



Australian Government

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Nuclear-based science benefiting all Australians

2010-2015 Corporate Plan



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Over 50 years of scientific endeavour and technology delivery provides a strong foundation for our future. While we proudly acknowledge our past, we need to position ANSTO for the next 50 years.

A Message from the CEO

Science by its nature is both precise and imperfect, open to challenge, creating connections and providing serendipitous outcomes for our benefit. We have examined our vision, purpose and core values against a contextual overview of nuclear science and technology. We have analysed the findings from strategic and operational reviews undertaken over the past two years and used these to set our strategic priorities for 2010-2015.

These priorities allow us to achieve our functions under the *Australian Nuclear Science and Technology Organisation Act 1987*.

We have had the courage to look back, critically self-assess our performance and think about our role in the global nuclear science community. We believe that advances and opportunities in the peaceful application of nuclear science and technology will be unsurpassed in the next decade.

Ensuring that Australia retakes its rightful place at the nuclear science and technology table has never been as important as it is now. It will mean that all Australians can continue to benefit from essential products and services such as radiopharmaceuticals for medical diagnosis and therapy. But this is just the beginning.

ANSTO must position itself in areas of crucial development, including hadron particle therapy, nuclear chemistry and fusion research. Our key platforms of accelerators and the Open Pool Australian Light water reactor (OPAL) enable us to participate in cutting edge science and technology with immense benefit to humankind.

ANSTO also plays a vital role in providing expert and independent advice to Government and proactively supporting the safe use of nuclear science and technology in our region and globally. This includes areas such as nuclear safety and security, radioactive waste management and nuclear forensics.

This document frames ANSTO's next five years, and holds us accountable, both scientifically and economically, through review and achievement. Positioning ANSTO as the natural partner of choice will foster, nurture and develop not only next generation technologies but also the next generation of nuclear scientists and engineers.

These are exciting times for the world of nuclear science and technology, and ANSTO is ready to respond.

A handwritten signature in blue ink, appearing to read 'Adi Paterson'. The signature is stylized and fluid.

Dr Adi Paterson





Introduction

Nuclear science and technology is a dynamic area of endeavour that focuses on the basic building blocks of matter at the atomic and sub-atomic level. It has many uses, including helping to gain a better understanding of both biological and physically complex systems, and in improving our quality of life. Nuclear science and technology's potential to improve our lives and unlock the many mysteries of science is well established, but new and exciting areas are still open for innovation.

This document details ANSTO's Corporate Plan (the Plan) for the period 2010-2015, in particular:

- Our vision, purpose and core values
- A contextual overview of nuclear science and technology
- Findings from strategic and operational reviews undertaken over the past two years
- Strategic priorities for 2010-2015
- How we will measure our success in implementing the Plan.

Key external documents that have informed development of the Plan include:

- Statement of Expectations for the Australian Nuclear Science and Technology Organisation (Minister for Innovation, Industry, Science and Research)
- Australia's National Research Priorities
- Powering Ideas: An Innovation Agenda for the 21st Century
- National Security Science and Innovation Strategy
- Inspiring Australia: A National Strategy for Engagement with the Sciences
- *Australian Nuclear Science and Technology Organisation Act 1987.*

Internal documents include ANSTO's:

- 2030 Scenario Planning Research Papers (2010)
- 2055 Infrastructure Plan (2010)
- ANSTO Statement of Intent (2010).

Our Vision

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

Our Purpose

Under the *Australian Nuclear Science and Technology Organisation Act 1987*, our core functions are to:

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

Our Core Values

- Safety, security and environmental sustainability – safeguarding human health, ensuring high priority to safe and secure operations, and minimising our environmental footprint
- One ANSTO – a unique organisation, working as one to harness the power of nuclear science and technology to solve the great scientific, environmental and human challenges of our times
- Transformation and Performance – increased flexibility, agility and efficiency through de-bureaucratisation, increased accountability and performance through a focus on outcomes
- Partnerships and Collaboration – working collaboratively with our partners, both internal and external, for the benefit of government, customers and the community.



Strategic Context

In the decade to 2020, energy, health, climate, environment, water and security will continue to be global areas of concern under all economic scenarios.

ANSTO recognises that various aspects of the nuclear world are often a source of division and consternation. However, no modern nation can advance and meet the needs of its people without a deep and profound understanding of, engagement with, and utilisation of the benefits of nuclear science and technology.

Nuclear safeguards and security remain a significant challenge globally. Australia can only engage internationally in seeking to address these issues if it maintains a critical mass of people and facilities that provide a capability and deep understanding of the major domains of nuclear science and technology, and associated systems.

There are five focus areas and systems that support nuclear science and technology.

The peaceful use of nuclear science and technology is dependent on understanding these systems and the applications that are derived from them. The key global and local trends associated with these areas are:

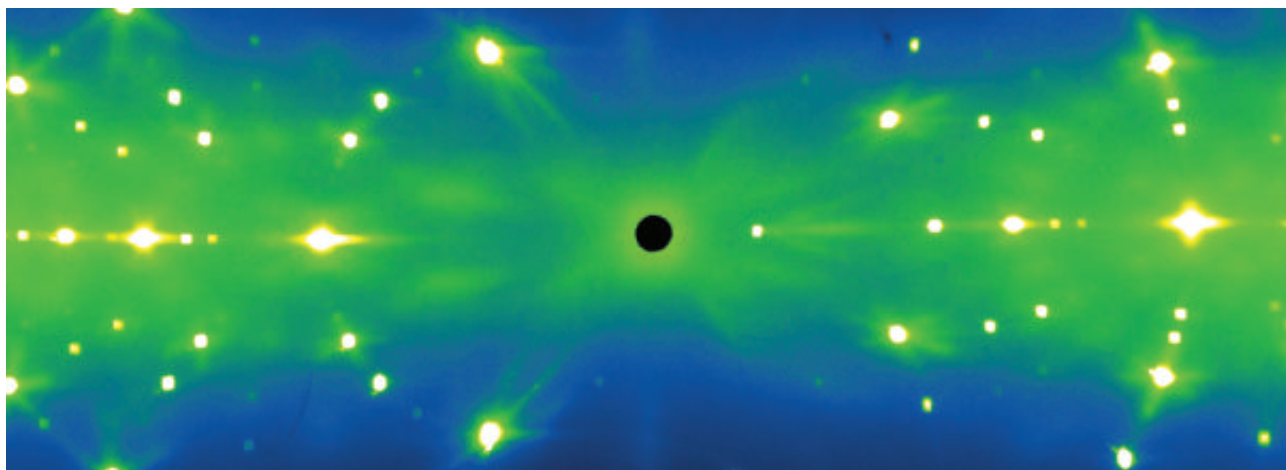
1. Nuclear Interactions, Isotopes, Chemistry and Materials

Areas of ongoing importance include:

- Development and application of radioisotopes for industrial, environmental and medical purposes
- Understanding how radiation interacts with matter
- Use of isotopes, particle beams, synchrotron light and plasmas in research and applications, including medicine.

The integration of nuclear imaging techniques with Computed Tomography (CT) scanning, together with new modalities of case management, will drive the growth of these techniques in improving human health.

Because of its precise temporal and spatial measurement capabilities, nuclear science and technology will continue to play a critical role in understanding both biological and physically complex systems underpinning developments in climate research, new materials and modern medicine.





ANSTO is well positioned, in collaboration with the academic, research and commercial communities, to conduct ongoing research and innovation in each of these areas.

2. Accelerator Systems

Accelerator systems (cyclotrons, synchrotrons and linear accelerators) are the workhorses of nuclear science and technology. It is essential for a developed nation to have a robust and growing infrastructure of accelerator systems if it is to expand its knowledge base and benefit from new techniques and applications.

Australia is prescient to have developed the Australian Synchrotron and in providing funding for the new Centre for Accelerator Science. These two initiatives have re-energised a community that was at serious risk of disconnecting from the rest of the developed world. Australia will also benefit in the coming years from the commissioning of new medium energy cyclotrons for use in medicine and research.

However, if Australia is to participate in and benefit from cutting edge research, then it will need to engage with, and develop expertise in particle therapy platforms and large-scale accelerator facilities, such as the Large Hadron Collider at CERN.

Accelerators

ANSTO currently operates two accelerators (STAR and ANTARES), which provide high sensitivity analytical technologies for the benefit of internal and external users.

These facilities are used annually by over 100 external researchers and clients from Australian universities, other research organisations and a number of international scientific collaborators.

These high quality analytical services are used in:

- Environmental science, including research into climate change, water resources and air pollution
- Nuclear non-proliferation investigations
- Studies of materials engineered for applications in medicine and nanotechnology.

In the 2009-2010 budget, the Australian Government allocated \$25 million to establish a Centre for Accelerator Science at ANSTO's main facility in Sydney. ANSTO will also make a substantial contribution from its own funds to support this important initiative.

This new facility will contain two new state-of-the-art accelerators with enhancements developed at ANSTO to increase sensitivity, sample throughput and range of applications.

The Centre will also contain sample preparation laboratories, uranium series laboratories (relocated from the Australian National University), office space and a visitor display area. The facility will complement Australia's existing accelerator capability and will be available to the user community by 2015.

ANSTO will implement measures detailed in this Plan to ensure that it can actively participate in these emerging areas.

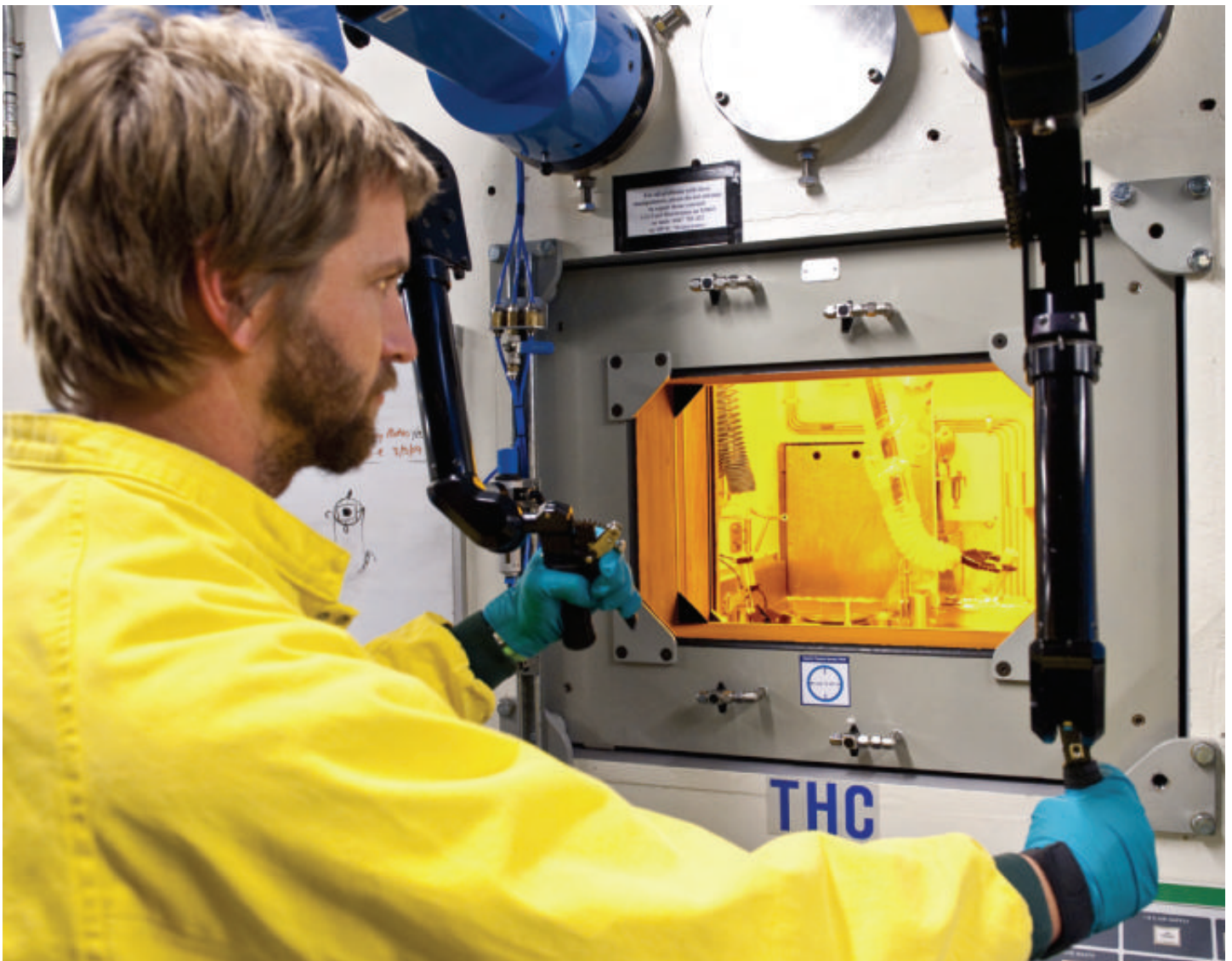
3. Reactor Systems

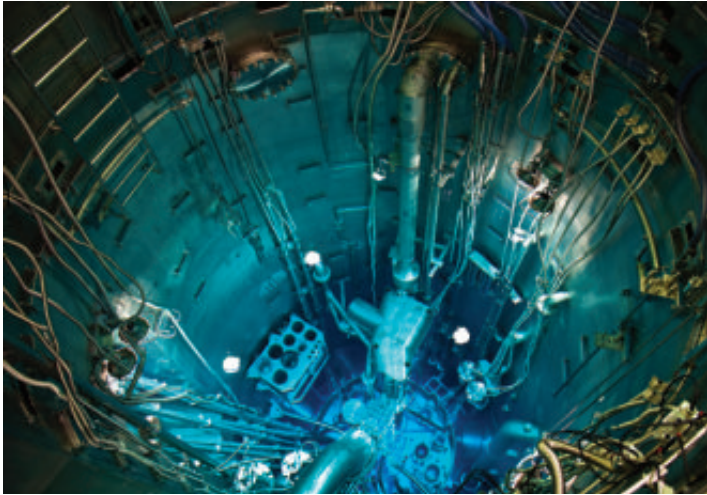
In nuclear science and technology, the “accelerator world” is complemented by the “reactor world”. There has been a resurgence of interest in a new and distinctive family of research reactors, with ANSTO’s OPAL research reactor generating interest in a number of countries. OPAL is a cornerstone of ANSTO’s science and health initiatives.

ANSTO, in partnership with the Australian

National University, will give strategic priority to providing the Australian Government with insight into the importance of fusion research (and plasma research more generally) and ensure that a new generation of Australian scientists and engineers can participate locally and globally in this important endeavour.

ANSTO will also continue to focus on understanding the interaction of radiation with materials, particularly in extreme environments.





4. The Nuclear Fuel Cycle

Australia plays a pivotal role in the world's nuclear industry through its significant reserves of uranium, its world-class mines and a vigorous exploration programme.

ANSTO will continue to support this industry through business units such as ANSTO Minerals, a globally respected research and engineering services entity, and ANSTO Inc., dedicated to the management of niche nuclear wastes. ANSTO has unique partnerships to maintain and grow its position in complex wastefrom science and the management of nuclear waste.

5. Nuclear Safety, Safeguards and Security

Australia has a strong leadership role in the global multilateral setting of the International Atomic Energy Agency (IAEA). ANSTO's technical and policy support roles have been, and will remain, essential to Government for the continuation of this role.

With the expanded scope of National Security, global interest in non-proliferation and the ongoing threat of global terrorist activity, ANSTO will leverage its knowledge to expand its activities in areas of national interest, including nuclear security and non-proliferation. ANSTO will deepen its partnership with government to deliver critical non-proliferation, nuclear safeguards and security technologies.

ANSTO will need to be both a leader and partner if Australia is to retain and grow its contribution to nuclear science and technology locally and globally.

ANSTO will continue to put nuclear safety at the top of its strategic priorities, both in terms of nuclear and radiation safety at its sites, as well as in the broader context.



Current State Analysis

During 2008 and 2009, ANSTO undertook a number of internal and external strategic and operational reviews, including an assessment of our current strategic priorities.

The analysis indicates that ANSTO has made considerable progress in key strategic areas including the successful commissioning of the OPAL reactor, the establishment of a world-class neutron scattering capability and the ongoing development of ANSTO's accelerator science, technology and associated facilities. There has also been significant focus on areas of national importance, including security related issues; the establishment of the National Deuteration Facility; realignment of ANSTO research portfolio to better reflect the Government's research and innovation policies; and progress in communicating ANSTO's role and expertise to key Government departments. In other areas progress has been less evident.

These reviews have also highlighted several opportunities for improvement, including the need to:

- increase our reach into the community to provide education about, and address concerns surrounding the application and benefit of, nuclear science and technology

- actively support development of the next generation of nuclear scientists and engineers for Australia and the region
- streamline ANSTO's internal systems and processes
- ensure ANSTO has the most appropriate organisational structure to support its strategic direction
- develop a strong performance culture
- foster partnerships and collaborations both internally and externally
- create an improved portfolio of focused international partnerships
- establish longer integrative research and innovation programmes.

In 2009, the Federal Government provided significant new financial investment, under the Super Science initiative, for three additional neutron beam instruments and a Centre for Accelerator Science. ANSTO has also established several companies to exploit intellectual property.

Two of these have been established as stand-alone entities, while a third will provide an excellent platform in the United States to advance our interests in specialised waste forms.

Strategic Priorities 2010-2015

ANSTO is well positioned, both nationally and internationally, to take advantage of the global resurgence in nuclear science and technology. In moving forward, the organisation will be focused on establishing a truly national presence, as well as extending its influence regionally and beyond.

OPAL

OPAL is ANSTO's world-class nuclear research reactor. It is a multi-purpose facility that generates neutrons for neutron scattering experiments, uses neutrons to activate samples for research and commercial application, and to irradiate targets for radioisotope and radiopharmaceutical production, and silicon for the semi-conductor industry. It was designed to meet Australia's specific needs and officially opened in April 2007.

OPAL is still in its early years of operation. It will take some time to optimise all aspects of its performance. ANSTO's goal is for OPAL to become a world leader in research reactor operations and utilisation.

We will achieve this by:

- Building reactor availability to more than 300 days per annum at nominal full power by the end of 2011
- Delivering cold and thermal neutron beams for scientific research with a reliability of 95%
- Increasing our capacity to reliably deliver irradiated silicon, radioisotopes and activated materials to the user community
- Maintaining safety in all of our operations.

Critical to achieving these goals are a strong safety culture, efficient operational practices, systems and processes, and regularly planned maintenance programmes.

In so doing, ANSTO will:

- Realise the benefits of nuclear science and technology for the benefit of all Australians
- Build on our landmark infrastructure
- Support Australia's international competitiveness through research, innovation and collaboration
- Develop the next generation of nuclear scientists and engineers
- Enhance Australia's international standing, particularly in the areas of non-proliferation, nuclear safety, security, and specialised applications of key technologies.

The table below details the strategic priority areas for the current and new corporate plan. The change in focus is a natural evolution as ANSTO's new direction seeks to build on the achievements of previous years.



The diagram below outlines ANSTO's strategic direction for the next five years.



Strategic Priorities

ANSTO has identified four strategic priority areas for the new Plan. These will drive our focus, our resource allocation and how we monitor our success over the life of the Plan.

1. Deliver World-class Research and Innovation in Nuclear Science and Technology

ANSTO has a proud history of success in fundamental and applied research. Historically we have invested in world class infrastructure and people. This Plan seeks to continue this investment in both human and physical resources.

ANSTO's unique strength lies in research in interactions and phenomena at the molecular, atomic and sub-atomic scales and relating this to complex physical and biological systems.



ANSTO will focus on its strengths including:

- Materials Engineering research, with a focus on behaviour (observed and predicted) of materials in extreme environments (radiation, temperature and pressure) for application in next generation energy systems, application of nuclear and material sciences in national security efforts, and applied research in support of commercial opportunities in nuclear waste management.
- Environmental research, with an emphasis on the application of nuclear methods to understand past climate events, the sustainability of groundwater systems and assessing human impacts on environmental systems. Landmark infrastructure will include construction and commissioning of the Centre for Accelerator Science.



- ANSTO LifeSciences research and innovation in radionuclide and radiopharmaceutical development and novel imaging techniques to support a broad set of life sciences disciplines. Landmark infrastructure will include construction and commissioning of the ANSTO LifeSciences Biology facility.
- Neutron scattering research to support developments in diverse fields such as plastics, minerals, engineering, pharmaceuticals, electronics and biology. Landmark infrastructure will include the design and implementation of three new instruments, supported by the Government's Education Infrastructure Fund.

Where appropriate, ANSTO will collaborate and partner with other eminent Australian science and technology organisations to ensure that there is a national approach to researching major themes in key priority areas.

Strategic collaboration will be critical to ensure the optimisation of scarce resources, to maximise the contribution of complementary skill sets and to support work on landmark projects.

We will recognise our success by:

- Achieving high impact research outcomes from projects including use of accelerator

systems in studying radiation and climate phenomena

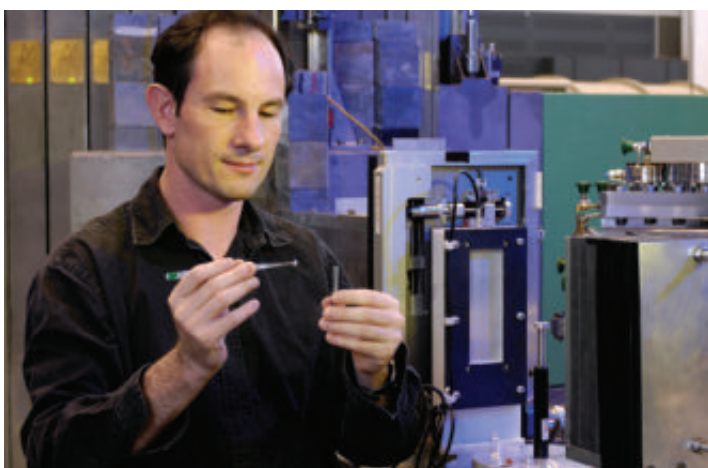
- Generating new sources of revenue from successful creation of new ventures and technology transfer
- The depth and impact of collaborative research outcomes.

2. Expand ANSTO's Reach and Contribution, Exploiting Landmark Technologies

This strategic priority area comprises a number of specific objectives, including establishing a truly national presence, expanding ANSTO's leadership role in the Australian nuclear science and technology community, re-engaging in a number of areas that are of global scientific significance, strengthening local and global networks and specific communities, and examining involvement in global fusion research programmes and the Large Hadron Collider and its multiplicity of associated programmes.

We will recognise our success by:

- The scope and impact of our national presence
- Development of national networks and communities for:
 - Cyclotrons
 - Accelerator Science and Engineering
 - Nuclear and Nuclear Engineering Education



- Serving users of our neutron scattering, isotope and accelerator facilities through AINSE, competitive research programmes, graduate and post-graduate development programmes and research partnerships
- Engagement with the global scientific community in key areas of interest.

3. Serve the Nuclear Needs of the Government, Industry, Community and People of Australia

ANSTO performs a number of essential services on behalf of the Australian Government and community. These include the provision of radiopharmaceuticals for medical diagnosis and therapy as well as expanding nuclear knowledge and capability in areas such as nuclear safety, security and safeguards, radioactive waste management and nuclear forensics. As part of this focus, ANSTO will investigate the feasibility of developing a hadron particle machine for therapeutic and research purposes.

ANSTO also plays a vital role in providing expert and independent advice to the Government, proactively supporting the safe use of nuclear science and technology in our region and internationally. These roles will continue.

ANSTO will work to raise community and industry awareness of the applications, benefits and risks of nuclear science and technology, as well as to increase industry utilisation of nuclear science and technology.

We will recognise our success by:

- The operational performance of our facilities and equipment, particularly OPAL and the radiopharmaceuticals production facilities
- Engagement with the international community, including the IAEA, on nuclear safety, security and non-proliferation
- Continued safe handling, management and storage of radioactive waste

Health

One of ANSTO's main contributions to health outcomes in Australia is through provision of radioactive diagnostic and therapeutic products. On average, every Australian will use a nuclear medicine product some time in their life.

By far the most common radioisotope used in diagnostic nuclear medical procedures is technetium-99m, a decay product from molybdenum-99. Technetium-99m radiopharmaceuticals can be used for a range of studies involving heart, brain, kidneys, lungs or bone.

Since 2009 there has been a global shortage of molybdenum-99. This shortage highlighted the fragility of the international supply chain – due mainly to the age of the reactors used for production of molybdenum-99. Towards the end of that year ANSTO completed commissioning studies of its new molybdenum-99 production process and facility and obtained approvals from the Australian Radiation Protection and Nuclear Safety Agency and the Therapeutic Goods Administration for routine production and sale of product. ANSTO is working with its customers to maximise product availability.

In the coming years, ANSTO will focus on optimising the molybdenum-99 production process. In this way we will continue to fulfil Australia's needs and assist, where possible, in alleviating shortfalls in the international market.

- Progress in raising Government, community and industry awareness of nuclear science and technology and its benefits
- Provision of radioisotopes.

4. Drive Organisational Renewal

ANSTO will sharpen its focus on long-term financial sustainability. This will include the judicious use of government appropriations and the maintenance of appropriate internal controls and governance structures. We will seek to increasingly leverage our research and development activities and grow revenue in areas of competitive advantage such as waste management technologies.



ANSTO will also strengthen engagement with the academic and student communities to ensure that Australia trains a new generation of nuclear science and technology researchers, engineers and technicians, whilst continuing to attract the best scientists from abroad.

We will recognise our success by:

- Our financial performance, including growth in commercial revenue
- Investment in our people and partners
- Predictive and proactive maintenance and development of our facilities and landmark infrastructure
- The pipeline of future scientists, engineers and leaders developed from internal sources
- The ability to attract world-class researchers from across the globe.

Enablers

Delivery of outcomes in these four areas is dependent upon:

- Investment in landmark infrastructure, both nationally as well as in Sydney
- Development of our staff and improvement in organisational outcomes
- Improvement in our capacity to develop strong partnerships with all levels of

Government, industry, universities and other research institutions

- Leadership in governance and delivery that will underpin organisational excellence and capability.

We will measure our success in these areas by:

- Our safety record
- Regulatory compliance
- Development of landmark facilities, particularly
 - The Centre for Accelerator Science
 - Three new neutron beam instruments
- Completing feasibility studies for the establishment of a knowledge campus
- Jointly developing a proposal for hadron therapy and particle research
- Implementation of our People and Talent Strategy
- Progress in implementing the 2055 Infrastructure Plan.

ANSTO is committed to achieving the outcomes described in this Plan and delivering value to the government, industry, community and people of Australia. We will continue to improve our capabilities, invest in our people and strategically partner and collaborate, nationally and overseas, in order to fulfil our mandate and vision. We will monitor our progress against the plan on a quarterly basis, report biannually to the ANSTO Board and annually to the Minister.

We look forward to the opportunities awaiting us in the next five years and the strategic resolve to deal with the challenges, all with the aim of strengthening the regard in which nuclear science and technology is held in Australia.



Neutron Beam Instruments

ANSTO operates a suite of neutron scattering instruments using neutron beams generated by OPAL. These instruments offer state-of-the-art performance, in many cases the equivalent of instruments on spallation neutron sources and much larger reactors, due to a combination of the latest optics and detectors. The neutron beam instruments are used for solving complex research and industrial problems in many important fields, ranging from fundamental physics, chemistry, materials and biology through to interdisciplinary areas such as engineering and archaeology. Examples of research include studies into the behaviour of materials in extreme environments, the structure-function relationships in food-based systems relevant to human nutrition and the investigation of materials for hydrogen storage applications.

At the beginning of 2010, six of the ten initial neutron beam instruments were operational, one was being

commissioned, two were under construction and the remaining one was in detailed design. In May 2009, ANSTO was awarded funds for a further three neutron beam instruments as part of the Australian Government's Super Science - Future Industries initiative. These instruments will be named BILBY, DINGO and EMU, in keeping with the naming tradition established for the first ten instruments.

Over the next five years, ANSTO will complete the design, construction and commissioning of these instruments. The operational facilities will be available to Australian and international researchers through a peer reviewed proposals mechanism and to industry on a commercial basis.

ANSTO also houses the NCRIS-funded National Deuteration Facility that offers the facilities, staff and expertise to produce a wide variety of deuterated compounds for downstream analysis techniques such as small-angle neutron scattering, neutron reflectometry and neutron crystallography.



Australian Government



Nuclear-based science benefiting all Australians

The Australian Nuclear Science and Technology Organisation (ANSTO) is the home of Australia's nuclear science expertise.

This unique expertise is applied to radiopharmaceutical production and research, climate change research, water resource management, materials engineering, neutron scattering and a range of other scientific research disciplines.

ANSTO is a Federal Government agency and operates Australia's only nuclear reactor OPAL - used for research and isotope production. ANSTO applies nuclear science in a wide range of areas for the benefit of all Australians.

ANSTO produces regular updates on its science and technology and has a range of publications available. ANSTO also conducts free tours for school groups, community groups and members of the public. For bookings or more information, please contact us.

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