nuclear techniques.

The **Contaminant Impacts** program focuses on air quality, the movement of contaminants through the soil and understanding the impact of radioactivity on the biosphere.

This information can improve management strategies for mitigating pollution, the degradation of the atmosphere, changes to sub surface environments and the biosphere.

ANSTO shares its environmental research expertise through its participation in a number of IAEA projects on soil and water quality.

Using nuclear techniques to detect micro-plastic contaminants our environmental scientists are investigating the effects of plastics on marine habitats. Our initial studies have led to new exciting international initiatives and projects, including a new IAEA – Coordinated Research Project into marine pollution.

2

Strategic objective 2

World leading research and technology outcomes

Nuclear Fuel Cycle

Nuclear fuel cycle research extends to all aspects of the cycle from the mining of uranium through to the disposal of nuclear waste. Our key areas of focus include:

1. the development of improved fuels for advanced reactor designs
2. investigation of materials for use in nuclear systems, structures and components, and the effects of irradiation and high temperature on their structural properties
3. advancing the understanding of the management of spent fuel and associated waste forms

This research takes advantage of ANSTO's unique capabilities including specific expertise in waste forms, the capacity to undertake theoretical predictions of fuel properties, and other expertise in advanced materials used in the nuclear industry. The current focus on properties of accident-tolerant fuels and advanced fuels has strengthened scientific collaborations with industry and other research groups and created the potential for commercial linkages.

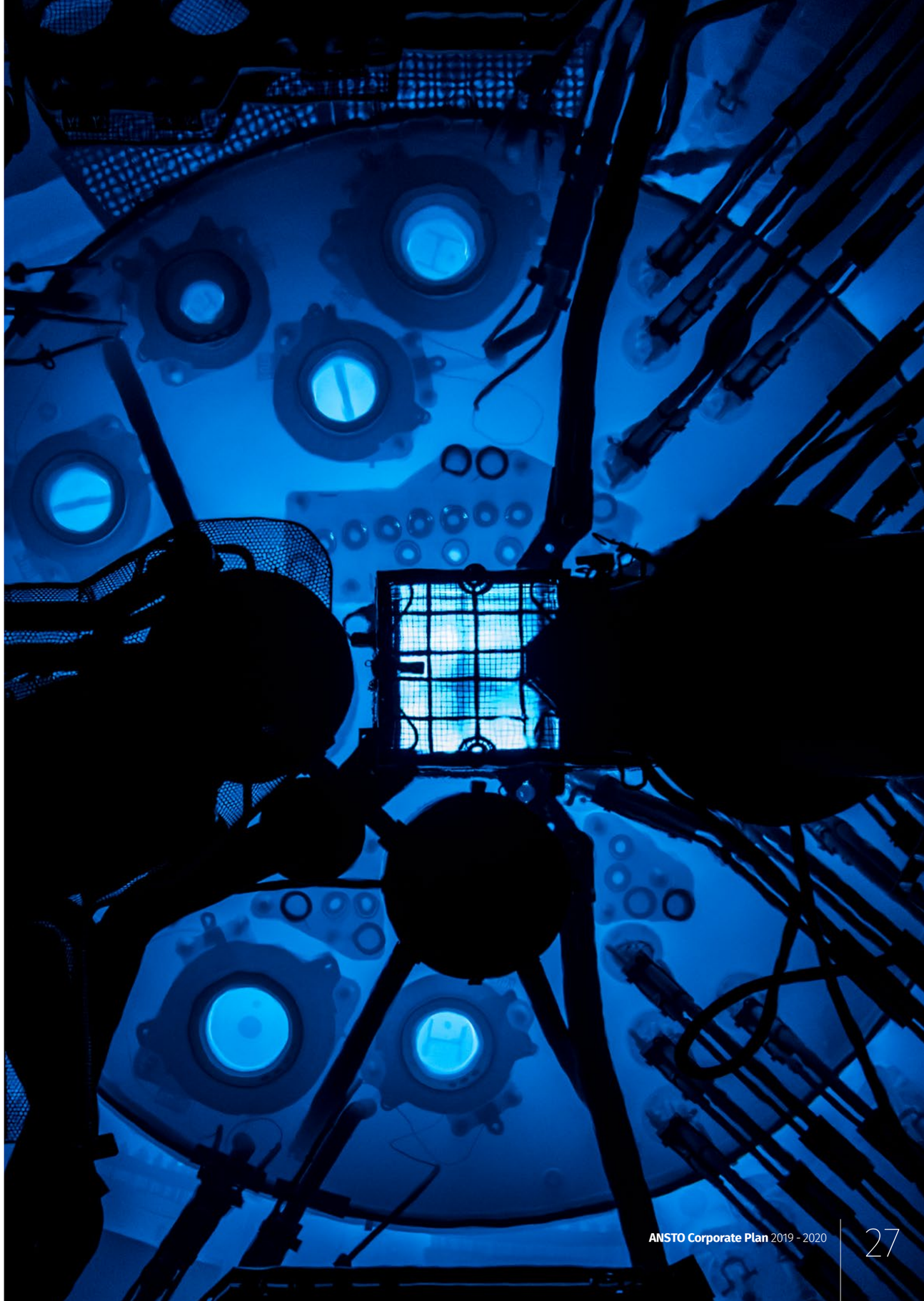
Nuclear fuel cycle researchers contributed to the development of the Synroc waste treatment technology, a demonstration plant and the first of its kind operational facility at ANSTO.

ANSTO's Synroc waste treatment technology (a special project of this report) will offer significant cost and performance benefits for a broad range of waste streams.

ANSTO represents Australia on the Generation IV International Forum (GIF) and provides timely and comprehensive advice to Government on nuclear technologies. The forum supports collaborative long-term research on advanced nuclear power reactor technologies, which are safer and more sustainable.

Australia participates by focusing on research on Very High Temperature reactors and Molten Salt reactors. ANSTO's ongoing involvement is based on its extensive experience and expertise in materials engineering and structural integrity research. ANSTO staff are also leading and coordinating a cross-cutting investigation of how Advanced Manufacturing and Materials Engineering could be used to reduce the deployment time of Generation IV reactors.

Nuclear fuel researchers are also supporting the ITER nuclear fusion research project in the areas of diagnostic imaging and plasma theory and modelling other high level GIF activities including the GIF Risk and Safety Working Group, as well as public education and communication in line with GIF outreach.



3

Strategic objective 3

Strategic management of landmark and national infrastructure

To serve users, enable world-class research and create economic impact and benefit.

- **Meet user requirements for quality and reliability:** To provide excellent user experience and engage users in future capability development.
- **Operational Excellence:** To provide effective and efficient utilisation, best practice facility operation, management and continual improvement.
- **Asset management and expansion:** To strategically plan and invest in the lifecycle and development of landmark and national research infrastructure to serve the needs of users, collaborators and partners.
- **Distinct national and global competencies and capabilities:** To operate and leverage capabilities that are recognised as world leading, enabling world-class outcomes, and allowing Australian researchers to develop standing and leadership in the international research system.

The strategic development, effective use and maintenance of ANSTO's research infrastructure plays a crucial role in Australia's economic and social prosperity. The Australian Government has committed to further investment in research infrastructure through the National Research Infrastructure Investment Plan, which has resulted in a commitment to sustained, strategic investment in ANSTO operated facilities including the Australian Centre for Neutron Scattering (ACNS), the Centre for Accelerator Science (CAS), the National Deuteration Facility (NDF) and the National Research Cyclotron Facility.

As custodian of these nationally important facilities, ANSTO has a mandate to operate them to ensure maximum utilisation, thereby enabling world-class research and delivering real-life benefit and impact. Under a range of access arrangements, ANSTO delivers research outcomes aligned with its research mission, often in partnership with external researchers.

Over the coming years, ANSTO will continue to grow Australia's neutron scattering capabilities. In 2019, the installation of the Spatz neutron beam instrument was completed, after being gifted and transferred from Helmholtz-Zentrum Berlin. The instrument complements existing capabilities and will be used for a wide range of applications in biomedicine, energy and materials science. ANSTO will also commence scoping studies for new neutron beam capabilities, to be housed within a second neutron beam guide hall. The second guide hall was identified as a priority for Australia in the *2016 National Research Infrastructure Roadmap*.

The cryogenic electron microscope commissioned and operated by the University of Wollongong temporarily at ANSTO, has the capability to bring insights into the development of disease that leads to drug discovery.

The expansion of the Australian Synchrotron beamlines, known as Project Br—ght, is discussed in a separate section of this plan.

ANSTO continues to develop access programs to ensure that the scientific and technical needs of users are well supported. Outreach, training and workshops, including a program of ANSTO User meetings, will be strengthened as part of the ANSTO User Experience program. An eResearch (or digital research infrastructure) strategy has been developed and will support researchers through the entire user experience – from scientific concept to innovation and impact. Reinforcing best practice user-focused support enables excellence in scientific discoveries and delivers innovation outcomes that benefit the nation.

Access to all of ANSTO's landmark and national research infrastructure is provided to the national and international user community through dedicated online portals. Further development of this technology will be addressed by the Current Research Information System and Portal (CRISP) project. The project will introduce systems for both measuring scientific impact and supporting user programs. A broader research management system, including greater capability to provide usage and performance metrics, grant management and analysis will result.

Performance criterion		2019-2020	2020-2021	2021-2022	2022-2023
OPAL	Days	287*	300	300	300
Australian Synchrotron	% of availability	95	95	95	95
Neutron beam instruments	% of availability	85	85	85	85
Accelerators	% of availability	65	65	65	65

** OPAL has a reduced target due to a scheduled maintenance shutdown*

3

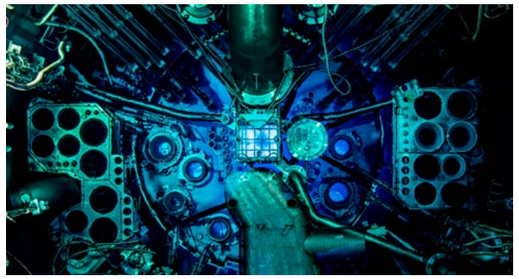
Strategic objective 3

Strategic management of landmark and national infrastructure

ANSTO's landmark and national research infrastructure

ANSTO operates a large proportion of Australia's landmark and national research infrastructure. This multi-user, multi-disciplinary, multi-decadal infrastructure places Australia at the forefront of innovation for the benefit of public health, industry and the environment.

OPAL multi-purpose reactor



LUCAS HEIGHTS CAMPUS | NSW

- OPAL is one of the world's newest and most productive multi-purpose reactors that uses proliferation resistant low enriched uranium for a wide range of applications.
- It produces 85 per cent of Australia's life-saving nuclear medicines, which will be required on average by two in three Australians.
- OPAL supplies neutrons for research at the Australian Centre for Neutron Scattering (ACNS).
- It produces almost 50 per cent of the world's neutron transmutation doped silicon used by the semiconductor industry in high-reliability and high precision applications, such as fast trains and hybrid cars.

Australian Centre for Neutron Scattering (ACNS)

LUCAS HEIGHTS CAMPUS | NSW

- ACNS uses neutrons from the OPAL reactor to help scientists and industries address complex challenges.
- Neutron scattering enables research into areas of national importance including health, food, materials engineering, energy, cultural heritage and environmental science, among other fields.
- ACNS is a global leader in neutron science and is home to 15 neutron beam instruments.
- It supports more than 1400 domestic and international user visits each year

Australian Synchrotron

CLAYTON CAMPUS | VIC

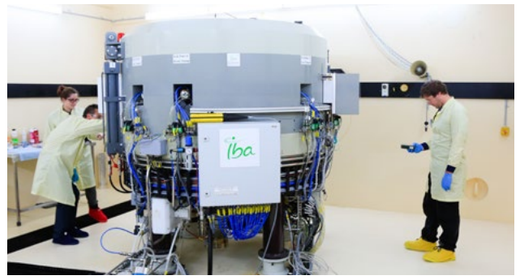
- The Australian Synchrotron uses accelerator technology to produce a powerful source of light, a million times brighter than the sun.
- Synchrotron light is guided into beamlines that are used for a wide variety of research purposes including human heath, energy, agriculture and manufacturing.
- Experiments with synchrotron light offer unique advantages in terms of accuracy, level of detail and faster results that complement a wide range of other experimental techniques that ANSTO offers.
- The Australian Synchrotron hosts more than 5000 researcher visits annually.

Centre for Accelerator Science (CAS)

LUCAS HEIGHTS CAMPUS | NSW

- Ion accelerators have a vast array of applications and can be used to enable research from agriculture to zoology.
- Accelerator science is now more important than ever in addressing challenges of climate change and particle pollution, development of advanced manufacturing capabilities and in detecting and preventing nuclear proliferation.
- Funded in part by the National Collaborative Research Infrastructure Strategy (NCRIS), CAS houses four world-class accelerators for ion beam analysis and accelerator mass spectroscopy.
- CAS is the largest centre of its kind in the southern hemisphere and welcomes several hundred users annually.

National Research Cyclotron Facility



CAMPERDOWN CAMPUS | NSW

- The Cyclotron is operated by ANSTO and is used by researchers from a wide range of organisations, universities and industry.
- The National Research Cyclotron Facility (NRCF) forms the centrepiece of the ANSTO/University of Sydney node of the National Imaging Facility and was Australia's first cyclotron dedicated entirely to biomedical research.
- This facility produces radiotracers and radiopharmaceuticals that enable researchers to make profound discoveries about the mechanisms and diagnosis of human disease, as well as potential treatments.
- The NRCF supports more than 100 national and international users annually.

4

Strategic objective 4

Nuclear and related expertise and advice

To provide expert advice, education, and services to support Australian policy and to strengthen Australia's nuclear science knowledge base.

- **Trusted advice to Government and key stakeholders**
  To assist the Australian Government in protecting and enhancing the national interest through the provision of specialised advice and support, and to provide accessible information to enhance public knowledge of ANSTO's work.
- **Local and International thought leaders**
  To engage with key international nuclear organisations and to contribute to global and regional nuclear discussions, implementing Australian Government policy and ensuring that Australia remains a leader in the applications of nuclear science and technology.
- **Education and engagement**
  To provide resources that meet the needs of the education and academic communities, and to demonstrate the benefits of nuclear science and technology to the wider community.

As mandated by the *ANSTO Act*, ANSTO plays a vital role in providing expert advice to the Australian Government on all matters relating to nuclear science, technology, and engineering and related matters. Australia's ability to contribute to the domestic and international dialogue on these and other nuclear science and technology matters is underpinned by the nuclear knowledge base at ANSTO. ANSTO also contributes to, and informs, policy-making in this area. This is achieved through frequent engagement with ANSTO's responsible ministers and their offices, the Department of Industry, Innovation and Science, and the Chief Scientist of Australia. As ANSTO faces many exciting opportunities and some challenges over the coming years, we will continue to prioritise our relationship with government stakeholders, particularly our responsible Minister and the Department of Industry, Innovation and Science.

Expert and technical advice is also provided to, and actively sought from Government, particularly across the Foreign Affairs and Trade portfolio in the areas of peaceful uses of nuclear energy and science, nuclear safety and security, and nuclear non-proliferation. ANSTO also contributes to major policy inquiries and expert working groups to support the broader national science and innovation policy environment. Additionally, ANSTO continues to provide expert technical support and advice to the National Radioactive Waste Management Facility project.

As well as supporting the Australian Government's interactions with the International Atomic Energy Agency (IAEA), ANSTO provides direct support to the IAEA in a number of areas. ANSTO staff serve on a number of high-level committees and participate in IAEA missions and activities in the areas of nuclear security, nuclear safety, nuclear law, environmental studies, human health, and waste management. ANSTO also acts as an expert advisor to the IAEA on the development of education and outreach materials for developing countries, and engages the wider Australian community through a variety of activities and events. ANSTO serves as the interface between the IAEA and Australia on all matters related to nuclear applications and technical cooperation. ANSTO acts as the National Representative on the treaty-level Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific (RCA). ANSTO's active participation in IAEA activities directly supports Australia's claims to a designated (permanent) seat on the IAEA Board of Governors, and the policy influence that brings, and helps demonstrate Australia's adherence to its international obligations to cooperate in the peaceful uses of nuclear science and technology.

ANSTO also has strong involvement with the OECD Nuclear Energy Agency (NEA), based in Paris, including representation on its Steering Committee for Nuclear Energy (the Agency's highest policy-making body) and the Nuclear Development Committee. We spearhead Australia's participation in the Generation IV International Forum, for which the NEA provides secretariat services, and continue to collaborate in the NEA's engagement with the global nuclear medicine industry.

ANSTO will continue to lead Australia's contribution to the Forum for Nuclear Cooperation in Asia, sharing experience and knowledge on the peaceful applications of nuclear technologies in our region. Ongoing support for Australia's participation in the Global Initiative to Combat Nuclear Terrorism will continue to position ANSTO as a leader in nuclear security issues.

ANSTO also engages with sister nuclear and research organisations directly through a series of over fifty bilateral MOUs, research agreements and other cooperative arrangements. These agreements have a broad regional and thematic scope covering all continents and areas such as research reactor operation, waste management, cooperation on nuclear security, and nuclear science and technology

Over the 2019-2020 period, ANSTO will look to further its international outreach through refreshing and expanding its series of bilateral collaborative agreements and look to support Australia's position in major multilateral fora such as the 2020 Review Conference for the Non-Proliferation Treaty.

ANSTO undertakes a stewardship role on nuclear matters on behalf of the Australian Government to ensure that Australia's reputation and leadership in the peaceful uses of nuclear technology continues.

ANSTO's nuclear experts maintain national capabilities that support industry, government and scientific users. These capabilities include nuclear forensics to ensure Australia has the necessary tools to prevent and respond to nuclear security threats; environmental monitoring and modelling of ANSTO's radiological footprint; maintenance of the measurement standard for radioactivity (the Becquerel), the provision of expert scientific advice and training in relation to the detection and measurement of ionising radiation; and the provision of expert radio-analytical chemistry consistent with international best-practice for the measurement of natural and anthropogenic radionuclides in the environment.

Over the next four years, activities will focus on sustaining these key deliverables, while enhancing outcomes for existing stakeholders and generating new opportunities in areas such as healthcare and national security. Strategic goals include refining the dissemination of existing radionuclide standards to assist Australian industry and Government in accessing the information. Importantly, it includes partnering with hospitals in the calibration of their equipment to ensure that they are providing accurate doses to patients; developing new national standards to support radiopharmaceutical development and clinical trials; developing innovative radiation detection technologies, including the commercialisation of a patented gamma ray imaging platform technology for a diverse customer base; achieving greater collaboration with domestic stakeholders for the provision of trusted advice and access to specialised services in nuclear security science; and investing in the functional aspects of our capabilities, including infrastructure for environmental monitoring and international co-operation in radio-analytical chemistry.

Performance criterion

Effectively facilitate ANSTO's role with Government and internationally as Australia's centre of excellence on nuclear science and technology by:

- Providing reliable and trusted advice to Ministers, Parliament, and Government departments and agencies.
- Engaging with key international nuclear organisations and policy discussions.

ANSTO will use case studies to highlight and assess the impact of our engagement with political and international stakeholders.

YEARS	TARGET
Annually	This will be assessed by a minimum of four case studies

5

Strategic objective 5

Business and innovation

Deliver nuclear or related products and services to our customers, and partner with others to develop impactful products and services for a sustainable future.

- **New knowledge, applied ingeniously**
  To leverage and translate research outcomes into new products and services.
- **Customer service**
  To operate our businesses to effectively serve our clients and the community.
- **Nuclear businesses**
  To sustainably grow our strategically aligned businesses through opportunities in new and existing markets.
- **Engage industry and contribute to the national innovation ecosystem**
  To engage with the needs of industry to drive Australian innovation.

ANSTO manufactures and distributes nuclear medicines throughout Australia, and to hospitals and clinics overseas. These products are used in a variety of nuclear medicine imaging scans to help diagnose a wide range of cancers and heart, brain, bone, lung and endocrine diseases. ANSTO also produces and distributes therapeutic nuclear medicine products. Therapeutics provide an alternative approach for cancers that are difficult to treat. This rapidly growing area of nuclear medicine represents an important opportunity to deliver better outcomes for Australian patients.

Currently, ANSTO supplies approximately 85 per cent of the nuclear medicines used in diagnostic scans in Australia, delivering the equivalent of 12,500 patient doses of technetium-99m (Tc-99m), the most widely used nuclear medicine, across Australia each week.

Over 2019-2020, ANSTO will continue to increase the supply of therapeutic agents to the domestic market, as well as improving its security of supply of nuclear medicine for diagnostic scans. Following intermittent disruptions in nuclear medicine supply over the past year, ANSTO is even more aware of the need to provide security of supply for Australian patients.

The 2019-20 Federal Budget allocated approximately **$26 million** to ANSTO to support the safe and reliable supply of nuclear medicine in Australia. This includes funding:

- to support the development of a business case to consider the options available to secure the long-term sustainability of nuclear medicine supply in Australia;
- to enable proactive maintenance work and equipment upgrades to support the ongoing operations of the current nuclear medicine production facility; and
- for the implementation of ANSTO's action plan to improve processes and safety at its nuclear medicine production facility.

ANSTO is a global market leader in the supply of molybdenum-99 (Mo-99), the parent isotope of Tc-99m. Mo-99 is distributed in bulk to several overseas customers due to its longer half-life. Upgrades to ANSTO's ageing Mo-99 manufacturing facility in 2016 have allowed the organisation to be able to supply 16 per cent of global demand of this potentially lifesaving radioisotope. This increase in supply has formed part of the broader ramp up and transition to the new world-class ANSTO Nuclear Medicine (ANM) facility, which commenced routine operations in June 2019. Production from the old manufacturing facility has recently transitioned to ANM, with the old facility having reached the end of its useful life. ANM will enable ANSTO to meet a significant proportion of global demand, with a particular focus on potential growth opportunities in the Asia-Pacific.

For instance, with a large and growing population, China is highly motivated to develop its domestic capability around the use of nuclear medicine products. Over the last couple of years, ANSTO has been focused on establishing strong relationships with a range of strategic stakeholders in the Chinese nuclear medicine community. The aim is to position ANSTO to capitalise on predicted future growth in the Chinese nuclear medicine market.

ANSTO is a leading national radiation safety training centre in Australia. As an expert in radiation protection and instrument calibration, ANSTO is able to offer training and consultancy services both in Australia and the region.

ANSTO provides consulting and process development services to the minerals industry, in Australia and globally. In addition, the Minerals business conducts long-term research and development focused on the needs of future clients. ANSTO has specialised facilities whereby laboratory studies and pilot scale operations can be conducted on behalf of clients. These activities provide added value to customers in a range of minerals areas, including minerals containing naturally occurring radioactivity and minerals processing operations with complex metallurgy.

ANSTO has been able to enhance value for key projects in Australia and overseas, and will continue its focus on strategic metals, including uranium, rare earths and lithium. Utilising their expertise along with new technologies, ANSTO Minerals can help its clients overcome challenges of lower grades and more complex ores. This is critical to advancing projects and ensuring ongoing world supply of these critical materials.

Utilising the OPAL multi-purpose reactor, ANSTO supplies the world's most reliable silicon irradiation services to provide clients with the highest quality neutron transmutation doped (NTD) silicon. This NTD silicon is used for special applications in high-powered microelectronics. The silicon ingots are delivered by customers to ANSTO, irradiated in the OPAL reactor and returned to customers for use further along the microelectronics supply chain. ANSTO has almost 50 per cent of the global market share for NTD silicon, achieved through a dedicated focus on the supply chain and meeting customer needs in a cyclical market.

As the global market leading supplier of NTD irradiation services, over the next four years ANSTO will focus on continuing to deliver to customer expectations. To do this ANSTO will optimise its production in line with market demand for high-power semiconductor applications, including high-voltage products for greener power grids, high-speed rail, industrial automation and the automotive industry. Special emphasis will be given to support demand in large diameter (8" & 6") silicon crystals.

PETTECH, a small nuclear medicine diagnostic company and wholly owned ANSTO subsidiary, recently concluded a transaction to sell its business operations to Cyclotek NSW and enter into a new collaborative venture which will strengthen the PET imaging market and increase the research and development capability for new nuclear medicine diagnostics in NSW. As a result of the transaction, government and the private sector will work together to achieve better health outcomes for Australian patients through optimising the utilisation of PETTECH's facilities and broadening the range of PET products available in NSW.

In January 2019, ANSTO and Cyclotek Theranostics Pty Ltd (Cyclotek) established a joint venture company, Applied Molecular Therapies Pty Ltd, for the purpose of development, manufacture and supply of therapeutic radiopharmaceuticals within Australia and in the broader Asia-Pacific region. The opportunity leverages ANSTO's significant investment in emerging therapeutic radioisotopes, particularly Lutetium-177 (Lu-177) which ANSTO produces and is currently in clinical trials to treat neuroendocrine and prostate cancers. There is growing clinical interest in the use of new therapeutic radiopharmaceuticals, and AMT is well positioned to participate in this emerging market and take a leadership role in the region.

5

Strategic objective 5
Business and innovation

TABLE 2

ANSTO subsidiaries operate in the context of the Corporate Plan to enhance our capabilities or provide transitional arrangement as we reorganise our activities.

ANSTO subsidiaries	Jurisdiction of operation	Status
PETTECH Solutions Pty Ltd	New South Wales	Owner of cyclotron facility
ANSTO Nuclear Medicine Pty Ltd	New South Wales	Operating producer of Mo-99
ANSTO Inc.	Delaware, USA	Inactive

Performance criterion

Human health.

Human health products

Radiopharmaceutical doses (Potential doses*)

YEARS	TARGET
2019-2020	3,391,917
2020-2021	4,050,103
2021-2022	4,997,453
2022-2023	5,178,404

** The potential patient doses reported in last year's Corporate Plan included forecast doses for the ANM facility. ANSTO has reviewed the method used to estimate doses based on internal and external developments, including changes in utilisation in clinical practice.*

Our quality compliance performance is measured by our Quality and Business Systems team and reported quarterly through an executive committee. One such measurement is our ongoing Quality Management certification.

Performance criterion

Maintain our ISO 9000 Quality Management System certification.

YEARS	TARGET
Ongoing	Maintain certification

Major projects

ANSTO currently has six major projects that support our purpose. These projects will ensure that we deliver on our strategic objectives and our legislated mandate over the next four years.

1 Strengthening nuclear medicine production

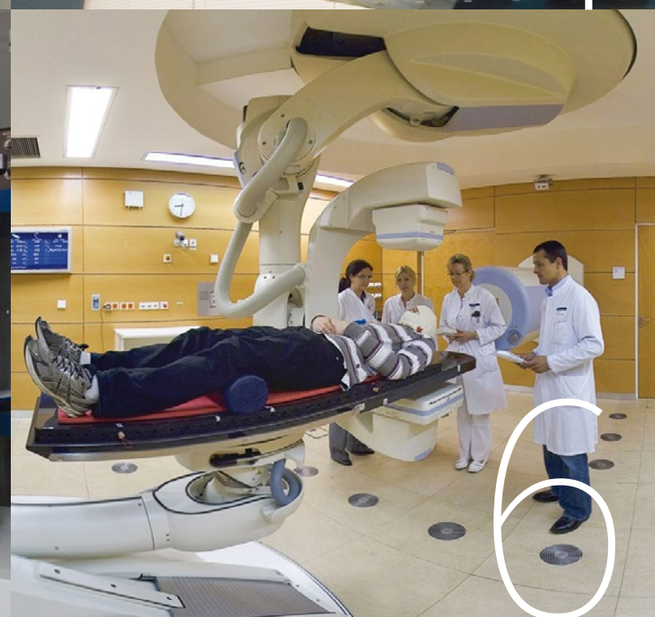
2 ANSTO Innovation Precinct

3 Science, Technology, Engineering, Mathematics and Medicine (STEMM) education

4 Project BR—GHT

5 Expanding our waste management capabilities

6 Next generation accelerator technologies



Major projects

Strategic objective 3

Strategic management of landmark and national infrastructure

Strategic objective 5

Business and innovation

1 Strengthening nuclear medicine production

The new ANSTO Nuclear Medicine (ANM) facility has begun manufacturing Molybdenum-99 (the most widely used radiopharmaceutical in the world, used for the diagnosis of a range of diseases, including cancer and heart disease). This export scale manufacturing facility has the capacity to supply a significant proportion of the world's needs for Mo-99.

The 'bulk' product produced in this new facility is either exported or transferred to ANSTO's nuclear medicine production facility, also known as building 23 to be dispensed to Australian hospitals.

With the ANM facility now operating, ANSTO's focus remains on ensuring the sustainability of its other aging nuclear medicine production facility and in parallel, considering the next steps required to establish a replacement facility. ANSTO's current production facility has supplied millions of doses of lifesaving medicine to Australian patients over many decades. However, it is coming to the end of its operating life and consequently is at risk of continued intermittent supply disruptions.

The nuclear medicine production facility is the final critical step in the Mo-99 manufacturing supply chain for the domestic market. In this facility, the Mo-99 from the new ANM facility is dispensed under sterile conditions onto ANSTO-designed radiopharmaceutical generators, where it decays to Tc-99m. These generators, known as Gentech™ generators, are then delivered to hospitals and nuclear medicine practices across Australia and have become the mainstay of nuclear medicine in Australia.

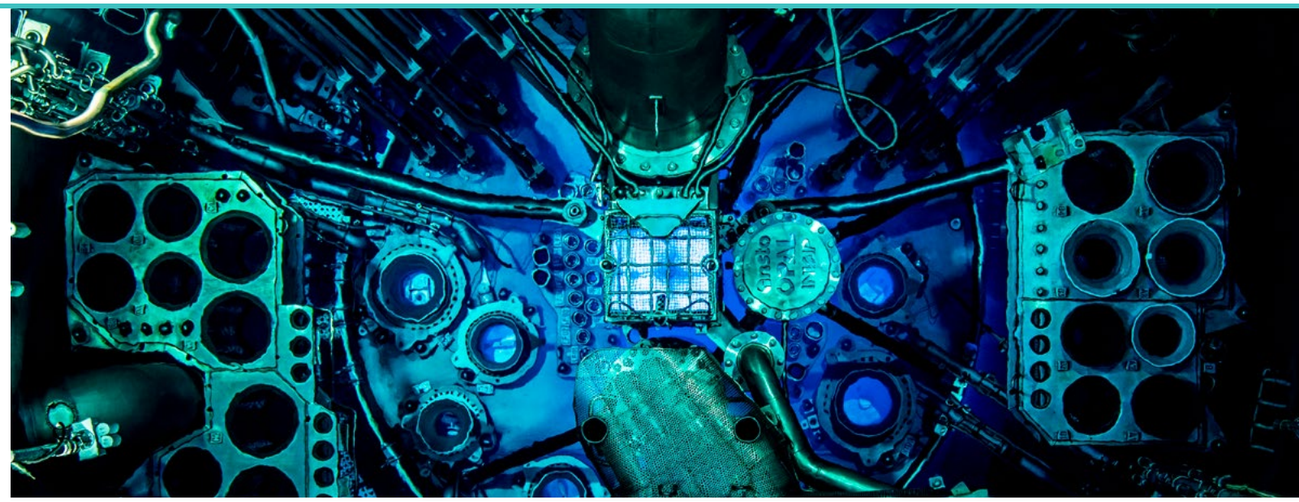
The Commonwealth Government's 2019-20 Budget provided $13.7 million to enable proactive maintenance work and equipment upgrades to support the ongoing operations of the existing production facility and to help ensure reliability of supply over the short term. The 2019-20 Budget also provided funding to support the development of a business case to consider the options available to secure the long-term and sustainable future of nuclear medicine supply in Australia. A replacement facility with additional processing lines would not only meet current and future compliance requirements, but also enable the elimination of a number of single points of failure.

It is presently anticipated that a replacement facility could have processing capabilities for a wider range of emerging radioisotopes and products under development or to be introduced into Australia. This includes therapeutic radiopharmaceuticals and 'theranostics' (a diagnostic and therapeutic radiopharmaceutical in one), which are projected to drive a revolution in the global nuclear medicine market.

The growing clinical interest in the use of new therapeutic radiopharmaceuticals presents significant opportunities for ANSTO over the coming years, including Lutetium-177 (Lu-177), which ANSTO currently produces for neuroendocrine and prostate cancer clinical trials.

Results from a single centre Australian phase II clinical trial of Lutetium-177 (PSMA-617) have demonstrated Lutetium-177's potential in delivering significant benefits to men with advanced prostate cancer, including improved overall quality of life. The positive results from the study have provided the evidence required to support a larger multi-centre clinical trial, which ANSTO is also supporting.

The recently established Applied Molecular Therapies Pty Ltd (AMT) joint venture between ANSTO and Australian radiopharmaceutical company Cyclotek will support the development, manufacture and supply of therapeutic radiopharmaceuticals within Australia and in the broader Asia-Pacific region over the coming years. The opportunity leverages ANSTO's significant investment in emerging therapeutic radioisotopes, particularly Lu-177, which is currently leading clinical development for targeted therapy globally. AMT is well positioned to participate in this emerging market and take a leadership role in the region.



Major projects

2 ANSTO Innovation Precinct

Strategic objective 2
World leading research and technology outcomes

Strategic objective 3
Strategic management of landmark and national infrastructure

Strategic objective 5
Business and innovation

In line with ANSTO's purpose and the national priority to drive Australian innovation through greater synergies between science and business, ANSTO is establishing an Innovation Precinct at its campus in Southern Sydney.

Alongside Australia's centre of nuclear capabilities and expertise, the Precinct will co-locate knowledge intensive businesses; high-tech industry; STEMM graduates from Australian universities; and scientific partners. Two significant components are the Graduate Institute and the nandin Deep Technology Incubator. In partnership, they will create an innovation community that nurtures and drives technology development and transfer, commercialisation, entrepreneurialism, collaboration and industry-ready postgraduates.

The ANSTO Innovation Precinct concept began a number of years ago in partnership with local business groups. In 2017, the Federal Parliament made amendments to ANSTO's governing legislation to provide ANSTO with the legislative flexibility to successfully establish the precinct. This paved the way for ANSTO to begin detailed planning and execution of the initial stages of the Innovation Precinct in earnest.

The nandin Deep Technology Incubator opened in November 2018 with six members and quickly grew to nine members. Early members include Australian businesses and startups engaged in manufacturing, smart technology, aerospace, defence and cyber-security. nandin has also become a hub for business groups and industry clusters, providing collaboration space and hard infrastructure for such groups in southern Sydney. ANSTO will continue to expand nandin's membership and activities over the next four years in partnership with industry and Government.

The vision for ANSTO's Innovation Precinct is to create:

A globally connected, vibrant and inclusive community with researchers, startups and industries delivering inspired solutions in partnership for a sustainable world.

The NSW Government is highly supportive of ANSTO's Innovation Precinct, and in February 2019 committed $12.5 million to:

- Co-invest in nandin Blue, a next-generation nuclear medicine industry cluster with shared chemistry and biology laboratories. nandin Blue will be unique within NSW and Australia, establishing NSW as a global centre of excellence
- Support the establishment of the Graduate Institute by contributing to the refurbishment of student space and creating a scholarship scheme
- Support industry laboratory suites for R&D
- Contribute to the creation of a prototyping and maker space
- Contribute to the establishment of a node of the Design Factory Global Network.

This NSW investment is a vital catalyst for the realisation of the broader ANSTO Innovation Precinct project. ANSTO is looking forward to delivering this crucial foundational stage of the Innovation Precinct over the next four years and building on this investment to crowd in new industries and students, driving innovation and creating new jobs.

Delivery of the infrastructure under this investment will be staged over the coming three years.

The Graduate Institute's Industry Foundations Program is sponsored by the NSW Government. It will give 25 graduate students the opportunity to work in a real-world environment alongside ANSTO's industry partners and under the guidance of some of Australia's leading scientists, researchers and engineers. They will also be given access to ANSTO's national and landmark research infrastructure. The first students of 'Industry Foundations Program' will commence in semester one 2020, with annual intakes each year thereafter.

In addition to the NSW Government's financial investment, the Greater Sydney Commission designated the Innovation Precinct as a Collaboration Area for 2018-19 and a planning priority for Sydney. The Collaboration Area will culminate in a 'Place Strategy' for the Innovation Precinct, which will be put before the Greater Sydney Commission for approval towards the end of 2019.

Major projects

3 Science, Technology, Engineering, Mathematics and Medicine (STEMM) education

Strategic objective 2

World leading research and technology outcomes

Strategic objective 4

Nuclear and related expertise and advice

ANSTO adopts a multisensory approach to STEMM education, offering students and their teachers the opportunity to engage with the organisation's world-class research in a variety of ways; by hearing, seeing, and even participating in experiments.

ANSTO's comprehensive STEMM education program aims to enhance the knowledge of students, teachers and the general public on the benefits of nuclear science and technology, and to provide insights into what a career in STEMM can offer young people considering their future.

In the last five years, almost 68,000 primary and secondary school students have participated in ANSTO's STEMM education activities, an almost 70 per cent increase on the previous five years. Specialised science tour programs available at our two main campuses in Sydney and Melbourne have provided school students with unique opportunities to go behind the scenes and visit scientists at work, as well as to witness theoretical science being put into action.

ANSTO has also supported over 290 video-conferencing activities. These provide an affordable, online incursion alternative to the ANSTO science excursion program, which is particularly useful to rural and regional schools. Almost 3,000 students in remote and regional areas of Australia took part in ANSTO video conference experiences, enabling students to talk directly to scientists and receive support for their science studies. Additionally, ANSTO is making a growing number of online resources, including written material, virtual reality technology apps and animations available to teachers and students.

The programs are designed to complement in-class studies and are aligned with NSW Education Standards Authority (NESA) and Victorian Certificate of Education syllabus outcomes. Over the past five year period, ANSTO has supported 1,890 teachers across all Australian states and territories who have participated in ANSTO's accredited teacher professional development courses. Over the next four years, ANSTO will focus on growing teacher development opportunities nationally and expand its range of classroom resources.

In the next decade, ANSTO will continue to introduce the benefits of nuclear science and technology to students in innovative ways to drive positive engagement in STEMM. New apps utilising virtual and augmented reality technologies will be developed by 2020 to bring theoretical science to life through multisensory learning.

Established STEMM education and role model initiatives such as the ANSTO Big Ideas Forum, Girls in the Lab, the annual AINSE Women in STEMM and Entrepreneurship (WISE) School, the Graduate Development Program, Top Coder competitions and Science and Engineering Challenges will continue to provide primary, secondary and tertiary students from across Australia with immersive experiences at ANSTO. Through these programs, ANSTO hopes to inspire young people to consider and continue with a career in STEMM, contributing to a strong nationwide pipeline of talent for Australian science. For the first time, ANSTO has also had two staff selected for Science and Technology Australia's 2019-2020 Superstars of STEM program.

Comprehensive apprenticeship and trainee programs will see ANSTO continue to engage technicians and trades persons within the field of science for young Australians who are completing their formal qualifications through recognised training organisations, such as TAFE.

Recognising that broad society engagement is vital for STEMM education to flourish, ANSTO will maintain and grow community involvement with science, encouraging the general public to visit and participate in tours, school holiday workshops, in open days and citizen science projects.

Major projects

4 Project BR—GHT

Strategic objective 2

World leading research and technology outcomes

Strategic objective 3

Strategic management of landmark and national infrastructure

The Australian and New Zealand science and research community successfully raised almost $100 million to expand the scientific capabilities of the Australian Synchrotron. This investment supports the $520 million of operational funding provided to the Australian Synchrotron by the Australian Government.

The response from the Australian and New Zealand research community has been overwhelming and is testament to the importance of the facility to the Australian and New Zealand innovation and science ecosystem. To date, over $94 million has been secured from more than 30 universities, research institutes, and government agencies, which will enable ANSTO to construct up to nine additional beamlines at the facility over the coming years, nearly doubling its research capacity.

ANSTO's engineering and planning expertise is a significant part of the BR–GHT project. Detailed design of the first six new beamlines is currently underway, with construction of the microcomputed tomography (MCT) and two medium energy X-ray absorption spectroscopy (MEX1&2) beamlines to commence in the second half of 2019. Construction of the Small Angle X-ray Scattering (BioSAXS) and Advanced Diffraction and Scattering beamlines (ADS1&2) will commence shortly thereafter.

The MCT beamline will open a window to the micron-scale 3D structure of a wide range of samples relevant to many areas of science including life sciences, materials engineering, anthropology, palaeontology and geology. A key feature will be the speed of data collection, allowing numerous samples to be imaged as well as enabling experiments where a single specimen is imaged many times to observe dynamic responses to changing conditions. The beamline will facilitate important research for Australian industry, such as analysing the microstructure of coal and coke for the mining and energy industries, and the development of high-grade medical implants.

The MEX beamlines will provide medium energy absorption spectroscopy on a bending magnet, optimised for cutting-edge applications in biological, agricultural and environmental science. Excitingly, it will provide an energy range not currently available to Australian and New Zealand researchers. The beamline will assist Australian industry in a number of ways, including aiding the mining industry in developing improved sulphide mineral processing and investigating sulphur in food and beverages, particularly in the form of preservatives.

Supported by the New Zealand's significant $25 million investment, BioSAXS will combine a state-of-the-art small angle scattering beamline with specialised on-line protein purification and preparation techniques for high-throughput protein analysis focused on improving drug design and validation processes.

The fifth and sixth beamlines will provide high energy capability. The Advanced Diffraction and Scattering beamlines (ADS1&2) will have applications for the mineral, manufacturing and materials sectors, including energy, transport, defence, marine and aerospace sectors.

ANSTO is in close consultation with its funding partners regarding the scoping and planning for the remaining beamlines.

Major projects

5 Expanding our waste management capabilities

The safe management and storage of diverse radioactive waste at ANSTO has moved into a new phase with the development of an innovative waste treatment technology, demonstration plant and construction of new facility on site.

Innovative and sustainable waste conditioning and management technologies, such as Synroc, will bring benefits to domestic and international facilities that hold radioactive waste.

These developments support ANSTO's core capability and legislative mandate to store and manage ANSTO's radioactive waste.

Synroc waste treatment technology is an exciting Australian innovation that dramatically reduces the volume of liquid radioactive waste for disposal compared to other methods of waste treatment, such as encasing in cement.

The world-first Synroc waste treatment plant is under construction adjacent to ANSTO's new Nuclear Medicine facility.

The new Synroc facility will treat liquid waste by-products from the manufacture of Mo-99 in a safe, economical and sustainable way. The facility is expected to be operational in 2021.

Following completion of the Synroc facility, ANSTO will undertake research into disposal solutions for niche waste streams generated from past activities, including those of its predecessor organisation, the Australian Atomic Energy Commission. Currently these waste streams are not suitable for treatment with the Synroc facility currently under construction.

There is potential for ANSTO's research on radioactive waste treatment and novel technologies to be adopted for use in overseas facilities—providing a commercial revenue stream to ANSTO.

ANSTO continues to provide technical advice to Government and the Australian community on the full life-cycle management of radioactive waste, including operational requirements, the development of safety cases, design parameters, and governance structures, particularly with regard to the establishment of the National Radioactive Waste Management Facility (NRWMF).

Leveraging our expertise and facilities for radioactive waste characterisation and treatment, ANSTO is committed to supporting other Australian facilities that produce radioactive waste in the preparation of their low-level radioactive waste for disposal at the NRWMF in future. At the same time, ANSTO will begin preparations to ensure its waste is ready for storage at the NRWMF when it is operational in 2026.

Critical interim funding provided in the 2019-2020 Budget is allowing ANSTO to continue to manage radioactive waste from the past production of life-saving nuclear medicine and research.

Preparations are underway to receive the second and final shipment of spent HIFAR fuel following reprocessing in Europe. The shipment is due to arrive back in Australia before 2023 and will need to be safely stored at ANSTO as an interim measure prior to the operation of the NRWMF.

As part of a sustainable long-term funding plan, ANSTO and the Government are working together to address ANSTO's spent fuel and radioactive waste management responsibilities until the new national facility is operational.

Major projects

6 Next generation accelerator technologies

Strategic objective 2
World leading research and technology outcomes

Strategic objective 3
Strategic management of landmark and national infrastructure

Strategic objective 4
Nuclear and related expertise and advice

Strategic objective 5
Business and innovation

ANSTO oversees the most significant accelerator-based infrastructure in Australia. With applications across the A to Z of science (archaeology to zoology), accelerators are now more important than ever as an innovative tool used by the Australian research community and industry to solve some of the world's most complex problems.

ANSTO's accelerator-related experience and expertise includes applications of accelerator science in environmental monitoring, climate science, nuclear medicine, space physics and forensics, among others and a strong history in the underlying accelerator physics and technology. This is exemplified by ANSTO's role in building and operating landmark facilities such as the Australian Synchrotron and the Centre for Accelerator Science. Accordingly, ANSTO is well positioned to be the convener and implementer of new developments in accelerator technologies in Australia.

Trends across the globe that are pushing the accelerator physics and technology frontier include the commissioning of X-ray free electron lasers, millions of times brighter than the Australian Synchrotron, and compact systems that can provide synchrotron-like fields in a facility housed in a university or a hospital, or that can deliver therapeutic particle beams to patients via a small gantry.

Compact light sources, enabled through recent advances in accelerator and laser technologies, offer a potentially disruptive technology that would enable ANSTO to translate the results of studies at the Australian Synchrotron's Imaging and Medical beamline (IMBL) into clinically relevant practices. International recognition for ANSTO's expertise in accelerator physics, including modelling and advanced diagnostic and feedback systems, enables the accelerator physics team to remain in touch with global developments in both compact light sources and x-ray free electron lasers. This allows ANSTO to be part of the next generation of accelerator-based light sources used for the public benefit.

More broadly, as the custodian of much of Australia's particle accelerator capabilities and expertise, ANSTO has provided, and will continue to provide, valuable advice and assistance to partners in universities and research institutes that share a common interest in this area. This ensures that ANSTO (and in turn, Australia) are kept up to date with the future of accelerator developments, and can identify potential improvement opportunities to benefit Australia. Examples include accelerator systems for radioisotope production and for particle therapy.

In conjunction with the University of Sydney, ANSTO operates the National Research Cyclotron Facility, part of the National Imaging Facility (NIF) in Camperdown, NSW. The cyclotron produces a range of radiopharmaceuticals for research purposes. The cyclotron is accessible to scientists and researchers across Australia, who are able to collaborate with ANSTO experts to use the radioisotopes in conjunction with nuclear diagnostic imaging such as PET or SPECT primarily for pre-clinical studies. ANSTO will also be an important partner supporting other cyclotron or linear accelerator research facilities as they are developed.

Particle therapy is an advanced treatment that destroys cancer non-invasively. ANSTO is helping to facilitate a national discussion on Australia's approach to making this important cancer treatment available to Australian patients.

The Commonwealth Government's 2017-18 Budget included $68 million towards the construction of a proton-based particle therapy facility at the South Australian Health and Medical Research Institute (SAHMRI). This is an important first step towards establishing a particle therapy capability in Australia.

Particle therapy is not restricted to the use of protons. Heavy ions, principally carbon, bring additional advantages. Carbon ion-based particle therapy has demonstrated advantages in that patients require fewer treatments (in some cases, less than a week), experience fewer side effects, and achieve better outcomes compared to other treatment options.

Internationally, particle therapy has been growing rapidly and there are now 86 particle therapy facilities around the world, with a further 66 under construction or in planning as of March 2019. Deployment of particle therapy, especially carbon ion therapy, in Australia would significantly improve patient outcomes, provide opportunities for cutting-edge research and bring Australia into a community of countries adopting the most advanced approach to cancer treatment and research.

ANSTO provides valuable advice and input to the national particle therapy discourse. This includes the creation and coordination of a National Particle Therapy Steering Committee, which hosts an annual National Particle Therapy Symposium. ANSTO is also providing technical assistance and access to overseas experts to the various state-based particle therapy facility proposals. ANSTO has also assisted the New South Wales Government in developing the only proposal in Australia to date that would deliver a carbon ion particle therapy facility, which is proposed to be located at the Westmead medical precinct. ANSTO is also engaged with SAHMRI on the development of their new proton facility, conducted a technical review of the proposed facility and will continue to provide technical assistance.

Radiation treatment in the Heidelberg Ion-Beam Therapy Center (HIT).
Source: Heidelberg University Hospital.

ANSTO's core capabilities

ANSTO leverages great science to deliver big outcomes. We partner with scientists and engineers and apply new technologies to provide real-world benefits. Our work improves human health, saves lives, builds our industries and protects our environment.

Capabilities

1 Nuclear Science & Technology and management of Landmark Infrastructure (NSTLI)

The operation and strategic management of much of Australia's landmark and national research infrastructure, and the application of ANSTO's unique nuclear expertise for research and industry.

2 Business products and services

The provision of products and services - most significantly, the supply of nuclear medicine for the diagnosis and treatment of cancer and a range of other diseases.

3 Support for Government and nuclear education

The provision of specialised nuclear advice, education and training.

Enabled by

Nuclear operations

Enabling functions and services

1 Nuclear Science & Technology and management of Landmark Infrastructure (NSTLI)

ANSTO's science and research infrastructure

OPAL multi-purpose reactor

Australian Centre for Neutron Scattering

Australian Synchrotron

Centre for Accelerator Science

National Research Cyclotron

ANSTO's research focus areas

Health

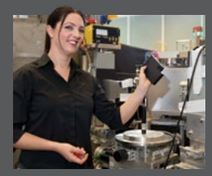
Environment

Nuclear Fuel Cycle

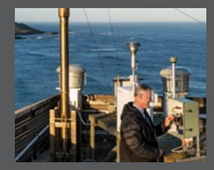
Australia's national science and research priorities

Advanced manufacturing

Cyber security



Energy



Environmental change

Food

Health

Resources

Soil and water

Transport

ANSTO's core capabilities

2 Business products and services

ANSTO provides the Australian and international community with products and services to improve human health, support industry and protect the environment.

ANSTO's range of commercial interests include health products, minerals consultancy and radiation services. ANSTO is one of the world's leading providers of irradiated services for silicon ingots which are exported to high-end electronics companies around the world.

- Health products
- Minerals consulting
- Measurement
- Gamma irradiation
- Radiation services
- Silicon irradiation
- Synroc waste treatment technology
- Neutron activation analysis and neutron irradiation

3 Support for Government and nuclear education

One of our key capabilities is the provision of expert and technical advice to the Australian Government on all matters relating to nuclear science, technology and engineering. We play a critical role in contributing to and informing policy making in these areas, as well as supporting Australia's participation in international dialogue on nuclear matters. Our science, technology, engineering, mathematics and medicine (STEMM) education capability contributes to the national objective of engaging all Australians in science and building scientific capacity and skills.

Enabled by

Nuclear Operations

Nuclear Operations encompasses the operation of Australia's world-class multi-purpose reactor, OPAL; and the management of radioactive waste from the production of nuclear medicines, as well as a broad range of research.

Importantly, this capability will be maintained and strengthened through the provision of $12 million in the 2019-20 Budget to undertake critical waste management, spent fuel management and decommissioning activities over the coming financial year. This funding will ensure we can continue to operate within our regulatory framework and allow us to continue to work with Government to establish a sustainable long-term funding plan for Australia's nuclear decommissioning and radioactive waste management, and spent fuel management responsibilities.

Significant work is planned over the next four years. OPAL will undertake a Periodic Safety and Security Review in line with regulatory requirements; work towards qualifying a second fuel and target plate supplier to mitigate supply risk; and plan for the major shutdown of the OPAL reactor in 2024 to replace the Cold Neutron Source. Longer-term maintenance planning includes: the replacement of control rods and the control rod guidebox; replacement of heavy water; and the planning for a second Neutron Beam Guide Hall for Australian industry and researchers. The second OPAL spent fuel shipment is planned for 2025-2026.

Enabling functions and services

Enabling functions and services includes human resources; legal; finance and procurement; security and safety; and ITC.

As ANSTO increases its engagement in global collaboration, ANSTO will be focusing on increasing the mobility of its services to enable the workforce to operate seamlessly from anywhere at any time. To support this virtual operating environment, ANSTO will be investing in the next generation of Microsoft Productivity Tools to complement the current SAP suite of tools. ANSTO is currently building a data driven analytics platform leveraging PowerBI as the user interface.

ANSTO continues to realise benefit from the ANSTO Enterprise SAP suite. The ANSTO Enterprise program has delivered a robust platform digitising and integrating ANSTO's processes and systems. Following the successful integration of the Australian Synchrotron, ANSTO has been focused on embedding the Advanced Planning and Optimization for its nuclear medicine supply chain. To prepare for the next phase of SAP (SAP HANA) due to be universally implemented by 2025, ANSTO is focusing on further simplification of ANSTO Enterprise. ANSTO will be seeking early adoption of the upgraded SAP system to ensure smooth integration into its more complex processes, such as nuclear medicine production. The digitisation and integration of end-to-end systems and processes are aimed at achieving long term efficiencies, as well as enabling greater transparency to minimise operational surprises.

Cyber Security remains a top priority for ANSTO. ANSTO is implementing major programs around identity management, intrusion detection and prevention, and improved network security to provide increased flexibility for scientific use, while maintaining the level of protection needed for ANSTO.

Governance and oversight of risk management

In order to fulfil our purpose and achieve our strategic objectives, we need to engage with risk and exploit opportunity, while also effectively managing uncertainty.

The ANSTO Board retains overall accountability for the application and integrity of ANSTO's systems of risk and control. The ANSTO Executive and line management are accountable to the Board and are responsible for implementing, monitoring and continuously improving these systems, and for their integration into the day-to-day activities of the organisation (see Figure 2, below).

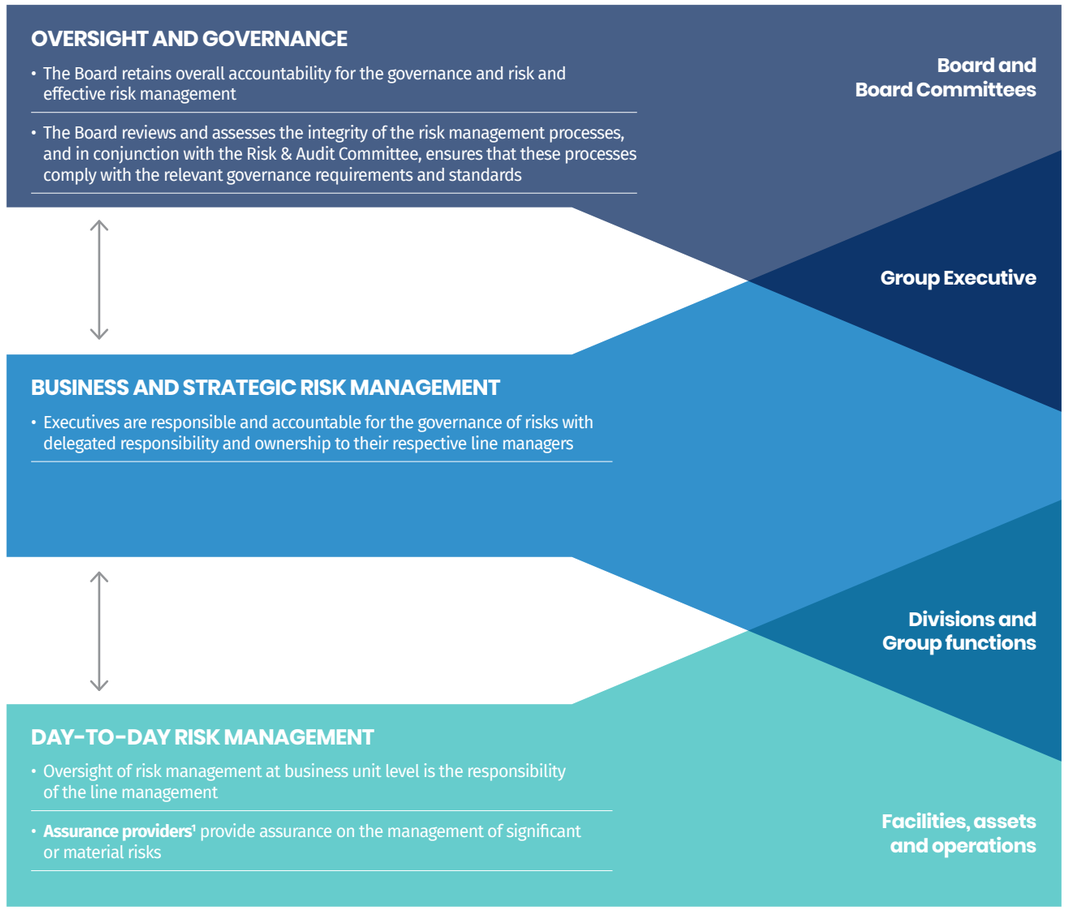


FIGURE 2 Accountability and responsibility for risk management

[1] ANSTO applies a Combined Assurance model based on the 'five lines of defence'.

How we manage risk

Implementing our Enterprise Risk Management Framework

We are currently implementing our Enterprise Risk Management Framework and plan to improve the governance and oversight of risk management, the integration of risk management into key decision-making processes and the application of our risk management processes across our operations over the next four years. This will coincide with specific initiatives to enhance our risk management capabilities and the development of new metrics to more accurately measure our risk management performance.

FIGURE 3 ANSTO Enterprise Risk Management Framework

Implementing our Enterprise Risk Management Framework

We are currently implementing our Enterprise Risk Management Framework through a Board-approved annual plan. For the 2019-2020 financial year, we plan to improve the governance and oversight of risk management, the integration of risk management into key decision-making processes and the application of our risk management processes across our operations. This will coincide with specific initiatives to enhance our risk management capabilities and the development of new metrics to more accurately measure our risk management performance.

Our risk management process

Our innovative risk management process directs attention to uncertainties across operations, supply chains, projects and business ventures. This assists us not only to preserve value, but also to create value on a risk-informed basis in line with our purpose, capacity, appetite and tolerance for risk.

To ensure we have a consistent approach to risk management across the organisation, our risk management process is made up of four rolling phases:

Plan	Identify and understand risk.
Do	Manage and monitor risk.
Review	Govern and assure effectiveness of risk management.
Improve	Determine opportunities for improvement. Implement improvements.

Our 'high risk' escalation process

Risks that are not within acceptable thresholds as defined in our Risk Appetite Framework must be escalated within a set timeframe to the responsible Executive and communicated to other relevant stakeholders. Based on available information and inputs from subject matter experts, the responsible person can either accept the risk, add controls or improve existing controls, or terminate the risk.

Governance and oversight of risk management

Our Risk Appetite Framework

Our Risk Appetite Framework provides specific guidance for strategic and operational decision-making across our organisation. We endeavour to understand and proactively manage risks within our risk appetite and risk tolerance levels in order to ensure safe operations and optimise returns.

We define risk appetite as the degree and types of risk we are willing to accept in pursuit of our strategic objectives. We define risk tolerance as the degree and limits of risk exposure and variation in performance outcomes we are willing to accept. It sets the maximum boundary beyond which we are unwilling to operate.

In line with our Enterprise Risk Management Framework and focus on continuous improvement, we attempt to align our risk management practices with contemporary thinking. To this end, we are taking steps to further institutionalise our Risk Appetite Framework as outlined in Figure 4 below.

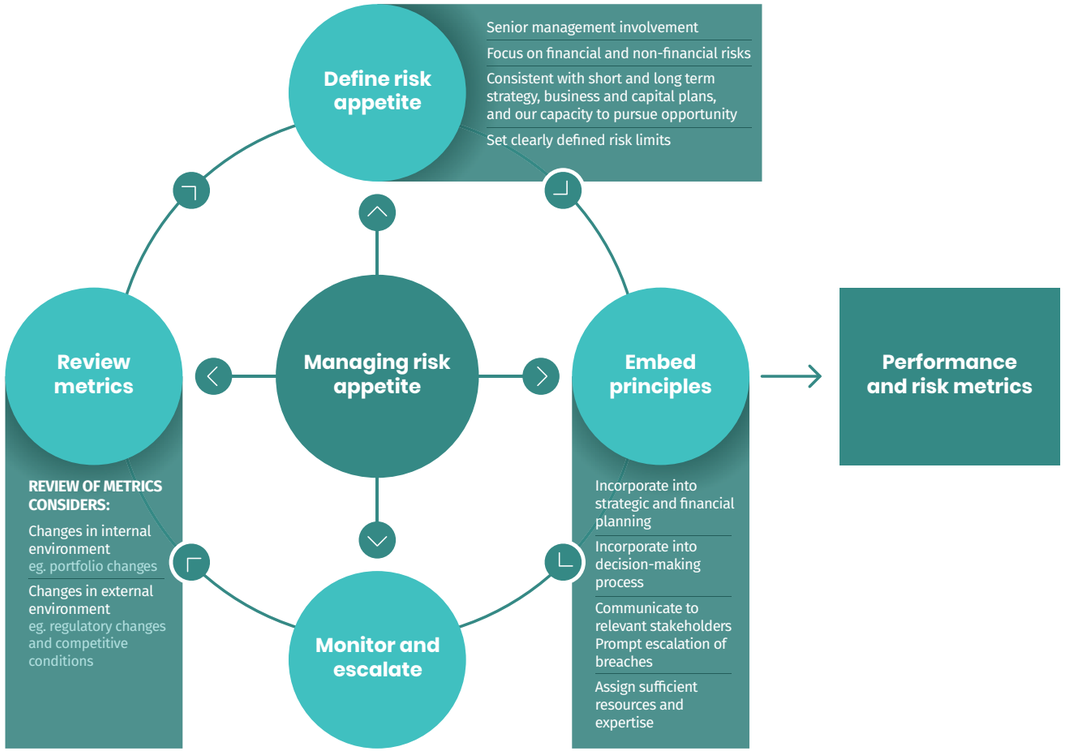


FIGURE 4 Managing Risk Appetite

Risk management in action

Based on the nature of our operations, we need a sound understanding of the risks we are exposed to as an organisation. From an enterprise risk perspective, we follow a structured approach to identify and prioritise risks across the organisation.

We classify our risk exposures broadly according to six risk categories:

RISK TYPE	DESCRIPTION	RESPONSE
Financial	*Risks that may affect our overall financial performance and sustainability, including capital availability, liquidity and credit risk.*	We are protecting our balance sheet and cash flows to limit potential negative impact on the organisation through a range of measures, including relevant policies and procedures and financial forecasting.
Operational	*Risks that may affect the execution of our business model, including the efficiency and effectiveness of operations and systems.*	In order to ensure reliable and safe operations, we focus on the day-to-day management of operational risks, including risks related to safety and the environment.
Market	*Risks that are influenced by external factors yet may affect the viability of our businesses.*	We form strategic partnerships and constantly monitor the safety and quality of our products and the competitive environment.
People	*Risks that may affect the overall wellbeing and performance of our management and staff.*	We actively endeavour to create a safe, secure and high-performance working environment, by providing flexible work arrangements and fostering a culture of learning and innovation.
Legal and Regulatory	*Risks that may result in noncompliance with applicable laws, regulations and governance practices.*	We monitor compliance with applicable statutory and regulatory obligations as well as with organisational policies and procedures.
Stakeholder and Geopolitical	*Risks that may negatively impact our reputation and expose us to geopolitical uncertainty.*	We maintain strong relations with our key stakeholders; consider the risks before commercially or professionally engaging with parties in other jurisdictions, and actively attempt to prevent any action that could negatively impact on our reputation and brand.

Risk culture

We acknowledge that organisations with a strong risk culture are more resilient, have the capability to make improved and timelier business decisions and are better equipped to protect and enhance their reputation. To this end, we plan to actively pursue opportunities to improve our risk culture, and the effectiveness of our risk management processes.

Australian Government

ANSTO

Lucas Heights | Clayton | Camperdown

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