Australian Government

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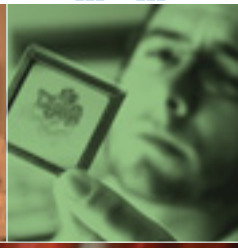
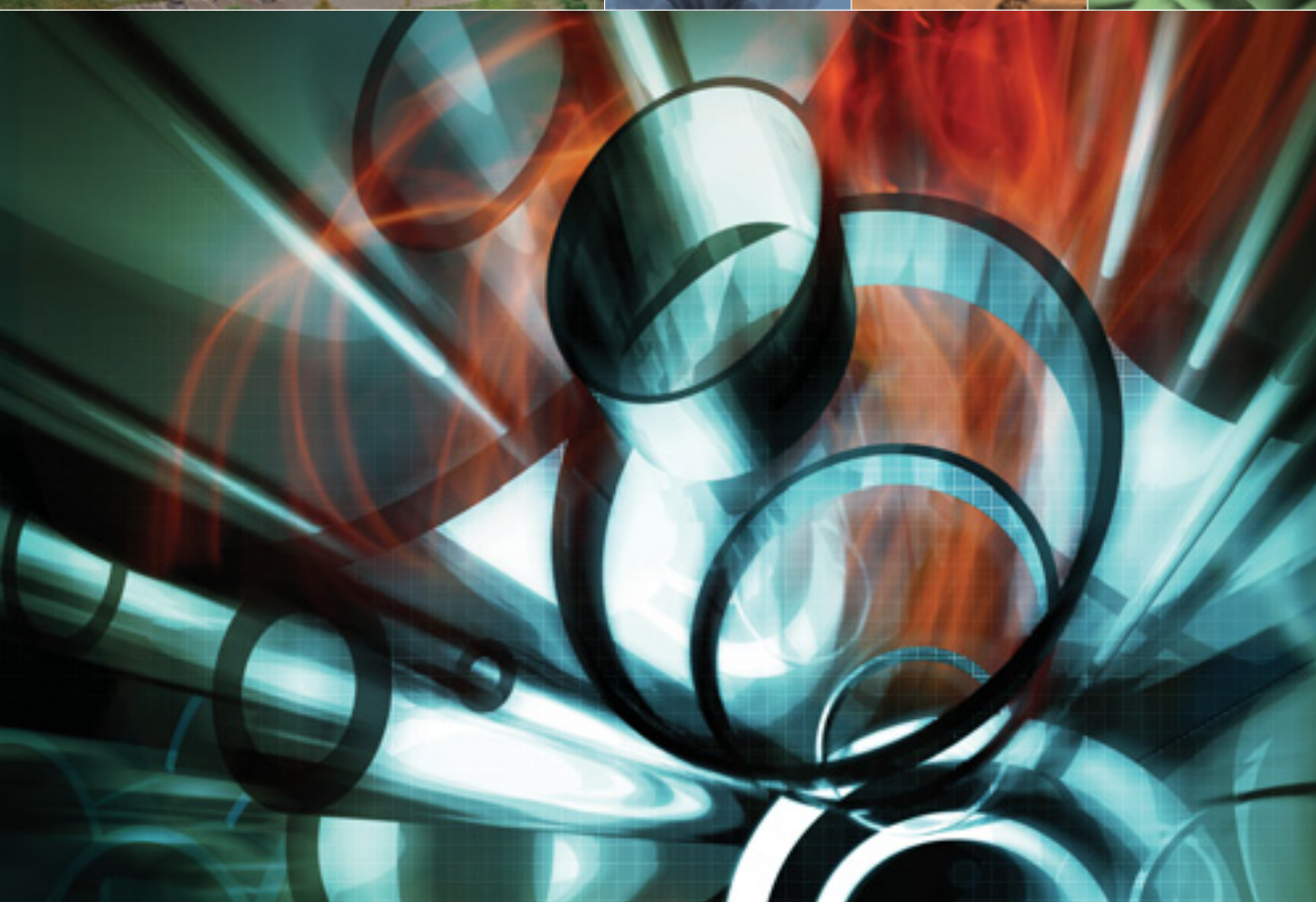
Nuclear-based science benefiting all Australians

ANNUAL REPORT 2004–05



ANSTO scientific facilities

- 10MW HIFAR MULTIPURPOSE RESEARCH REACTOR
- NEUTRON DIFFRACTION AND SCATTERING FACILITIES
- ANTARES 10MV TANDEM ACCELERATOR
- STAR 2MV TANDETRON ACCELERATOR
- ELEMENTAL ANALYSER – ISOTOPE RATIO MASS SPECTROMETER
- WATER TUNNEL FACILITY
- GAMMA IRRADIATION FACILITIES
- CERAMIC POWDER CHARACTERISATION FACILITIES
- COLLOIDAL CHARACTERISATION FACILITIES
- HOT AND COLD ISOSTATIC PRESSES
- TRANSMISSION AND SCANNING ELECTRON MICROSCOPES
- SCANNING PROBE MICROSCOPE
- SCANNING LASER DILATOMETER
- NUCLEAR MAGNETIC RESONANCE SPECTROMETERS
- PLASMA IMMERSION ION IMPLANTATION FACILITIES
- SECONDARY ION MASS SPECTROMETER
- MATERIALS TESTING LABORATORY
- ORE PROCESSING AND WASTE TREATMENT FACILITIES
- RADIOANALYTICAL LABORATORIES
- RADIOPHARMACEUTICAL DEVELOPMENT FACILITIES

Australian Government

ANSTO

ANNUAL REPORT 2004–05

Chairman's Letter

16 September 2005

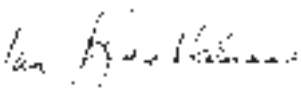
The Hon Dr Brendan Nelson MP
Minister for Education Science and Training
Parliament House
CANBERRA ACT 2600

Dear Minister

In accordance with Section 9 of the *Commonwealth Authorities and Companies Act* 1997 (*CAC Act*), I am pleased to present the Annual Report of the Australian Nuclear Science and Technology Organisation for the period 1 July 2004 to 30 June 2005.

This Annual Report includes a Report of Research and Operations, the content and preparation of which the Board is responsible for under Section 9 of the *CAC Act*.

Yours sincerely



Ian D Blackburne
Chairman

Contents

About ANSTO

The Australian Nuclear Science and Technology Organisation (ANSTO) is Australia's national nuclear research and development organisation and the centre of Australian nuclear expertise.

With approximately 860 staff, ANSTO is responsible for delivering specialised advice, scientific services and products to government, industry, academia and other research organisations. We do so through the development of new knowledge, the delivery of quality services and the provision of support for business opportunities.

ANSTO's nuclear infrastructure includes the research reactor HIFAR (High Flux Australian Reactor), particle accelerators, radiopharmaceutical production facilities, and a range of other unique research facilities. HIFAR is Australia's only nuclear reactor. It is used to produce radioactive products for use in medicine and industry, as a source of neutron beams for scientific research and to irradiate silicon for semiconductor applications. A replacement for HIFAR, OPAL – the Open Pool Australian Light-water reactor – is in its final stages of construction.

ANSTO also operates the National Medical Cyclotron, an accelerator facility used to produce certain short-lived radioisotopes for nuclear medicine procedures. It is located in the grounds of the Royal Prince Alfred Hospital in Camperdown.

ANSTO also manages access to overseas synchrotron facilities for Australian scientists.

ANSTO's main site is located 40 km south west of Sydney's central business district, occupies 70 hectares and is surrounded by a 1.6 km buffer zone.

ANSTO's general purpose is prescribed by the *Australian Nuclear Science and Technology Organisation Act* 1987 and is translated into action through corporate drivers of vision, mission and strategic goals.

ANSTO's vision

ANSTO's vision is to be recognised as an international centre of excellence in nuclear science and technology for the benefit of Australia.

ANSTO's mission

Our mission is to:

- Support the development and implementation of government policies and initiatives in nuclear and related areas, domestically and internationally
- Operate nuclear science and technology based facilities, for the benefit of industry and the Australian and international research community
- Undertake research that will advance the application of nuclear science and technology
- Apply nuclear science, techniques and expertise to address Australia's environmental challenges and increase the competitiveness of Australian industry
- Manufacture and advance the use of radiopharmaceuticals which will improve the health of Australians.

ANSTO's core values

Underpinning the vision and mission are ANSTO's core values:

Safety, Security and Environmental Sustainability: protecting human health, safeguarding our operations and minimising our environmental footprint

Honesty, Openness and Integrity: building trust within our organisation and with stakeholders

Innovation, Collaboration and Responsiveness: creating and embracing new ideas, promoting learning and development, recognising trends, understanding stakeholder needs and fostering cooperation and teamwork

Competence and Professionalism: maintaining high standards of expertise and delivery to internal and external customers

These core values are fundamental in all our activities and underpin the way in which we will deliver on our strategic directions.

ANSTO's strategic directions

ANSTO's strategic directions form the basis for the organisation's research and operations:

Deliver Excellence in Nuclear Science and Technology

We will be the source of significant new discoveries, producing new knowledge, capabilities and technologies. While some of these will be applied to our own operations, others will be developed through targeted research, with the benefit distributed widely by outreach activities which encourage adoption and commercialisation.

Focus our Capabilities to Support Issues of National Importance

We will focus our facilities, activities, expertise and collaboration on areas that contribute to Australia's priorities, especially in support of its nuclear, research, industry, environmental, health, security and international relations policies.

About ANSTO

Maximise Return on Investment in Expertise and Specialised Facilities

ANSTO will operate world-class nuclear facilities at a level of efficiency that ensures a high return on investment for the Australian Government, our customers and our collaborative partners.

Promote Understanding of the Benefits of Nuclear Science and Technology

Through effective communication and engagement with industry, research and the wider community, we will increase support for our work and encourage the further adoption of applications of nuclear science and technology.

Responsible Minister

The responsible Minister during the reporting period was the Hon Peter McGauran MP, Minister for Science until 21 October 2004, after which it was the Hon Dr Brendan Nelson MP, Minister for Education, Science and Training.

Statement of compliance

This report is written according to the guidelines provided for the presentation of Government documents, published by the Department of the Prime Minister and Cabinet in April 2004 (as amended) and the Commonwealth Authorities and Companies (Report of Operations) Orders 2005.

The Hon Dr Brendan Nelson MP (Minister for Education, Science and Training)

Organisational Chart

As at 30 June 2005

Senior Management

Dr Ian Smith
Executive Director

Dr Ron Cameron
Chief of Operations

Dr George Collins
Acting Chief of Research

Mr Ian Cullen
General Manager, Corporate Services

Mr Bob Harrison
Acting Head, Institute of Materials and Engineering Science

Professor Ann Henderson-Sellers
Head, Institute for Nuclear Geophysiology

Mr Barrie Hill
General Manager, Engineering Services

Mrs Cait Maloney
General Manager, Safety and Radiation Services

Dr Nabil Morcos
Acting Head, Radiopharmaceutical Research Institute

Dr Robert Robinson
Head, Bragg Institute

Mr Ian Turner
General Manager, ANSTO Radiopharmaceuticals and Industrials

Members of the Board

Dr Ian D Blackburne
BSc, PhD, MBA, FTSE, FAICD

Chairman
Chairman since 1 July 2001

Company director, former chief executive, scientist

Appointed 1 July 2001
Term concludes
30 June 2006

Mr Michael A Eager
BE (Mining), FAusIMM

Deputy Chairman
Deputy Chairman since 26 June 2002

Company director, mining engineer

Appointed 1 January 2002
Term concludes
31 December 2006

Mr Grahame Cook
PSM BEc, AIMM

Deputy Secretary, Department of Education, Science and Training

Appointed 13 June 2001
Term concludes
4 April 2006

Dr Carrie (Carmel) J Hillyard
BSc (Hons), PhD, FTSE

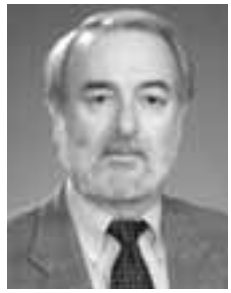
Venture Capital Partner, CM Capital Investments, biotechnologist

Appointed 21 July 1999
Reappointed 22 July 2004
Term concludes
21 July 2009

Dr Agatha van der Schaaf
MB, BS, BMedSc, FRACP

Head, Department of Nuclear Medicine, Sir Charles Gairdner Hospital

Appointed 25 July 2002
Term concludes
24 July 2007



Dr Klaus Schindhelm
BE, PhD

Senior Vice President Cardiorespiratory Development, ResMed Ltd

Appointed 20 March 2003
Term concludes
19 March 2008

Dr Ian Smith
BE, PhD, FTSE, FIEAust, FPENZ, FIM, CPEng

Executive Director, ANSTO

Appointed 17 May 2004
Term concludes
16 May 2008

Chairman's Report

Welcome to ANSTO's Annual Report for 2004-2005. You may notice it has a new structure, which reflects the outcomes of the strategic directions we developed during the year to guide us for the next five years. The strategic directions were developed in a spirit of great enthusiasm and opportunity, especially with the replacement research reactor nearing completion and demand for nuclear knowledge and expertise increasing.

The reactor's new name, OPAL, reflects the brilliance of the famous Australian gemstone. OPAL will give Australia world-class facilities for neutron beam research, radioisotope production and irradiation services. Construction and operations planning for the reactor and its neutron beam instruments progressed rapidly this year towards commissioning in 2006-07.

Marking a major new co-investment approach, the National Science Council of Taiwan sponsored an additional instrument to analyse materials at the atomic and molecular levels. This is a great step towards becoming a regional centre of excellence in neutron beam research. Seven Australian-funded neutron beam instruments are on track for installation in the coming year, the eighth soon to follow.

Asia has the fastest growing nuclear power installation program in the world, and this opens up opportunities to provide operational (safety and security) expertise to operators of these new facilities. With five decades of nuclear knowledge, a strong record on safety and safeguards, and leadership within international agencies, we have much to offer the expanding regional nuclear power sector, while we intend to continue our strong relationships with research reactor operators throughout the region.

We have already taken these relationships into new areas with a research project that

began in 2004 to help Asia-Pacific nations better control radioactive sources. This important contribution to counter-terrorism complements our other extensive collaborations with Australian research, defence and policing agencies, as well as internationally, especially through the International Atomic Energy Agency (IAEA).

The expansion of the nuclear power industry in our region has contributed to the debate over its viability as an alternative energy source in Australia. In this context, ANSTO provides expert advice to government about the state of the industry worldwide. We made a submission, for example, to the House of Representatives' inquiry into the use of non-fossil fuels. The debate on this issue, I am pleased to say, does indicate an increasing acceptance by the Australian community of nuclear science and technology generally.

To continue the promotion of nuclear science in the community, we published our first corporate social responsibility report, and a nationally-relevant high school teaching resource, Nuclear Science in Society. We believe that these endeavours, as well as our initiative to promote careers in science, undertaken in collaboration with some of Australia's other leading science agencies, will further increase Australians' understanding of nuclear science and technology.

Our nuclear science and technology is being used to solve engineering problems such as measuring and assessing critical components for stress and longevity; to provide nanotechnology solutions for pharmaceutical drug delivery, optical communications and protective coatings; and to better identify issues related to climate change, atmospheric pollution, soil contamination, and groundwater resources. Many more outcomes of our research are described in this annual report.

Collaboration is vital to our success. We collaborate with almost every Australian university through the Australian Institute of Nuclear Science and Engineering (AINSE) and directly through bodies such as Cooperative Research Centres (CRCs) and other specific arrangements. We see collaboration as essential to realising the full potential of nuclear science and technology to contribute to the advancement of the Australian research and development effort. This year, for example, we also launched our new STAR (Small Tandem for Applied Research) particle accelerator, which was jointly funded by the AINSE, ANSTO, the Australian Research Council (ARC) and several Australian universities.

We are also expanding our commercial relationships. While the sale and distribution of radiopharmaceuticals remains our largest income-generator, collaborative and contract research and consulting services such as in dosimetry (measuring radiation), materials assessment, mining and minerals analysis brought revenues of $5.4 million, representing 15% of goods and services revenue. Two highlights were the signing of a five-year contract with Nexia Solutions, part of the British Nuclear Group, to use our unique synroc technologies to immobilise plutonium waste at Sellafield in the UK and the growth of ANSTO Minerals.

To further increase the rate and extent of commercialisation we have refined our intellectual property management processes

Chairman's Report

and established a new business development group, Access ANSTO. This group will be a single point of contact for all commercial inquiries and industry customers and it will help our scientists expand the markets for our innovations.

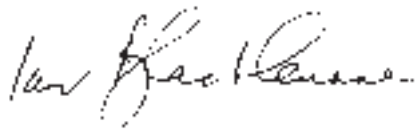
During the course of the year a number of initiatives were re-evaluated and, as a result, discontinued. It was determined that they would not result in sufficient long-term economic benefit to the organisation. These included specific projects in the radiopharmaceutical production area. In spite of this, the financial position of the organisation is sound and we are well positioned to meet the challenges of commissioning OPAL while continuing to operate HIFAR during the next year.

Such successes as I have mentioned depend not only on the quality of our facilities but also on the quality of our people. We have some of the best scientists in the region, and we are continuing to attract more.

A prestigious ARC Federation Fellowship was awarded to Professor Jeremy Smith of the University of Heidelberg, to lead research into complex biomolecular systems at the Bragg Institute. He would be the second Federation Fellow to be associated with ANSTO, the first being Dr Jill Trewhella who is located at the University of Sydney (as well as ANSTO). The Head of our Institute for Nuclear Geophysiology, Professor Ann Henderson-Sellers, was recognised by the Institute of Scientific Information as one of the world's most cited scientific authors. Attracting and retaining researchers like these who conduct excellent research will be one of the most important drivers of our success in coming years.

I would like to take this opportunity to thank our Executive Director, Dr Ian Smith, for his leadership over the past year. Dr Smith has overseen numerous positive outcomes, and has generated an impressive momentum for the organisation which I am sure will only increase in the future.

The future for ANSTO – due to our staff, ground-breaking research and unique facilities – lies in enhancing Australia's science, economy, society and quality of life. It is a task to which we are dedicated.



Ian D Blackburne
Chairman

Executive Director's Report

It has been an important year for planning at ANSTO. After considerable deliberation, consultation and discussion, we have identified and articulated the organisation's strategic directions for the next five years. This involved considering the coming opportunities and challenges as they relate to the ANSTO Act and to government policies and priorities for Australia. It also involved an extensive consultative process with staff, commercial customers, government and the academic community. As a result, the strategies we will be implementing as of July 2005 are not only very well-considered, they have the broad acceptance of staff and the external community.

There are four key strategic directions: to deliver excellence in nuclear science and technology, to focus our capabilities to support issues of national importance, to maximise return on investment in expertise and specialised facilities, and to promote understanding of the benefits of nuclear science and technology.

Underpinning these strategic directions is a number of critical success factors and objectives. We want to fully realise the production and research potential of our new OPAL reactor. We want to reinvigorate, refocus and increase the competitive edge of our research program to achieve world-class science. We want to run a tighter ship in our production, operations and support services. We want to build stronger relationships with research organisations, businesses and industry, both here and overseas, to increase opportunities for knowledge-sharing, collaborative research and co-investment. We want to capitalise on ANSTO's 50 years of expertise and Australia's geopolitical stability to consolidate our position as a nuclear role model in the Asia-Pacific. We want to maximise opportunities for commercialising

our research and facilitating business take-up of our products and services. We want to contribute to Australia's priorities, especially in support of its nuclear, research, industry, environmental, health, security and international relations policies.

To support our new strategic directions, we have restructured the organisation into operational divisions and four research institutes. The Bragg Institute is now joined by the Radiopharmaceutical Research Institute, the Institute of Nuclear Geophysiology and the Institute of Materials and Engineering Science. The restructure has also led to the creation of a Chief of Research and a Chief of Operations, which has streamlined our management structure and reporting processes.

While the Australian Government prepares a national Research Quality Framework (RQF) for use across universities and publicly-funded research organisations like ANSTO, we are taking a pioneering role in assessing research performance in 2005-06 in the Research Quality Framework. In preparation for this we have built on our already well-regarded research management system, and we are sharing our model with other organisations.

The assessment process will also contribute to our capability planning. To continue to build staff capabilities, we intend to make significant investment in training and educational opportunities, from TAFE cadetships to internationally-competitive postdoctoral scholarships, to attracting research leaders from around the world.

Planning for OPAL progressed well this year, a high priority being to ensure a smooth transition from HIFAR. Having had our operations plans for the new reactor reviewed favourably by an international peer review team commissioned by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), we submitted our application for an operating licence, which is required to load fuel into OPAL and commission it. This year we also began recruiting and training personnel to run the new facility. A major focus of our planning is to ensure that OPAL reaches its full potential and its neutron beam instruments are significantly utilised. We have already started taking bookings for instrument time from external research teams. To build a world-class facility the challenge is to have user demand significantly exceed supply to enable a competitive access policy to be applied.

Meanwhile we have continued to manage and operate HIFAR efficiently and effectively to ensure a high return on investment for the government and solid outcomes for our customers and our collaborative partners. The status of ANSTO as a world leader in nuclear safety remains unchallenged as HIFAR recorded its 46th year of continuous safe operation. Additionally, this year we made the transition to low-enriched uranium fuel, following the international trend to limit the use of high-enriched fuel. Interestingly, a 40-year-long independent health study conducted by the University of New South Wales (UNSW) concluded that ANSTO site workers have a 31 per cent lower mortality rate than the national average and a 19 per cent lower all-cancer mortality rate.

We reached a crossroads this year with an important part of our business, ANSTO Radiopharmaceuticals and Industrials (ARI). ARI's existing facilities, business plan and management practices were no longer capable of meeting projected future demand, an evolving market structure or ANSTO's new

Executive Director's Report

strategic directions. Following a comprehensive and objective review, ARI's facilities are being extended and refitted, a new General Manager has been appointed and a new ARI 'vision' introduced. ARI is now in a better position to exploit the significant capabilities of OPAL.

This year was the first in a new triennium of government funding, which is reflected in the new set of performance indicators you will see in this report.

This past year has been a challenging one as both the national and regional environment – in a scientific and especially a nuclear context – have undergone considerable evolution. This has been mirrored by internal change at ANSTO and has, I believe, provided a solid foundation for us to move into the future, a future in which we will promote excellence and reward our major stakeholder, the Australian community.

This excellence has been, and will in the future, be achieved with the assistance of ANSTO's staff. During the past year they have shown, once again, an impressive dedication to their tasks and an unwavering commitment to the betterment of the organisation, for which I thank them.

Ian Smith
Executive Director

Highlights

July 2004

- Construction of the building that will house the OPAL reactor was completed.
- ANSTO Minerals was launched to provide expert consulting services and innovative solutions to the mining and minerals processing industries.
- ANSTO became a foundation partner in the new Australian Synchrotron being built in Victoria. ANSTO will contribute $5 million to the project.
- Weekend tours of ANSTO, held on the first Saturday of each month and open to the general community, commenced. They have since been regularly booked out.

August 2004

- ANSTO was awarded first place in Workplace Safety Innovative Solutions by the Commonwealth Safety, Rehabilitation and Compensation Commission for our contractor safety management system.
- In National Science Week, we held a 'Materials Science Day @ ANSTO' for the general community and put on a four-day exhibition at the Australian Museum's 'Science in the City' program.

September 2004

- The operating licence application for the new OPAL reactor was submitted to the regulator ARPANSA. This was a major milestone: the operating licence is required before fuel can be loaded into the reactor and commissioning begun.
- *Velocity: Science in Motion* – a free, emailed, quarterly science magazine – was launched. Published by ANSTO, *Velocity* features stories about the work of scientists and science agencies across Australia. Visit velocity.ansto.gov.au
- An Australian Academy of Science grant enabled ANSTO to further collaborate with leading UK institutions. Technology patented by ANSTO and the Australian National University was applied to new copper-64 positron emission tomography radiopharmaceuticals. Potential applications have been identified for cancer, neuroblastoma and respiratory disease.

October 2004

- Environmental scientist and Head of ANSTO's Institute of Nuclear Geophysiology, Professor Ann Henderson-Sellers, was recognised by the Institute of Scientific Information as one of the world's most cited scientific authors. She is the first ANSTO scientist to receive this accolade, which goes to less than one out of 200 publishing researchers.
- ANSTO launched *Nuclear Science in Society*, a new resource for science students in Years 7 to 10. It was developed in consultation with the Australian Science Teachers Association and state science education departments and is available on CD-ROM or online at: www.ansto.gov.au/edu.

November 2004

- ANSTO took occupancy of the neutron guide hall that will house world-class neutron beam instruments for atomic and molecular level research into matter.
- ANSTO sponsored and participated in a conference in Sydney on nuclear safeguards and security in the Asia-Pacific. It was attended by ministerial-level staff from countries across the region and chaired by Australia's Minister for Foreign Affairs, the Hon. Alexander Downer.
- The results of a groundbreaking nuclear technique for measuring climate change

Highlights

were published in the Journal of Geophysical Research by ANSTO's Professor Ann Henderson-Sellers and Dr Kendal McGuffie of the University of Technology Sydney. They found that changes in the number of heavy water isotopes in rainfall from the Amazon jungle and the Andes mountains gave clear evidence of deforestation in the Amazon Basin.

December 2004

- A patent application was filed for the encapsulation and controlled release of biological entities. This new development, part of ANSTO's controlled-release technology platform, has potential applications for the encapsulation and release of proteins, enzymes and DNA.
- Federal Minister for Science, Education and Training, the Hon. Dr Brendan Nelson, announced funding for a new Cooperative Research Centre for Biomedical Imaging Development in which ANSTO will play a key role. He also announced a fresh round of funding for the CRC for Polymers, of which ANSTO is also a member.
- Five projects involving ANSTO staff were awarded prestigious Australian Research Council grants, testifying to the excellence of ANSTO's research and the strength of university collaborations.

January 2005

- At a special ceremony the replacement research reactor was officially named OPAL (Open Pool Australian Light-water reactor) by the Hon. Dr Brendan Nelson, Federal Minister for Science, Education and Training.
- ANSTO's shipment of 276 spent nuclear fuel elements arrived safely in France for reprocessing. The spent fuel represented seven years of HIFAR operation, during which time more than three million patient procedures for nuclear medicine were produced.
- Access ANSTO was created to replace ANSTO Business Development as a one-stop shop to facilitate and promote applications of ANSTO technology, research and industry services.
- The new $3.2 million STAR particle accelerator was launched. STAR will give Australia world-class capabilities in ion beam and accelerator mass spectometry for research into the environment, archaeology, heritage, biology and materials.
- Restructuring of ANSTO into a Research Group, an Operations Group and two business units to improve efficiency and gain stronger commercial, research and operational outcomes.

February 2005

- We secured contracts worth over $240 000 for iodine-129 analysis of soil and sediment samples for a Japanese laboratory with responsibility for environmental monitoring in Japan. The expertise and facilities required for these analyses were originally developed for nuclear safeguards applications for the IAEA.
- A Fulbright Postgraduate Scholarship was awarded to PhD student Andrew Wroe, who is participating in an ANSTO-University of Wollongong collaboration to measure the effects of radiation on the body at micro and nano levels.
- ANSTO's Intellectual Property-driven Innovation Forum held its first meeting with the intent of encouraging, nurturing and supporting invention disclosures across the organisation.

- An X-ray reflectometer was the first instrument to be installed in the new neutron guide hall. The reflectometer will be used to analyse films and coatings one ten-millionth of a millimetre thick.
- Representatives from ten Southeast Asian countries attended a four-day workshop at ANSTO to learn new techniques for controlling radioactive sources and preventing their potential illegal use. The workshop was part of a three-year program by the Australian Government to help secure the region against terrorist threats.

March 2005

- ANSTO, the Defence Science and Technology Organisation (DSTO), CSIRO and Geoscience Australia formed the Publicly-funded Agencies' Collaborative Counter-Terrorism Research Program to enhance science, engineering and technology support for Australia's counter-terrorism needs.
- A peer review of OPAL operation plans was completed, with positive findings.
- A US patent was granted for a joint ANSTO-ANU innovation that, in effect, creates building blocks for molecules with applications in medical imaging and therapy. This work is the subject of international collaborations with major research institutes in Europe and America.

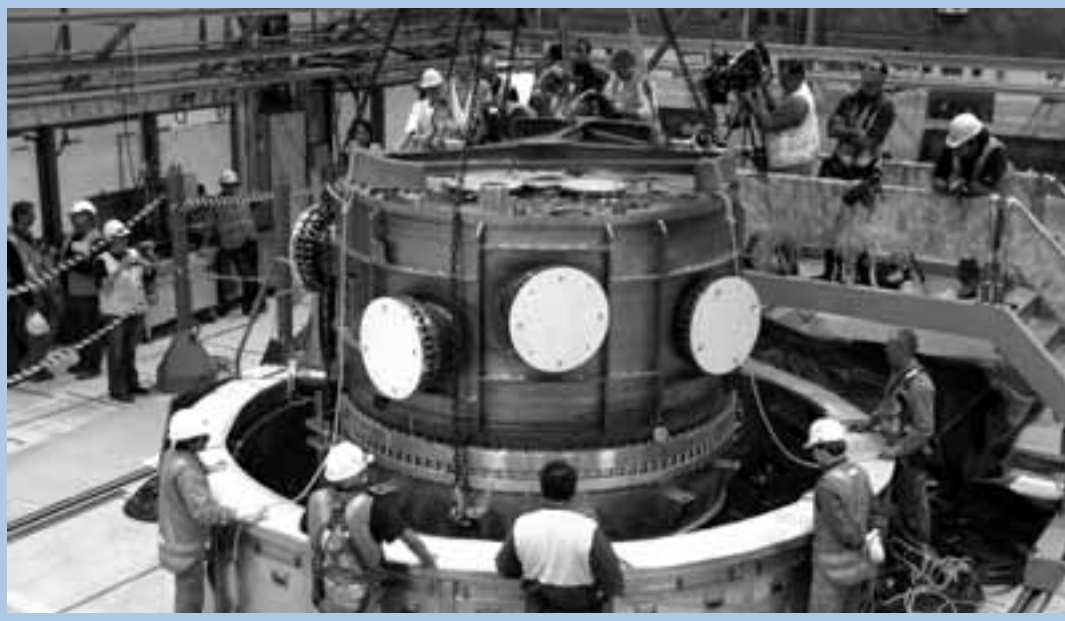
April 2005

- A dedicated proto-company called CeramiSphere™ was set up to develop and commercialise ANSTO's proprietary encapsulation and controlled release technology. Potential markets include health care, food, cosmetics, home and household care, and specialty chemicals. Visit the website: www.ceramisphere.com
- ANSTO announced a major organisational restructure to set up four dedicated research institutes: the Institute of Nuclear Geophysiology, the Materials and Engineering Science Institute, and the Radiopharmaceuticals Research Institute. This was in addition to the already operating Bragg Institute.
- A five-day international workshop on a new climate change project was held by ANSTO's Institute of Nuclear Geophysiology. The workshop explored the Institute's new isotopic techniques for the Project for Intercomparison of Land-Surface Parameterisation Schemes (iPILPS), aimed at better understanding environmental responses to climate change.

May 2005

- ANSTO's novel bioreactor technology patent application entered its international phase, with positive assessments from industry and experts, particularly for its waste treatment and specialty chemical production.
- An ANSTO-driven national initiative was launched to promote careers in science and encourage more students to study science subjects in Years 11 and 12. This was a collaborative initiative between ANSTO, the Australian Institute of Marine Science, CSIRO, DSTO and the NSW Ministry of Science and Medical Research.
- ANSTO signed a contract with Nexia Solutions for a plant to immobilise plutonium waste residues at Sellafield, UK in a customised glass-ceramic mix.
- ANSTO released our first corporate social responsibility report, outlining our social and environmental performance, as well as the quality of interaction with our employees and the Australian community.

Highlights



June 2005

- A prestigious ARC Federation Fellowship was awarded to Professor Jeremy Smith of the University of Heidelberg, a world expert in computational molecular biophysics, to undertake research at ANSTO's Bragg Institute. He will be using neutron and X-ray techniques to investigate metabolic pathways and support the design of new medical drugs.
- In an historic $8.5 million deal between ANSTO and the National Science Council of Taiwan, the Taiwanese Council will fund the installation and operation of an additional neutron beam instrument at OPAL. The cold-neutron 3-axis spectrometer will be used to analyse materials at the atomic and molecular levels.
- The zirconium alloy Reflector Vessel, a key component of the new OPAL reactor, was lowered into place in the reactor pool, watched by staff and media (see above). This was a significant milestone in OPAL's construction.
- Two new patent applications were filed covering novel processes for producing controlled release ceramic particles tailored for hydrophobic active materials.
- It was announced that ANSTO will collaborate in a new research centre to be established in the field of antimatter-matter studies. The proposed Centre for Antimatter-Matter Studies will investigate the nano-world that underlies everyday processes and new technologies.

REPORT OF RESEARCH AND OPERATIONS

Introduction

Introduction – Research

ANSTO has a strong track record in quality research, and with our replacement reactor coming on line in 2007 we will be able to carry out work never before possible in Australia. The opportunities this brings are reflected in ANSTO's new strategic directions which emphasise excellence in research as a top priority.

To support this priority, ANSTO has established three new research institutes: the Institute of Materials and Engineering Science, the Radiopharmaceutical Research Institute, and the Institute for Nuclear Geophysiology (nuclear-based environmental science). They join the Bragg Institute, Australia's leading centre for neutron and X-ray research, which was established in 2002. By nurturing a dedicated research culture, these institutes will foster excellence, stimulate the exchange of ideas, facilitate engagement with the wider scientific community and attract external researchers.

The institutes were established part way through the 2004-05 financial year. Therefore the projects and case studies selected for this section of the annual report were initiated under ANSTO's former Core Business Area structure but evolved into our new 'institute' structure. These projects and case studies reflect the range of our research activities which cover the key themes of health, materials, environment, neutrons and X-rays, and issues of national importance such as counter-terrorism and climate change.

Introducing these five themes has increased the correlation between ANSTO's research management and Australia's four National Research Priorities (NRPs). Almost all of our research in the NRP of An Environmentally Sustainable Australia takes place within the environment theme. We support the

Report of Research and Operations

Promoting and Maintaining Good Health NRP primarily through research in our health theme. The two themes of materials and neutron and X-ray scattering contain much of our research within the Frontier Technologies for Building and Transforming Australian Industries NRP. Our national interest and capability enhancement theme is our vehicle for research under the Safeguarding Australia NRP. In addition, the wide range of applications of our research means that a project often delivers benefits in more than one NRP.

Striking the right balance between 'discovery' and 'applied' research, between projects that map uncharted areas of knowledge and those that generate immediate revenue, is the great challenge for any research program. At ANSTO we approach this challenge by thinking in terms of a research 'portfolio'. Our portfolio includes projects from across the research spectrum, from exploratory research to the delivery of established services and products, spreading risk and at the same time creating new opportunities. Taken as a whole, the portfolio must meet certain fundamental organisational objectives. Our research must be of the highest quality. It must be relevant to the wider research community as well as to Australia's national science interests, as expressed in the National Research Priorities. It must maximise returns from the government's investment in our people and facilities. And it must cultivate collaborative science, bringing ANSTO together with universities, Cooperative Research Centres, other research organisations and end-users.

All our research is carefully reviewed by external Australian and international experts.

In addition to individual project reviews, each research institute has a review panel that convenes once a year. Ongoing projects as well as research proposals are assessed against criteria of scientific merit, collaboration, application and dissemination. For new ideas, ANSTO also has a dedicated Innovation Forum. Here we build business cases for development to determine if these ideas will translate into commercially viable products and services as well as new patents.

We believe that by striving for the right balance, we are establishing a research program that is innovative, successful and sustainable.

Neutrons and X-ray science

Tracey Hanley, a research scientist at the Bragg Institute, is in charge of the first two instruments to be installed in ANSTO's new OPAL facilities: an X-ray reflectometer and a small-angle X-ray scattering instrument. Tracey managed the tendering, purchase and installation process and now operates the two instruments. She trains researchers to use the equipment, assists with their experiments, peer-reviews proposals for instrument time, and gives seminars on the instruments' capabilities in order to expand the user-base. Tracey's own research is in the field of polymer-based systems, or plastics. She is investigating the properties and behaviour of polymers when they are subject to various manufacturing processes.

Managing access to instruments

Activity

Under this project we facilitate Australian researchers' access to ANSTO's neutron-beam instrumentation at HIFAR. We will be operating in a similar but expanded and more efficient manner with the new instruments at OPAL when it comes into operation in 2007. In preparation for this we are now working to increase the prospective user base and improve business processes for assessing, approving and scheduling customers' beam time proposals.

Output

We implemented a new peer-review proposal system for ANSTO and non-AINSE research in late 2004, and the first of these projects were scheduled and ran in the first half of 2005. We also began development of a web portal through which customers can submit their beam time proposals and ANSTO can review, approve and schedule them. Access to ANSTO neutron beams has facilitated a broad range of Australian scientific research.

Outcomes

ANSTO operates the only neutron beam facility in Australia. Its unique scientific tools, which allow the structure and properties of solids and liquids to be studied at the molecular level, enable researchers from universities, industry, cooperative research centres and government agencies to solve complex research and industrial problems in a wide range of fields including plastics, minerals, engineering, pharmaceuticals, electronics and biology.

Future

In the future, access by all researchers to neutron beam instruments at OPAL will be by peer review based on merit. There will be no charge for beam time if research results are

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published in the open literature. Access for proprietary work, on the other hand, will be available on a fee-for-service basis.

Developing world-class neutron beam instruments

Activity

In this project, begun in August 2000, we are building a suite of eight world-class neutron beam instruments for the new OPAL reactor. These instruments will be used by scientists from ANSTO, universities, research institutes and industry to characterise matter on the atomic and molecular scale.

Output

This year we focused mainly on detailed design work as well as manufacturing and procurement. Instrument design is now almost complete, and manufacturing and procurement are past the halfway mark. This equates to some $18 million in capital commitments. We also took occupancy of the neutron guide hall and attached offices and laboratories. Subsequently, we prepared the workshops for use and made the neutron guide hall ready for the installation phase of the project to begin in August 2005.

Outcomes

With these neutron beam instruments, Australian scientists will be able to gain valuable new insights into the atomic and molecular structure of modern materials. The instruments, together with the scientific expertise offered by Bragg Institute staff who will operate them, will facilitate cutting-edge discoveries that will enhance Australia's scientific reputation internationally. The facilities will also attract leading international research collaborations and provide opportunities to develop OPAL's full scientific potential.

Future

In 2005-06 our focus will shift from manufacturing and procurement to assembly. We will be installing the neutron beam instruments in readiness for when the reactor commences operation in early 2007.

CASE STUDY:

Stressing out in the power industry

The blades in the low-pressure steam turbines that generate electricity in our power stations are over a metre in length and spin at more than 3 000 rpm, the tips travelling at close to the speed of sound. At these enormous speeds, even the tiny water droplets condensing from steam strike with a force that erodes the leading edges of the blades. With an average power station running four to eight turbines, each with about 160 blades worth $10-15 000 per blade, the cost of removing and replacing damaged blades can run into the millions of dollars.

To extend the life of these blades, a technique for repairing the damage without having to remove the blades themselves is being developed at the Industrial Research Institute Swinburne (IRIS), and CSIRO Manufacturing Science and Infrastructure Technology. The technique uses laser technology to clad the blades with a hard-wearing cobalt-based alloy, Stellite 6™. Late last year, in a trial run, six blades from the Torrens Island Power Station in Adelaide were repaired using this laser

cladding technique. To test the effectiveness of the repairs, ANSTO was called in to perform residual stress measurements. The measurement of residual stress allows us to more accurately model and predict the in-service behaviour of engineering components.

We measured through-thickness stresses using neutron diffraction analysis, then applied X-ray diffraction analysis to measure surface stress. These techniques produce complementary results and together demonstrated that significant tensile and compressive residual stresses were being generated in the blades due to the cladding process itself. These high stresses had the potential to accelerate fatigue resulting in premature cracking, thereby reducing the life of the blade.

To rectify this, IRIS and CSIRO applied a post-weld heat treatment (PWHT) to the laser-clad blades. After further residual stress measurements, we found that the PWHT process minimised residual stress gradients in the repaired section of each blade, thereby reducing the potential for accelerated fatigue. No adverse effects have been recorded to date.

This work has been sponsored by a group of Australian power stations and undertaken within the Cooperative Research Centre for Welded Structures. We anticipate that the neutron-based techniques for stress analysis will become better-known by industry and academia and used increasingly for solving real-world engineering problems. With the new strain scanner we have commissioned for the OPAL reactor, we will be able to perform this work 10 times faster and on much larger samples.

CASE STUDY:

Cracking under pressure

Why do *some* soft drink bottles explode under the pressure of their carbonated contents and others don't? It might seem like a trivial question, but if you're manufacturing thousands of bottles every day, it's a question you want solved. Furthermore, these bottles are made from polyethylene terephthalate, better known as PET, a polymer used in countless household and industrial products, so it is a material that many people want to know a lot more about. Our work with soft drink bottles is part of a larger research project to investigate the structure of PET under controlled laboratory conditions and to understand better the complex processes involved in its manufacture, processing and recycling. The project, initiated and led by ANSTO, is run by the Cooperative Research Centre for Polymers, of which both ANSTO and the bottle-manufacturer are partners.

PET bottles are in fact quite complex objects to make. Multi-parameter manufacturing process in which an injection-moulded preform is first produced, then reheated, and stretch-blow moulded into a bottle. A few years ago it wasn't possible to make a PET bottle that was strong enough to hold its drink *and* stand up straight. Can you recall the black-based bottles you bought at the supermarket? Those early PET bottles had a round bottom – a strong shape – to withstand the pressure of carbonated liquid, and a black base was then glued on so that the bottle would stand up. The technology has improved since then and one-piece bottles with a petal-shaped base are the norm. Yet some of these still develop cracks in the base.

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To find out why this happens, and to learn how to prevent it, we have 'mapped' the molecular structures (or polymer chain morphology) of the bases of both strong and defective bottles. We did this using a small-angle X-ray scattering (SAXS) instrument located on an intense X-ray beamline at the Advance Photon Source in the USA. ANSTO scientists have played a major role in applying the SAXS technique to a range of problems in polymer science. The SAXS images indicate that, in a good bottle, the polymer structure at the centre of the petal-shaped base is amorphous (the polymer chains are very tangled) and becomes semi-crystalline in the outer feet and valley regions. This makes the bottle tough enough to withstand high stresses. Defective bottles, in contrast, have a polymer structure at the centre of the base where the polymer chains are aligned in a circular pattern and remain non-crystalline as they move outward. This creates weak points which are susceptible to cracking under high pressure. Our results indicate that this occurs when the polymer is processed at the wrong temperature: *low* temperatures cause the circularly-aligned morphology in the central region. Maintaining precise control of the polymer's temperature is therefore a critical factor in the manufacturing process.

From our study of the innocuous drink bottle, we have been able to identify the causes of a long-standing industry-wide problem

Isotopes in earth systems

Nicola Creighton is an environmental biologist working in ANSTO's Isotopes for Water project. She is using artificial radioisotopes of metals in laboratory studies to trace how these metals transfer from the environment into aquatic organisms and through aquatic food chains. The results of these studies are used to assess the ecological risk of contaminants in estuaries and catchment areas.

Using isotopic tracers to understand atmospheric transport

Activity

ANSTO's *IsoTrans* project uses nuclear techniques and natural (radio)isotopes to produce advanced representations of transport and exchange processes in the lower atmosphere. This work is driven by the need for better knowledge and predictions of the emission and movement of atmospheric pollutants and water. This has applications in health and water resource management as well as climate change mitigation.

Output

This year *IsoTrans* has developed and tested new detection systems for investigating mixing processes in the lower atmosphere; novel tools for generating comprehensive atmospheric pollution profiles (sources, composition and spatio-temporal dynamics) for urban and industrial areas; and isotope datasets for evaluation of land surface water exchanges in climate and hydrology models.

Outcome

By improving our knowledge of the activity of pollutants and water in the lower atmosphere, *IsoTrans* contributes to high-priority Australian and international scientific research. It will also lead to practical, science-based improvements in managing pollution and water resources and alleviating the effects of climate change.

Future

We aim to make ANSTO a leading, internationally-recognised centre for the application of nuclear tools and techniques to important issues in the science of the lower atmosphere.

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Providing services in accelerator science

Activity

Under this project we provide services and expertise in accelerator mass spectrometry (AMS) and ion beam analyses (IBA) for ANSTO as well as for external clients from universities, the CSIRO, local and state governments, industry and international organisations including the IAEA. We are also responsible for the safe, efficient and effective operation of these facilities.

Outputs

This year we secured contracts worth over $240 000 for iodine-129 AMS analysis of soil sediments for Japanese customers. The new STAR accelerator for IBA and AMS research was successfully commissioned, and opened by the Federal Minister for Education, Science and Training the Hon. Dr Brendan Nelson, in January 2005. Work carried out using IBA and AMS techniques resulted in the publication of a book chapter, seven journal articles, five conference papers and 38 commercial reports.

Outcomes

We participated in competitive national and international research programs and grants, enhanced ANSTO's nuclear and atomic scientific reputation by publishing leading-edge research on the application of accelerator-based nuclear techniques in environmental and materials science, and trained international researchers, postdoctoral fellows, and postgraduate and undergraduate students in quality leading-edge accelerator-based nuclear techniques and their applications.

Future

We will be undertaking new studies on wood smoke pollution in urban areas in Victoria. With our unique accelerator-based nuclear methods, we will also study hyper-accumulating heavy metal plants and biological systems using ion beam techniques and synchrotron X-ray methods.

Understanding radioactive contaminants in the ground

Activity

ANSTO's Institute for Nuclear Geophysiology has been involved in an international project, co-ordinated by the Nuclear Energy Agency (NEA), to investigate the behaviour of radioactive materials, such as uranium, in the environment. The project aimed to advance the way we model contaminant interactions with mineral surfaces, a process known technically as 'adsorption'. Teams from organisations in several countries modelled a series of seven test cases. The outcomes of these test cases were analysed by a review team of five scientists – from the United States, Switzerland, Finland, the United Kingdom, and Australia.

Output

By comparing models which describe experimental data sets, we predicted how variables such as the pH of the soil affect the uptake of radionuclides. As the project, which began in 1999, nears its end, the review team have released a paper detailing their findings in an international radiochemistry journal.

Outcome

This has been the first major project in the world to compare the underlying assumptions and range of applicability of various types of adsorption models. Our research will enable the most appropriate models to be used to predict the movement of contaminants in soils and groundwater environments. While the focus of this project has been radioactive contaminants, the modelling approaches we used can be applied to other contaminants, such as nutrients and heavy metals.

Future

With this type of environmental modelling attracting increasing scientific study worldwide, a follow-on project is presently being discussed by the participating countries.

CASE STUDY:

Ocean circulation and climate change

When Charles Darwin collected coral specimens from the Cocos (Keeling) Islands in 1836, he couldn't have imagined that nuclear scientists would be using the same samples almost 200 years later to understand the impact of ocean circulation on climate change.

Porites corals from the Cocos Islands, an isolated Australian atoll in the eastern part of the Indian Ocean, were used by a team of scientists from ANSTO, James Cook, Wollongong and Queensland Universities to chart the circulation of the Indian Ocean over the past century. Ocean circulation plays a key role in climate change. Just as the rings in a tree trunk can tell you the tree's age, the bands of calcium carbonate that build up in coral can tell you when the coral was formed. From these bands, the research team has established an annual chronology for Cocos corals covering most of the twentieth century.

In the first stage of the collaboration, a set of corals of known age (including Darwin's) was analysed to determine the carbon-14 value in surface waters around the Cocos Islands. This value is similar to those for the eastern Indian Ocean and adjacent seas, and is much higher than those for the northwestern Indian Ocean. For the most recent study, annual bands of Cocos corals were analysed for radiocarbon for the period from 1955 to 1985. The recent results confirm the previous observation of carbon-14 distribution within the Indian Ocean, suggesting that surface waters reaching Cocos are derived from the far western Pacific via Indonesian currents and are not influenced by southeast flow from the Arabian Sea, as other researchers recently proposed.

Indeed, for most of the study interval, there is good agreement between the carbon-14 values for Cocos and those for Watamu (Kenya), suggesting that the South Equatorial Current carries carbon-14-elevated water rather than carbon-14-depleted water across the Indian Ocean. This implies that oceanic 'upwelling' in the northwestern Indian Ocean is spatially confined, calling into question previous assumptions held by oceanographers as to the role of the Indian Ocean within the global ocean circulation model.

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CASE STUDY:

Nuclear techniques for managing groundwater resources

The effective management of water resources is a critical issue in Australia today. Businesses and residents across the country are being urged to 'save water', and federal and state governments are developing strategies to deal with the nationwide shortage. In October 2004, the NSW State Government released a 25-year Metropolitan Water Plan for Sydney.

Actually, there is an enormous amount of water in the Sydney Basin (the area from Newcastle to Jervis Bay and west to Lithgow), but it lies deep in aquifers in the sandstone. Some of it is already used for drinking and irrigation, but there is a great deal more available, if only we could find out where to tap into this groundwater. Defining the flow characteristics of sandstone aquifers is one of the objectives of a major new research project involving scientists from ANSTO and three universities (Wollongong, UNSW, and UTS) as well as staff from the NSW Department of Infrastructure, Planning and Natural Resources.

Extracting groundwater from the region's famous Hawkesbury sandstone has proved difficult because the sandstone is not very permeable; currently less than half the bores drilled are reaching aquifers where the water's flow rate is high enough to make commercial extraction viable. To improve on this, ANSTO and University of Wollongong scientists are using nuclear and other techniques to ascertain the identifying characteristics of comparatively permeable sandstone so that drilling can be directed towards areas which promise higher flow rates.

Another objective of the project is to develop more responsible and sustainable ways of using the groundwater. Having discovered this resource, we don't want to over-exploit it. Crucial to effective management is knowing how quickly an aquifer is replenished, or 'recharged', and a clue to this is the groundwater's age. 'Young' groundwater indicates the recharge is rapid and derives primarily from rainfall. 'Old' groundwater indicates the recharge is slow, so usage has to be managed with particular care. ANSTO scientists use a method to date groundwater which involves analysing the carbon-14 in dissolved carbon dioxide and the tritium radioisotopes in water. In one study, at Mangrove Mountain on the NSW Central Coast, some groundwater was estimated to be as old as five thousand years, considerably older than previous studies have indicated. This means a much closer eye will have to be kept on its usage – it already supplies local residents, farmers and industries and is bottled as spring water.

Similar work is already being undertaken south of Sydney in the NSW Southern Highlands, and ANSTO anticipates its specialist geochemical services will be called upon in the search for sustainable water in other parts of the Sydney Basin.

Health

Andrew Katsifis is a senior research leader in ANSTO's Radiopharmaceutical Research Institute and the newly-formed Cooperative Research Centre for Biomedical Imaging Development. He has previously worked on the development of molecular radiopharmaceuticals in France and Germany and is now one of the driving forces behind world-class radiopharmaceutical research in Australia. The focus of his current research is the development of non-invasive imaging techniques to locate diseased or abnormal cells. To do this, radiolabels are implanted in molecules, such as small proteins, that travel through the body and attach to the cells. The radiolabels then emit signals that can be used to 'map' the diseased tissue.

Designing radiopharmaceuticals to combat neurodegeneration, inflammation and cancer

Activity

The Radiopharmaceuticals Research Institute (RRI) has developed and patented novel chemical markers that target a specific protein on the cell's outer mitochondrial membrane which is over-expressed in cells undergoing damage or uncontrolled proliferation. The mitochondria are organelles within cell cytoplasm, and they are a cell's centre of energy generation. They also contain RNA and DNA, which allows them to independently replicate and code for the synthesis of specific proteins. These novel molecules can penetrate the cell membrane and target select proteins on the mitochondria membranes. This behaviour has enormous relevance in cellular imaging of inflammation, neurodegeneration, and abnormal cellular proliferation as found in tumours. The RRI and several medical research institutions are collaboratively developing these agents to image diseases such as multiple sclerosis, stroke, and Alzheimer's.

Output

We selected several lead candidate molecules for their high specific and selective binding to the target mitochondrial protein following a systematic process of synthesis, radiolabelling, and screening. Preliminary *in vivo* results in models of inflammation, melanoma and breast tumours indicated that iodine-123 analogues of these lead compounds have the potential to image these disease states. Patents in the US, Europe and Australia have been granted in this technology, and Japanese patents are pending.

Outcomes

Our research will contribute to the development of diagnostic and therapeutic radiopharmaceuticals and the production of

novel radioisotopes for nuclear medicine using the OPAL reactor. In addition, the RRI contributes to the education of students in radiopharmaceutical sciences through collaboration with Australian universities.

Future

We will develop Positron Emission Tomography (often known just as PET) analogues of these compounds to extend their medical applications. We are also planning studies into drug optimisation through molecular modifications to further enhance their specificity and selectivity in clinical studies. Specific aspects of this work relevant to molecular imaging will also be undertaken under the Cooperative Research Centre for Biomedical Imaging Development.

CASE STUDY:

Measuring radiation for proton therapy and space travel

Space exploration and cancer treatment might seem worlds apart, but there is a common link. The patient undergoing cancer therapy and the astronaut exploring deep space are both exposed to above-normal doses of radiation. To make radiation therapy more effective and space missions less dangerous, we need better ways to assess the impact of radiation on the body. In fact, we need instruments that will measure the interaction of radiation at the cell nuclei level – that is, at a size of a millionth of a millimetre (a nanometre).

Since April 2004, ANSTO has been working with the University of Wollongong's Centre of Medical Radiation Physics (CMRP), under the direction of Professor Anatoly Rozenfeld, to design and build a microdosimeter that can measure radiation effects at a cellular level. The main aim of the collaboration is to develop a nanodosimeter capable of measuring radiation effects at a cell nucleus level. To this project, ANSTO is contributing its scientific expertise in radiation detection and measurement as well as a unique suite of analytical nuclear techniques, such as its heavy ion microprobe.

The initial impetus behind developing the microdosimeter is proton therapy, the latest cancer treatment (not yet available in Australia). Whereas conventional radiotherapy techniques damage not only the tumour – which is what you want – but also the healthy tissue around it, proton therapy is more accurate and far more successful in conforming the radiation dose to the tumour alone. Owing to the reduced dose to healthy tissue, proton therapy also has fewer side effects: a patient can leave the hospital straight after treatment, without experiencing extreme nausea and weakness.

The difficulty with this revolutionary new treatment is that the behaviour of protons when they interact with the body is considerably more complex than that of X-rays and electrons associated with conventional radiotherapy. Proton therapy has to be carefully planned for each patient so that the beams enter the body at the correct angles and optimal energy levels. The nanodosimeter currently under development will make it possible to measure the interactions of protons with living cells at the nucleus level. Associated computer software, also under development, will let us model and predict this behaviour at the DNA level. With this

information, radiation oncologists and medical physicists will be able to plan more precise and effective treatment.

The same technology can be used to measure the effects of radiation on astronauts. Out in space, intense radiation can cause fatigue, hair loss, cancer, and damage to the central nervous system. Understanding the effect of space radiation on astronauts is critical for the planning of extended exploratory missions. As part of its space program, therefore, NASA is funding an international team which includes CMRP, and more recently ANSTO, to investigate the use of the first generation microdosimeter in radiation protection applications in space. So far, ANSTO has undertaken performance tests and provided new data on the microdosimeter devices that will be launched on board a US Naval Academy satellite in 2007.

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Materials

David Carr specialises in fracture mechanics and the life assessment of nuclear and industrial plant. He currently leads the Nuclear Component Integrity project, which supports the safe and efficient operation of ANSTO's nuclear plant, and is involved in developing the Surveillance Program for OPAL, whereby zirconium alloy coupons will be removed from the reactor core every five years for testing and assessment. David is also on several project teams that apply nuclear capabilities, such as neutron diffraction, to commercial and scientific problems in diverse areas such as coal-fired power generation, the automotive industry, and biomedical implants.

Ensuring the integrity of nuclear components

Activity

In this project – one of many ANSTO is undertaking to ensure the safe operation of its nuclear plant – we are studying Zircaloy-4, a material that will be used in the core region of the new OPAL research reactor. When exposed to radiation some materials change shape, and this has been taken into account in OPAL's design. By irradiating samples of the material in our existing reactor, HIFAR, we can measure its growth before OPAL goes into operation.

Output

By irradiating Zircaloy-4 at the temperatures and flux levels which are expected in OPAL's core regions, we have succeeded in obtaining data about its behaviour at low temperatures where information was not previously available.

Growth measurements have been made on Zircaloy-4 samples sourced from ANSTO, INVAP and from library material from the HANARO reactor in South Korea (samples provided by the Korean Atomic Energy Research Institute). The measurements made so far indicate that growth is approximately 0.04%, similar to that described in the literature for Zircaloy-2 (a related alloy used widely in the nuclear power industry) at a similar temperature and fluence, and well within the value used in the OPAL reflector vessel design calculations.

Outcomes

This work is significant in that it confirms for ANSTO and OPAL's designer, INVAP, that the growth values used in the design of the reflector vessel were conservative and that the structure will be able to withstand any additional stress caused by growth over the design life of the vessel.

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Future

In the coming year we will continue taking growth measurements in HIFAR and we will also take measurements on samples irradiated in OPAL once operation commences. This information will add to the data currently available to research reactor operators and will provide confirmation that the OPAL reflector vessel will fulfil its design function for its expected operational life.

Encapsulating and releasing active molecules: 'CeramiSphere'

Activity

As part of a major nanotechnology research program, ANSTO is developing and commercialising an innovative technique for encapsulating and releasing a wide range of active molecules from ceramic micro- and nano-particles. A key feature of the technology is the production of particles with a defined microstructure, which can be designed to have controlled dose/release rates to suit specific requirements.

Output

This year we filed five provisional patents, set up a business venture whose sole aim is to commercialise the controlled-release technology and developed partnerships with a wide range of companies, local and overseas, to explore the commercial potential of our technology. This applies to market segments such as home care products (e.g. detergents), oral care products (e.g. toothpaste), agriculture (e.g. biocide/herbicide), food (e.g. flavours), veterinary (e.g. antigen) and healthcare (e.g. biomedical applications). We also initiated collaborations with the Ian Wark Research Institute at the University of South Australia to increase the 'stealth' of our nanoparticles in the blood stream, and with Queensland University of Technology and the McComb Foundation to investigate our technology's potential for treating burn (keloid) scars.

Outcomes

The new business venture – of which the principal target is currently non-medical applications, to minimise the time to market – has significantly increased the technology's commercial potential. The new provisional patents have strengthened our intellectual property (IP) portfolio and confirmed our leading position in the field. future medical applications of ANSTO's controlled-release technology stand to benefit all Australians.

Future

We will identify and develop opportunities for commercialisation by working with potential customers to identify solutions for them using our controlled release technology.

Providing unique services to industry

Activity

Based on nuclear research and expertise developed for ANSTO's own facilities, we provide unique consulting and other specialised services to Australian industry. In particular, we are targeting the biomedical sector (mainly orthopaedic prosthetics) and heavy industry, especially heavy manufacturing, petro-chemical and power utilities.

Output

Over the year we provided services to 37 customers, with 'value add' reaching the millions of dollars, and reached our own external revenue target of half a million dollars.

Major projects included analysing and modelling extensions of equipment life for the mining industry; testing for fatigue in knee and hip prosthetics for the biomedical industry; and testing for thermal shock resistance of refractories. We also initiated significant alliances with large engineering firms that will strengthen our ability to both undertake and bring in new work.

Outcomes

Our work supports Australia's existing multi-million-dollar industrial infrastructure and also helps develop new products. Working closely with industry benefits ANSTO staff too, ensuring that we keep abreast of the latest knowledge and techniques. This is particularly important for our engineering and materials work on the new OPAL reactor.

Future

We aim to further improve our services to Australian industry, particularly in 'remaining life' assessment of high-temperature components. By increasing the longevity of these components, we can significantly benefit both the power industry and the economy in general.

CASE STUDY:

Low-risk high-performance fuels for research reactors

To reduce the risk of nuclear weapons proliferating, there has been a worldwide move to replace the high-enriched uranium (HEU) fuels currently used in research reactors with low-enriched uranium (LEU) fuels. An LEU fuel is one that contains less than 20 per cent uranium-235, the fissile isotope or active ingredient of uranium. However, the LEU fuels currently available have two major drawbacks: they compromise reactor performance and they cannot easily be reprocessed. The challenge is to develop new LEU fuels that are high in performance, safety and economic viability. Since 2002, ANSTO has been involved in an international program to do just this.

Let's go back a few years. In 1978, as part of the United States' nuclear non-proliferation policy, the US Department of Energy established a Reduced Enrichment for Research and Test Reactors (RERTR) program, with a mission 'to develop technologies that could be used to minimise and eventually eliminate the use of highly-enriched uranium in civil applications worldwide.' This was the initial impetus behind the shift from HEU to LEU fuels, and to make it happen an international program of LEU fuel development and qualification was set up, led by the Argonne National Laboratory (ANL) in the US. In 1988, a new uranium silicide-based LEU fuel was approved for use by the US Nuclear Regulatory Commission. Since then, numerous research reactors around the world (including HIFAR at present and OPAL from its commissioning) have successfully converted to this fuel.

Uranium silicide fuel cannot, however, produce the higher neutron fluxes that some research reactors require to operate; furthermore, it cannot easily be reprocessed using current commercially-available technologies. What is needed is a readily reprocessable fuel with a higher uranium density to provide better neutron performance. In 1996 the ANL program began work on developing such a fuel.

Three years ago, Ross Finlay, a metallurgical engineer from ANSTO, joined the program in

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which he has assumed an increasingly senior role. Through RERTR's involvement, ANSTO has stayed at the cutting-edge of fuel development, with access to the latest research results. What has emerged from this research is that the best candidates for the job are alloys of uranium and molybdenum (UMo) mixed (as in other fuels) with aluminium powder. A coordinated international program is now under way to evaluate and qualify them. In the longer term, we may be able to achieve still higher fuel densities using UMo foils – that is, with no added aluminium – which would enable even the highest-power research reactors to convert to LEU fuel. Meanwhile, the experience and knowledge ANSTO has gained from the program to date will prove invaluable when we upgrade the new OPAL reactor from LEU silicide to UMo dispersion fuel in a few years' time.

CASE STUDY:

Locking up plutonium waste in the UK

The treatment and safe storage of radioactive wastes is one of the most important challenges in the nuclear industry today. Not only is it good for the environment, it also benefits non-proliferation by locking out of harm's way materials that might otherwise be used to make nuclear weapons. Developing and commercialising the technology to 'immobilise' these wastes is one of ANSTO's major priorities, and this year we signed a major agreement with Nexia Solutions, part of the British Nuclear Group, to assist with the clean up of plutonium waste in the United Kingdom.

Impure plutonium wastes stored at Sellafield in the UK have been considered intractable due to their diverse and complex chemistry. In 2001, ANSTO was challenged to come up with a solution. ANSTO has a unique technology for immobilising radioactive wastes – known as 'synroc' – which can be adapted to meet a range of conditions and requirements. In essence, synroc ('synthetic rock') mimics the action of geochemically-stable minerals in the Earth's rocks which have for billions of years retained naturally-occurring radioactive materials such as uranium and thorium. Together, ANSTO and Nexia Solutions have come up with a synroc glass-ceramic matrix designed specifically to immobilise the Sellafield waste for long-term storage and eventual permanent disposal.

How does it work? First, we combine the plutonium waste with the glass-ceramic precursor mix. Then we put the mix into metal cans and place the cans inside a hot-isostatic press. At high temperatures and with enormous pressure, the press compacts the mix into a dense, inert, glass-ceramic matrix. This material is now ready to be stored in a specially-designed facility. Using this process, two tonnes of impure plutonium waste will be permanently locked away in a solid form.

ANSTO and Nexia Solutions have a long-term commitment that will continue throughout construction of the plant and beyond. In March 2008, a full-scale non-radioactive demonstration line is to be commissioned, and this will be a pilot for other plutonium waste initiatives in the UK and elsewhere. By demonstrating to the nuclear industry that there are better options for disposing of radioactive wastes, the British Nuclear Group-ANSTO relationship promises to open many doors for ANSTO internationally.

National interest and capability enhancement

Liz Keegan is an analytical chemist and has worked at ANSTO for over 10 years. She is in charge of the inductively-coupled plasma mass spectrometer in the Institute of Materials and Engineering Science, which is used to analyse elements at trace concentrations in radioactive and non-radioactive samples and to determine isotope ratios. Liz is also a member of the National and International Safeguards and Security Research project, and she is currently creating a library of the isotopic content of Australia's uranium reserves so that each export product can later be traced back to its place of origin.

Building partnerships to counter terrorism

Activity

This year ANSTO established a National and International Safeguards and Security Research project (NISSR) to contribute expertise and facilities to Australia's counter-terrorism research and training priorities. We are working closely with organisations such as the Department of Prime Minister and Cabinet's Science, Engineering, and Technology Unit for Counter Terrorism, publicly-funded research agencies, law enforcement groups, customs, and emergency service agencies.

Outputs

ANSTO collaborated on a number of research programs in the fields of nuclear forensics, traditional forensics, environmental safeguards, and radiation detection. Nationally, our research partners included the Australian Federal Police, the Defence Science and Technology Organisation, the University of Canberra, the University of Technology Sydney, and the University of Western Sydney. We participated in training exercises for various state and commonwealth government agencies, and the NISSR team helped draft the position paper for a national radiological counter-terrorism forum. Internationally, ANSTO continued to participate in high-profile research fora such as IAEA-coordinated projects for detecting illicit trafficking of nuclear material and the International Technical Working Group's Nuclear Forensic Laboratories program. Our Accelerator Mass Spectrometry group has continued to provide technical assistance to IAEA programs in support of international nuclear non-proliferation activities. NISSR project members published a number of articles, a book chapter (by invitation), and have been involved in writing and reviewing several IAEA publications.

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Outcomes

ANSTO's core expertise and facilities are making an important contribution to national efforts to protect Australia from crime and terrorism. Our involvement in international programs demonstrates Australia's continuing commitment to the Nuclear Non-Proliferation Treaty.

Future

In the coming year ANSTO will continue to build networks with research providers and users such as the recently formed Publicly Funded Agencies' Collaborative Counter-Terrorism Research Programme and to offer research and training assistance in counter-terrorism methods to external stakeholders.

CASE STUDY:

New methods for detecting illicit radioactive materials

The events of the last 15 years have seen vast changes in the worldwide political landscape. One trend of particular concern is the upsurge in global terrorist activity. While terrorist groups continue primarily to use conventional weapons to conduct their operations, there is concern that several may be considering the use of radioactive or nuclear materials for the creation of either a radiological dispersion device ('dirty bomb') or an improvised nuclear device. With this in mind it is essential that the international community takes steps to detect and recover illicitly trafficked radioactive and nuclear materials. One area in which ANSTO has contributed to counter-terrorism initiatives is in the field of radiation detection.

For the last two years ANSTO staff members have been engaged in an international research activity co-ordinated by the IAEA entitled *'Improvement of Technical Measures to Detect and Respond to Illicit Trafficking of Nuclear and other Radioactive Material'*. A primary focus of our work has been to evaluate the performance of a number of hand-held radiation detectors and to monitor how effective they are, in a variety of test scenarios, at detecting the unique gamma-ray signatures of radioactive and nuclear materials. In one scenario, for example, a legal shipment of radioisotopes is used to hide or mask the presence of illicit nuclear materials. We had to determine how this might be attempted, and how effectively. The information obtained from these types of scenarios helps customs officials and other policing agencies to develop more effective detection and response strategies.

ANSTO submitted two confidential reports to the IAEA on the results of this research and is also working to ensure that stakeholders – national and international – will benefit from it. In the spirit of non-proliferation, we are making an important contribution to international efforts to reduce and eliminate the trafficking of illicit nuclear and other radioactive materials across international borders.

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John Coombes has a maintenance background in the marine, aeronautical and mining industries. He came to ANSTO in 1998 to manage the maintenance group at HIFAR and was heavily involved in the successful major shutdown of 1999-2000. Subsequently he ran the Engineering Development Workshop, and last year he took over management of the Site Services group. John has been busy implementing the use of Service Level Agreements and period contractors, and developing an ethic of continuous improvement.

Introduction – Operations

A broad range of activities is required to operate ANSTO's reactor and facilities: to enable other organisations to access these facilities and our technologies and expertise; to provide advice to government and to support research and commercial operations – not to mention the work involved in finance, human resources, maintenance, safety and security. These activities are managed primarily by the Corporate Services, Engineering Services, Reactor Operations, and Safety and Radiation Services divisions, as well as by teams in the Executive division. In early 2005 these teams were brought together under the Operations Group. Some operational activities, notably the operation of accelerators and the provision of neutron-scattering services, continue to be managed by ANSTO's research institutes.

The Operations section of the annual report provides information on the development and operation of major facilities, the management of nuclear materials and wastes, ANSTO's interactions with government, and our role in representing Australia in international affairs. Central to all these activities is the continued safe operation of HIFAR and the construction and commissioning of the OPAL reactor. Case studies explain how we are planning for the opening of the OPAL reactor. They also highlight ANSTO's international involvement in regional counter-terrorism activities and our support for the development of nuclear science in other countries.

The Operating Plan for the coming year emphasises efficiency; integrating support services with major projects and ongoing activities; maintaining the systems, processes and compliance required by the organisation and increasing the focus of our international activities. A key issue is staff development through appropriate training and exposure to

best practices from around the world. In this regard, ANSTO continues to focus on learning and development, both for individuals and as an organisation.

Internationally, nuclear science and technology is growing, and many countries are pursuing the development of nuclear power. This is especially true in the Asian region. ANSTO's work in various international fora provides opportunities for Australia to encourage commitment to safe and secure operations and adherence to the non-proliferation regime. We also offer assistance to countries in the Asia-Pacific region to realise the benefits of nuclear science and technology in medicine, agriculture, environmental protection and industry.

Project outlines

Constructing the new OPAL research reactor

Activity

ANSTO is constructing a replacement research reactor and associated facilities to improve Australia's scientific research and services to medicine and industry. The new OPAL reactor will be a low-power water-cooled pool reactor that uses low enriched uranium fuel. This major project is now well advanced and construction is scheduled for completion in early 2006. This year we have also been recruiting and training operators and other personnel for the OPAL reactor as part of a comprehensive transition process from HIFAR to OPAL.

Output

A number of important milestones were reached during the year. The reactor building and the neutron guide hall were completed in 2004. The reflector vessel was installed in May 2005. In September last year we submitted the application for an operating licence to ARPANSA, and early this year ARPANSA arranged a peer review of the adequacy of our OPAL operations plans, the overall findings of which were positive. The reviewers noted in particular that, "the contractor and its subcontractors have done a remarkable job and made enormous efforts to keep the deadlines."

Outcomes

The OPAL reactor will be a multi-purpose facility for radioisotope production, irradiation services and neutron beam research. Being more modern and efficient, it will allow ANSTO to expand its work in the development and application of new knowledge in many areas that are vital to Australia's future, such as agriculture, industry and manufacturing, minerals and energy, construction, human health and the environment.

Future

Cold commissioning of OPAL is currently scheduled to run from January to March 2006. Hot commissioning and performance testing of the reactor are currently scheduled to run from May 2006 to January 2007.

CASE STUDY

The future is OPAL

Children from as far afield as Kangaroo Island in South Australia have helped give an identity to Australia's largest ever investment in scientific infrastructure. A nationwide competition amongst schools contributed to an inspired choice for the name of the new 20MW research reactor now being built at ANSTO: OPAL – symbolising an Australian icon highly valued for its iridescent beauty. The name was made official by the Federal Minister for Education, Science and Training, the Hon. Dr Brendan Nelson, at a ceremony on 24 January 2005.

OPAL is the future of nuclear science and technology. Outperforming HIFAR – Australia's existing nuclear facility – in every respect, and in the top league of research reactors around the world, OPAL will give Australian and international scientists the opportunity to carry out research and develop technologies never before possible in this country. It can also dramatically increase our production of radioisotopes, vital for medicine and industry both here and overseas.

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The design, construction and commissioning of a new reactor is a long-term project. This year we installed the reflector vessel, which sustains and controls the nuclear reaction, and all but completed the reactor's physical housing. We also finished most of the design and procurement activities associated with the eight neutron beam instruments that will be used to conduct research, and we completed the building in which they will be housed and operated. These instruments will utilise the neutrons the reactor generates and direct them at materials – anything from blood cells to newly discovered electronic compounds to aircraft components – so that scientists can analyse them at the atomic and molecular levels. The next stage of the project is to have the fixtures, fittings and technical equipment installed. Commissioning will commence in early 2006.

An important enhancement this year was an $8.5 million deal between ANSTO's Bragg Institute – responsible for building and operating OPAL's neutron beam facility – and the National Science Council of Taiwan to install and operate a unique instrument called a cold-neutron 3-axis spectrometer. The spectrometer will analyse how atoms affect each other as they jostle for position in their (atomic) environment, and this can help us explain why some materials perform better than others in specific applications. This instrument will operate at the lower neutron energies provided by OPAL's cold neutron source, and it is therefore especially suited to analysing more subtle effects such as those involving electronic and magnetic interactions. It will complement ANSTO's thermal-neutron 3-axis spectrometer (TAIPAN), which will operate at higher neutron energy levels and will be suited to stronger effects such as those that determine the stability of compound materials. Between them, the two spectrometers will provide a broad capability for probing atomic motion and magnetic properties that will make research at OPAL highly attractive to leading international scientists. The new instrument will take around four years to build.

OPAL will have enormous benefits for many aspects of Australian life and is anticipated to remain at the cutting-edge of scientific research for the next 40 years. As Rob Robinson, Head of the Bragg Institute, says, "It is the opportunity for a generation." OPAL will still be going strong when the children who helped name it are old enough to be developing the next generation of nuclear technology.

Running HIFAR – operation, maintenance, utilisation

Activity

ANSTO's operations and maintenance programs ensure that our 10MW HIFAR research reactor, Australia's only operating nuclear reactor, continued to operate safely and reliably throughout the year, delivering irradiated materials for radiopharmaceuticals, neutron transmutation doped silicon for industry and neutron beams for research.

Output

The first Low Enriched Uranium (LEU) fuel elements were loaded into HIFAR this year. LEU fuel, in which less than 20% of the uranium is uranium-235, is being progressively

loaded into the reactor to convert the 25 fuel-element HIFAR core from Highly Enriched Uranium (HEU). This conversion process complies with the objectives of the international Reduced Enrichment for Research and Test Reactors Program, which is part of the international non-proliferation effort. This year we also improved our safety management program by making more use of self-assessment methods to investigate real or potential plant and operator faults.

Outcomes

Our activities ensured that HIFAR operated at high levels of availability and safety throughout the year, to the continued satisfaction of internal and external customers. We also developed more effective communication with our customers and with regulatory bodies. Our experience with HIFAR has benefited the OPAL project too, with our staff being able to contribute their knowledge and expertise to support operational planning for the new reactor.

Future

We will to continue to keep HIFAR operating safely and with good reliability until its final shutdown after the new OPAL reactor is fully commissioned. After that, HIFAR will be decommissioned.

Managing ANSTO's waste

Activity

The safe storage and ultimate disposal of ANSTO's radioactive wastes is a key focus of the organisation. Tasks include the collection, processing, treatment and conditioning of low and intermediate level wastes into solid-form packages suitable for storage and transportation.

Output

As well as continuing to manage the handling, transport and storage of the site's waste safely and efficiently, we undertook several new project activities this year: a radioactive waste tracking system to maintain and track our low and intermediate level solid waste inventories; a mock-up facility to test the integration of the ceramic titanate immobilisation technology (synroc) within hot cell geometry; improvements in processing and conditioning radioactive wastes; and improvements in the receipt, treatment and disposal of sewage and trade waste waters to allow the OPAL reactor to be integrated into the system.

Outcome

ANSTO's program for managing radioactive waste continued to meet Australian regulatory requirements, international standards and community expectations. We are recognised world wide as a provider of innovative waste management solutions.

Future

Our radioactive waste management facilities and processes will undergo continuous improvement to ensure they remain world-class. New processes will include long-term immobilisation of intermediate level liquid wastes using ANSTO's synroc technology; volume reduction and improved packaging of low-level solid wastes; and improved treatment of low-level liquid wastes.

Maintaining Australia's radiation standards

Activity

At ANSTO's Radiation Metrology Laboratories

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we maintain the Australian primary and secondary standards for the measurement of radioactivity, as well as a secondary standard for the measurement of absorbed dose. Together, these standards underpin the accuracy of diagnostic, therapeutic and palliative treatment procedures associated with the use of radiopharmaceuticals and radiation therapy at Australian hospitals. Radioactivity standards also underpin many of ANSTO's industrial and commercial activities.

Output

This year we developed a secondary dosimetry standard for the treatment of prostate cancer and a new radioactivity standard for the treatment of liver cancer. We conducted our annual comparison with the International Atomic Energy Agency of our Secondary Standard Laboratory's radioactive beams, demonstrating an accuracy of the measured radioactivity dose to within 1%. We also performed calibrations on the National Medical Cyclotron at Camperdown, provided standardised sources of irradiated materials to internal ANSTO customers on request, and measured the gamma-ray emission rates of an intense radioactive calibration source used for dosimetry measurements by the recently refurbished Instrument Calibration Facility. In collaboration with the Laboratoire National Henri Becquerel (LNHB) in France, we have been developing an advanced level of liquid scintillation metrology (an absolute measurement capability) to support the research and development of primary radioactivity standards at ANSTO. The LNHB provided ANSTO staff with high-level training for this work.

Outcome

ANSTO's radioactivity and dosimetry standards benefit the Australian community at large by ensuring that the delivery of diagnostic, therapeutic and palliative treatment modalities in the nuclear medicine and radiation therapy centres of our hospitals is safe and reliable. Radioactivity standards underpin the safe and effective operation of HIFAR. They will do so for OPAL when it is commissioned and throughout its operational life. Radioactivity standards also underpin the commercial efficiency of ANSTO's radiopharmaceutical production as well as ANSTO Radiopharmaceuticals and Industrials' status as a verifying authority for the radioactivity measurement of several key radiopharmaceuticals.

Future

The collaborative work we are undertaking with LNHB in France will develop the capability for the Standards Group to provide absolute primary standards of an emerging new generation of medical radiopharmaceuticals for Australia.

Representing Australia internationally

Activity

ANSTO continues to maintain a strong presence and high profile in established international and regional fora, amongst which is our support of Australia's permanent position on the Board of Governors of the IAEA. In these roles we support Australia's commitment to peaceful nuclear cooperation and respond to its obligations under the

Nuclear Non-Proliferation Treaty. We also advance ANSTO's own international and regional scientific standing.

Output

ANSTO staff provided their expertise across a wide spectrum of assignments to support the IAEA's nuclear-related programs, especially its Technical Cooperation Program. These assignments included participating in consultants and technical meetings, providing specialist advice to developing countries and delivering lectures at IAEA training events. Key leadership was provided in chairing meetings aimed at developing international agreements on the safety and security of radioactive sources and nuclear liability. The IAEA also funded ANSTO staff to undertake 41 missions, totalling 195 days. Additionally, as part of an ongoing arrangement with the IAEA, ANSTO coordinated the placement of 53 Fellows and scientific visitors for specialist training in Australia.

A key role is played in the Regional Cooperative Agreement with 17 regional countries and the IAEA. Australia, through ANSTO, providing the national representation, acts as lead country for radiation protection, chairs the Regional Office Advisory Committee and, with the support of AusAID, funds a range of activities in response to environmental pollution and radiological emergencies.

The ANSTO counsellors in Vienna and Washington provided representation for Australia on nuclear issues and a link with nuclear developments in these areas throughout the world. Strong links continued with the OECD Nuclear Energy Agency (NEA) and the IAEA. ANSTO represented Australia at the NEA Steering Committee and at relevant technical committees. Special attention was given to support government departments in areas related to non-proliferation.

Outcomes

ANSTO enhanced its strong reputation in regional and international nuclear science and technology by participating in key international, regional and national events. Our leading role in two major regional nuclear cooperative mechanisms – the treaty-level Regional Cooperative Agreement and the Forum for Nuclear Cooperation in Asia – underscores our country's commitment to the peaceful application of nuclear science and technology and demonstrates the high standing of our scientific and technological achievements.

Future

ANSTO will continue to represent Australia in international and regional nuclear cooperation arrangements and in implementing ongoing technical and management initiatives. A major aim of this involvement is to encourage countries in the Asia-Pacific region to achieve increased self-reliance in using nuclear science and technology peacefully and safely.

CASE STUDY

Nuclear neighbours working together – ANSTO and the Indonesian National Nuclear Energy Agency (BATAN)

In 1999, at the request of the International Atomic Energy Agency, an ANSTO engineer went on a mission to Indonesia. His task was to train staff at the Serpong nuclear facility to conduct 'in service' inspections – safety checks

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undertaken while a nuclear reactor is temporarily shut down for routine maintenance. The mission was a resounding success. In March 2000 the visit was reciprocated: an Indonesian engineer spent a month at ANSTO getting on-the-job experience in inspection and materials testing procedures during a major shutdown of the HIFAR reactor. Thus began a long and fruitful relationship between ANSTO and BATAN.

Over the years, ANSTO staff members have visited Indonesia on a number of occasions, delivering training in the areas of materials testing, calibration, quality systems, assessment of the 'remaining life' of key equipment components and the water chemistry of reactors. They have also helped BATAN prepare funding proposals to the IAEA, for a major project on reactor inspection, and to AusAID, for a materials testing project. Both proposals were successful.

Under the IAEA-financed project, ANSTO specialists lectured at an Indonesian National Training Course and conducted on-the-job training at the KARTINI research reactor in Yogyakarta. Further collaboration on the project is scheduled for BATAN's Serpong and Yogyakarta facilities in the latter half of 2005.

Under the AusAID-funded project, ANSTO helped BATAN revitalise and enhance its capabilities for performing advanced materials testing and 'remaining life' assessment. These techniques and technologies, which make it possible to determine with great accuracy the remaining life of critical components, will benefit not only Indonesia's nuclear operations but also its industry in general.

IAEA and AusAID funding has also assisted BATAN scientists to come to Australia. In the last two years, staff from Yogyakarta and Serpong have spent a total of almost a year at ANSTO being trained in a variety of skills and techniques. Thanks to AusAID, personnel from BATAN and the Indonesian Electric Power Company recently visited a number of electricity support organisations in Australia to gain practical insights into how ANSTO's 'remaining life' techniques interface with industry.

In the next two years, as part of the Regional Cooperative Agreement (RCA) program, BATAN and ANSTO will join forces to study marine pollution in Southeast Asia and to model the consequences to humans of radioactivity releases into the environment. Collaboration between the nuclear neighbours is flourishing.

Advising government

Activity

ANSTO advises ministers, Federal Parliament, government departments and agencies on a range of national and international nuclear issues including the nuclear fuel cycle, counter-terrorism initiatives, regional activities and developments at the International Atomic Energy Agency. We also contribute to government policy on science and technology, health, environment, industry, foreign affairs and trade.

Output

During the year ANSTO gave advice on radioactive waste management, nuclear fuel cycle developments around the world and

other overseas developments of importance to Australia. We also provided analytical services to help detect clandestine nuclear activities and supported Federal Government interactions on security and safeguards with neighbouring countries. We made submissions to the House of Representatives Standing Committee on Industry and Resources' inquiry into the non-fossil fuel energy industry in Australia and to the House of Representatives Standing Committee on Science and Innovation's inquiry into technological innovation. We also submitted reports to government ministers and the Parliamentary Public Works Committee on the progress of the replacement research reactor project.

Outcomes

Through our expertise and experience in nuclear science and technology, radioactive waste management, environmental science, research funding and commercialisation and other important endeavours, we provided sound advice about these issues to ministers, Members of Parliament and government agencies.

Future

We will continue to play an advisory role to government, in particular providing substantive information in the burgeoning discussions about nuclear energy as an alternative source of power in Australia.

Leading the way in security and international safeguards

Activity

ANSTO has implemented international safeguards agreements for all its nuclear material in accordance with permits issued by the Australian Safeguards and Non-Proliferation Office (ASNO). ANSTO also implements physical protection and site security measures to comply with international agreements.

Output

ANSTO's facilities were inspected by the IAEA and regularly audited by ASNO. The IAEA inspections confirmed compliance with accounting and reporting requirements. ANSTO facilities and expertise were also used to train safeguards staff from other countries. Construction began on ANSTO's new main entrance, which is designed to provide additional security measures.

Outcomes

ANSTO's management of nuclear materials and facilities enabled Australia to continue to comply with the Non-Proliferation Treaty and implement Integrated Safeguards. Its facilities were also used to promote adherence to non-proliferation principles in neighbouring countries.

Future

The new main entrance will further enhance security at ANSTO as well as provide a more visitor-friendly face to the site.

Engaging with the Australian community

Activity

ANSTO engages actively with the Australian community through the media, school education, presentations, publications, the internet and other mechanisms. The communications group drives organisational

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branding and contributes to interaction with staff, as well as government, science and business sectors.

Output

ANSTO strengthened its positive media profile in 2004-05, with stories featured nationally on water isotope research (as well as numerous other scientific breakthroughs), ANSTO staff and OPAL construction progress. We made frequent presentations to community groups and increased our involvement with schools. An educational resource relevant to every Australian state and territory curriculum, *Nuclear Science in Society*, was distributed. Analogous to our science, collaborative initiatives such as a careers in science promotion took place (driven by ANSTO in partnership with CSIRO, DSTO, the Australian Institute of Marine Science and the NSW Ministry of Science and Medical Research), whilst our e-magazine, *Velocity*, also featured the best of the nation's science. ANSTO also published its first corporate social responsibility (CSR) report.

Outcomes

The media has been increasingly inclined to seek out and feature ANSTO's perspectives on a range of topics, generating favourable and balanced coverage of the organisation and nuclear issues. There has been widespread positive feedback from Australian science teachers and ANSTO's community site tours consistently received positive feedback, as did the Materials Science Day that was our 2004 National Science Week centrepiece. ANSTO's CSR approach drew praise from a number of stakeholders. Positive feedback was also obtained from the ANSTO Community Discussions, forums for local residents to find out more about the organisation, and our attendance at numerous community events. A number of brochures were produced on topics such as ionising radiation, the National Medical Cyclotron and radioactive sources, whilst assistance was provided for ANSTO's environmental reporting and the Human Activity and Climate Variability project summary.

Future

ANSTO will promote its nuclear capabilities and facilities – with a special focus on OPAL and the Bragg Institute (including the production of brochures) – to all stakeholders, with an emphasis on encouraging use of our facilities and collaboration with our scientists. Involvement with science education will continue, and we will sustain the transparent way in which we engage with our diverse group of stakeholders. There will continue to be a strong focus on the media, and at the same time we will promote the organisation more effectively to science, business and government audiences.

Delivering learning and development

Activity

The Learning and Development section is responsible for identifying and delivering a variety of individual and organisational development activities for ANSTO staff.

Outputs

Over the year, Learning and Development ran a number of training courses (see Table 1) and facilitated a total of 69 postdoctoral, year-in-

Table 1. Overview of courses managed by Learning and Development July 2004 - June 2005

Courses & duration	Number of courses delivered 2004-05	Total number of days	Number of attendees
Site-Wide Training Programs			
Frontline Management (AIM) x 1 or 2 days	7	9	71
Welcome to ANSTO Orientation Day x 1 day	3	3	40
Welcome to ANSTO Workshops x ½ day	3	1½	19
Science Communication Workshop x 2 days	1	2	9
Introduction to Supervision x 2 days	1	2	12
Advanced Supervisory Skills x 1 day	1	1	12
Performance Management x 2 days	1	2	9
Objective Setting and Review Process Training x ½ day	2	1	30
Project Management x 3 days	2	6	25
Recruitment Training 3 x ½ day	1	1½	9
Harassment Contact Officer Training x 2 days	2	4	17
Internal Auditor Training x 2 days	1	2	11
Working Successfully at ANSTO x 2 days	3	6	30
Division/Institute Development Workshops			
Team Development and Creative Thinking Program x 1½ days	1	1½	6
Conflict Resolution Training x 1 day	1	1	8
Management Team Development Day x 1 day	1	1	8
TOTALS	**31**	**44½**	**316**

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Table 2. Supervision of students by Learning and Development July 2004 – June 2005

Program	Numbers
Postdoctoral Fellowships	12
Year-in-Industry (undergraduate)	20
Vacationers (undergraduate)	19
Work Experience (high school)	18

industry, vacation and work experience students (see Table 2). We introduced several new programs, including staff orientation and internal workshops, helped facilitate team development and planning activities for various work units and redesigned our Frontline Management training program to enable more flexible delivery.

Outcomes

This year we helped staff develop their skills in project management, recruitment, supervision, interpersonal relations, setting and reviewing objectives and science communication. And with supervisory skills a key requirement at ANSTO, the redesigned Frontline Management program has given our current and aspiring managers a more flexible and practical way to enhance their skills and to obtain formal accreditation.

Future

To support a better work culture, we will be introducing additional online programs including 'Workplace Rights and Wrongs' and 'Ethics'. We will also be implementing a Performance Coaching program to assist managers in staff development activities.

Expanding library services

Activity

At ANSTO we are moving towards a 'library without walls', with the Library providing web-based access to high-quality scientific information. This year we have expanded our e-collection of electronic databases, for example with the addition of the Institute of Scientific Information (ISI) Web of Knowledge, and we complement this by subscribing to 5 000 electronic journals in all relevant fields of research.

Output

ANSTO scientists now have direct web-based access from their desktops to prestigious current and retrospective research literature across all the sciences. Electronic resources such as the ISI Web of Knowledge and the electronic journal collection are giving our scientists immediate and easy access to the best research available.

Outcomes

By transforming our 'library' into a state-of-the-art collection of electronic products and services, we make it possible for ANSTO staff

to be at the cutting edge in their disciplines. Access to quality information enables important theories and concepts to be substantiated, tracked and confirmed, which in turn can encourage our science teams to generate innovative ideas and set new directions for research.

Future

The Library will continue to pursue cost-effective options for acquiring nuclear science literature on web-based platforms so as to best meet the research needs of our scientists.

Implementing ANSTO's Business Management System (ABMS)

Activity

This project develops and implements the integrated management system used to conduct ANSTO's business. We audit, review and refine business processes and thereby improve the performance of key components of the system.

Output

This year we worked towards making key business processes across the organisation more consistent and ensuring that all new business systems comply with the Australian Standards for Quality Management (ISO 9001) and Environmental Management (ISO 14001). We also strengthened our capacity to identify opportunities for continuous improvement of ANSTO's business processes.

Outcomes

By incorporating the business practices of a number of ANSTO's divisions into a single certified business management system in which key organisation-wide processes have been identified and uniformly applied, the ABMS was a vehicle to deliver safe, efficient and environmentally responsible outcomes to our customers and stakeholders.

Future

As existing management systems are recertified over the next three years, we will be integrating them into the ABMS. We will also be ensuring that the ABMS continues to meet Australian standards of quality and environmental management.

CASE STUDY

Making radioactive sources secure in the Asia-Pacific

Around the world today you will find abundant use of radioactive isotopes in areas such as nuclear medicine, aerospace engineering, minerals analysis, pollution control, agriculture, oil exploration and food processing. Some of these isotopes are highly radioactive: caesium-137 and cobalt-60, for example, are prevalent in applications such as the irradiation sterilisation of medical products and the treatment of cancer; iridium-192 is used extensively in the radiography of metallic parts; and other highly active sources can be found in industrial gauges for process measurement and control.

It is imperative that these highly radioactive sources never fall into the wrong hands.

To prevent this from happening, ANSTO is now playing a major role in an Australian Government counter-terrorism initiative in the Asia-Pacific. The Government has committed

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$4.5 million to a three-year outreach program that is assisting countries in our region to improve the control of radioactive sources and to prevent any potentially illegal use. The program, which is being run with support from related programs of the IAEA and the US National Nuclear Security Administration, had an excellent start. In the program's first year, a range of Southeast Asian countries participated – Brunei, Darussalam, Cambodia, Timor L'Este, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam – as well as ten Pacific Island nations including Papua New Guinea.

ANSTO's role in the program is wide-ranging. As well as urging countries to adopt the IAEA Code of Conduct for the Safety and Security of Radioactive Sources, we are providing the strategic advice, expert knowledge and hands-on technical experience that will bring radioactive sources under better control and further develop our network of regional technical cooperation. Together, we are working to improve the legislation that governs each nation's control of radioactive sources, the systems used to license and inspect radioactive sources and the technical capabilities for tracking and detecting these sources, particularly in regards to unauthorised movements within a country or across regional borders.

Already ANSTO staff have run technical workshops and information seminars and made several visits to countries in the region. In February, the region came to us: 21 participants from ten Southeast Asian countries attended a four-day workshop at ANSTO, undergoing training in the latest strategies and techniques for searching out and securing 'orphan and vulnerable sources' – that is, radioactive sources not under adequate or legitimate control or without a legitimate owner. The interest, cooperation and mutual understanding evident at this workshop augur well for the program's future.

KEY PERFORMANCE INDICATORS

Key Performance Indicators

The Australian Government funds ANSTO in three separate tranches, or outcomes, to:

1. acquire new nuclear based infrastructure, that is, the construction of OPAL

2. dispose of spent HIFAR fuel

3. deliver valued, nuclear-related scientific services and products.

The first two outcomes are funded in accordance with specific Government decisions. The third outcome is subject to a Triennium Funding Agreement (TFA) between the Minister for Finance and Administration, the Minister for Education, Science and Training, and ANSTO. Funding on a triennial basis provides a more stable financial environment and a realistic timeframe in which to plan for and deliver outputs and outcomes.

The following performance report covers all three outcomes and reports against outputs identified in ANSTO's section of the 2004-05 Department of Education, Science and Training Portfolio Budget Statements. The performance indicators for the third outcome are also part of ANSTO's new TFA, which began in 2004-05. As a result, some of these indicators differ from those included in the 2003-04 Annual Report. Several performance indicators are new.

Outcome 1: Nuclear based infrastructure

Effectiveness – overall achievement of the outcome

Objective

The replacement research reactor is operational and providing improved core nuclear facilities for medical, industrial and R&D applications during 2006.

Indicators	Performance
Level of compliance with project plan and achievement of specific milestones:	
• On time	• As reported to the Minister, full power operation has been delayed by six months.
• Within budget, to the extent within ANSTO control	• Minor cost escalation has occurred due to externally driven factors.

Contributions of Outputs to Outcome

ANSTO's specific output relates directly to client supervision of the design, construction and performance testing of the outcome in the form of an operational replacement research reactor together with neutron beam instrumentation.

Performance information for departmental outputs

Output 1.1

Effective contract management for the design and construction of the replacement research reactor.

Indicators	Performance
• Complete Neutron Guide Hall (NGH) (July 2004)	• To permit the contractor to efficiently complete works, the NGH handover was rescheduled to September 2004, at which time ANSTO took possession of defined NGH areas.
• Complete installation of cooling towers (August 2004)	• Completed May 2005 due to construction and controlled delay to align with other works.
• Complete Reactor Beam Hall (November 2004)	• To permit the contractor to efficiently complete works, the Beam Hall handover was rescheduled to February 2006.
• Complete installation of reflector vessel (January 2005)	• Installation occurred in May 2005.
• Complete installation of Cold Neutron Source (May 2005)	• Due to delays in manufacturing and the installation of the reflector vessel, the projected completion date was rescheduled to November 2005.

Outcome 2 – Disposition of Spent Fuel

Effectiveness – Overall achievement of the Outcome

Objective

Removal of spent fuel from the ANSTO site in line with stringent safety arrangements and community views.

Indicators	Performance
Safety procedures adhered to fully and shipments:	
• On time	• All necessary safety procedures within Australia, en route to and at its final destination, were fully met.
• Within budget	• A seventh shipment of HIFAR spent fuel was dispatched on schedule and successfully completed in accordance with budgeted contract terms.

Key Performance Indicators

Contributions of Outputs to Outcome

A program of shipments for reprocessing of all HIFAR spent fuel in place.

Output 2.1

Indicators	Performance
• Shipment effected according to schedule	• The seventh shipment was effected on schedule.
• A seventh shipment of HIFAR spent fuel is currently scheduled for late 2004	• Shipment scheduled for November 2004 successfully completed.

Outcome 3 – Science and Technology Solutions

Output 3.1

Management of core nuclear facilities providing Australia with nuclear capability and credibility from which socio-economic benefits flow to Australia, the R&D community and industry.

Indicator	Performance	
	2003-04	**2004-05**
• Research beamline usage – percentage of all available days, across all seven HIFAR instruments	75%	**83%**
• Research reactor availability – percentage of actual hours at power as a proportion of total hours planned to be at power	97%	**93%**[i]
• Accelerator usage – percentage of all available days, excluding maintenance, for tandem accelerators[ii]	82%	**86%**

Output 3.2

Expert scientific and technical services for and on behalf of Government, in support of Australia's national and international strategic and nuclear policy objectives.

Indicators	Performance
	2004-05
• Leadership role in national and international fora and networked organisations – number of such roles	**21**
• Person years by staff on projects that have as a primary objective providing advice to Government	**14**

Output 3.3

The acquisition of knowledge, through research and its utilisation, through innovation, to advance the beneficial applications of nuclear science and technology to problems of environmental, medical, social and industrial importance.

Indicators	Performance	
	2003-04	**2004-05**
• Publication and conference paper		
- Books, chapters & monographs	1	**5**
- Journal articles	113	**175**
- Conference papers/abstracts	322	**267**[iii]
Total	436	**447**
• Number of collaborations in research projects – total of collaborations within each project	n/a	**260**
• New inventions per year		
- Invention disclosures	9	**15**
- Provisional patent filing	3	**6**

Output 3.4

Science and technology services to industry and the Australian research and development community, including training of students in nuclear science and technology and its applications.

Indicators	Performance	
	2003-04	**2004-05**
• Number of postgraduates and undergraduates supervised	186	**201**
• External earnings from services and contract research	$6 018 000	**$5 380 000**
• External earnings from training courses	$97 000	**$100 000**

Key Performance Indicators

Output 3.5

Regular production and sale of radiopharmaceuticals and radioisotopes for medical and industrial applications and other services through designated business units.

Indicators	Performance	
	2003-04	**2004-05**
• Radioisotope sales (total)	$20 066 493	**$20 730 278**
• Export sales	$3 628 739	**$4 394 653**
• Radiopharmaceutical doses to patients – potential doses[iv]	n/a	**1 451 817**

Output 3.6

The exploitation of ANSTO's intellectual property and physical assets

Indicators	Performance	
	2003-04	**2004-05**
• Intellectual property being commercialised – inventions and designs with active commercialisation plans	n/a	**21**
• External earnings from land management and CSIRO site support	$3 790 000	**$3 488 339**

i Reactor availability was lower in 2004-05 due to unplanned shutdowns caused by power outages to the Lucas Heights Science and Technology Centre site. The causes of these have been discussed with Energy Australia.

ii The indicator is for usage of STAR and ANTARES. The Van de Graaff accelerator is not included as it ceased operations on 28 February 2005.

iii The decline in number of conference publications is attributed to staff adopting a more strategic approach to conference attendance.

iv Potential doses to patients based on radioactivity of the five main ARI products, as measured at the point of despatch to nuclear medicine centres in Australia. These five main products are a technetium-99m generator, thallium-201, gallium-67 and the medical iodine products iodine-131 and iodine-123. The estimate takes account of transport times, rates of radioactive decay and average dose quantities per patient but not the centres' hours of operation and usages, patient characteristics or the organs imaged. The indicator only covers distribution in Australia, not exports.

v Commercialisation processes were revised in 2004-05, and so comparable figures cannot be provided.

BUSINESS AT ANSTO

Business at ANSTO

Angela Donald has been with ANSTO for 17 years, first working at the Specific Pathogen-Free Animal Facility breeding clean animals, then in research and development, and now in radiopharmaceutical production at ANSTO's National Medical Cyclotron. She prepares and electroplates solid copper targets with nickel and zinc. These form the basis of what will become, after irradiation and further processing, the radiopharmaceuticals thallium and gallium, used to treat heart disease, cancers, and other conditions. In addition to her laboratory work, Angela recently became involved in sales and marketing. In this capacity she will be responsible for clients at nuclear medicine departments in hospitals.

Access ANSTO

This year we have replaced our business development function with 'Access ANSTO'. As the name implies, we want to give clients a single, easy point of access to all the commercial and industrial services ANSTO has to offer. But Access ANSTO is not only about letting industry come to us: we will be taking ANSTO to industry. To achieve this, Access ANSTO will be staffed by versatile professionals with backgrounds in all major commercial areas including law, marketing, sales, commercialisation and strategy.

The main objectives of Access ANSTO are to:

- assist ANSTO staff in marketing and selling services to commercial clients
- advise on and assist with technology commercialisation
- provide legal support for ANSTO's commercial activities
- facilitate improvements to ANSTO's commercial practices
- provide commercial clients with a single point of entry to ANSTO.

A specific objective is to increase ANSTO's capacity to offer 'high value' consulting services to commercial clients. In this regard, we aspire to the standards of quality providers of professional services and we aim to forge with our clients deep, durable relationships. Our model for this is ANSTO Minerals, which has a commendable record of consulting to mining companies domestically and internationally.

Through business planning, commercial analysis, technology evaluation, and our input into the organisation's Innovation Forum, we will play a key role in commercialising ANSTO's technology.

ANSTO Radiopharmaceuticals and Industrials

ANSTO Radiopharmaceuticals and Industrials (ARI) supplies approximately 200 public and private nuclear medicine centres in Australia as well as 10 centres in New Zealand. We also provide radiopharmaceuticals to 12 countries in Asia.

ARI produces radiopharmaceuticals at HIFAR and at the National Medical Cyclotron. The isotopes produced in our reactor are used in more than 80% of diagnostic nuclear medicine procedures (about 470 000 procedures) in Australia every year. Cyclotron-produced radioisotopes account for about 96 000 procedures. All in all, over 500 000 Australian patients benefit from our radiopharmaceuticals annually.

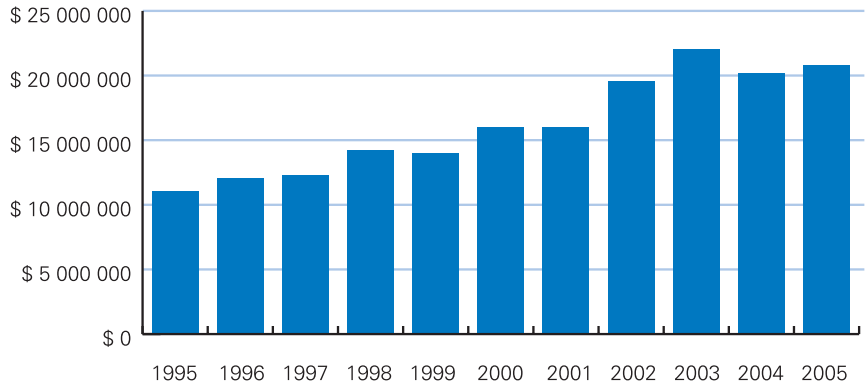
A principal application of radiopharmaceuticals is to enable us to 'see' diseased or inflamed cells inside the body. This is called 'imaging'. The appropriate radiopharmaceutical has to be selected to suit the bodily organ or physiological process to be imaged. For example, thallium-201 is used for cardiac imaging, gallium-67 for tumour and infection imaging. The results provide valuable functional information, and this can be correlated with structural changes evident through other imaging techniques. Nuclear imaging is now integral to improved cancer diagnosis, and according to the NSW Cancer Council, better diagnosis is contributing to the recent decline in mortality from cancer.

The other important applications of radiopharmaceuticals are in therapy and palliative care. ARI supplies the Australian company Sirtex Medical with yttrium-90 microspheres, which are used to treat liver cancer. 'Sir-spheres', an Australian innovation, are used in both Australia and the the United States. ARI also produces Quadramet (samarium-153) for alleviating pain from breast and prostate cancers that have spread to the bones. Iodine-131 is used to treat thyroid cancers. Iridium-192 is used in internal radiotherapy, while phosphorus-32 is used by physicians to treat polycythaemia vera (a chronic disease characterised by an increase in the number of red blood cells and blood volume).

ARI also has an industrial arm. We supply industrial radioisotopes and provide nuclear-based services to the following sectors: automotive, nuclear, oil and gas, aerospace, power, chemical, petrochemical and civil engineering. For example, we have supplied Thermo Electron in Adelaide – a company that supports mining and process control industries – with the vast majority of its industrial radiation-based products. We are the preferred supplier of Oceaneering, the world's largest non-destructive testing company; we supply products, hardware and logistics solutions for all their radiation-based product requirements. And we developed, produced and supplied a unique radioisotope for a specialist testing application within the Rolls Royce group.

Business at ANSTO

ARI revenue growth



The table above shows respectable increases in ARI's revenue with an aggregate growth of about 8% over the last 10 years.

ANSTO Minerals

Role and capabilities

ANSTO Minerals is a mining consultancy that specialises in knowledge of uranium ore processing and radioactivity in mineral processing. It was recently formed to consolidate several groups into one Business Unit. The core group has a 20-year track record of providing practical solutions and innovative technology in ways that deliver financial and environmental benefits to the mining and minerals processing industries.

ANSTO Minerals provides consulting services as well as sponsored, collaborative and contract research and development services in the areas of:

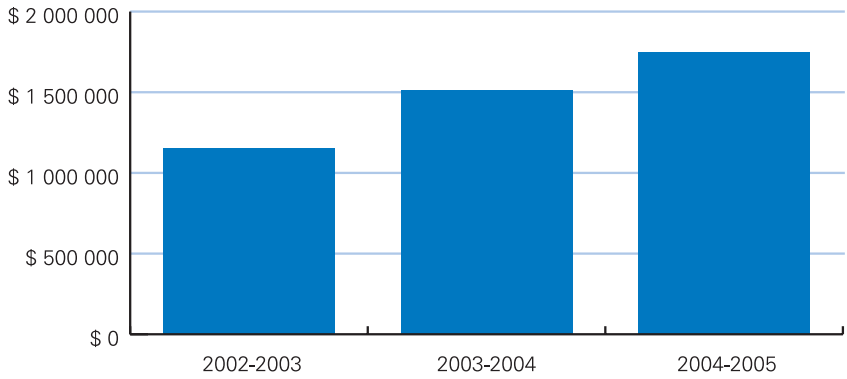
- uranium ore processing
- control of Naturally-Occurring Radioactive Materials (NORM) in the minerals industry
- process development for extractive hydrometallurgy
- management and predictive modelling of sulfidic heap behaviour.

The uranium/radioactivity market

Australia has the largest reserves of uranium in the world and is the world's second largest uranium producer. ANSTO has been very active in the development and application of technology for the uranium industry for over 20 years and has built strong relationships with all uranium producers in Australia.

For the past two decades the price of uranium has been at historically low levels due to large stockpiles of the ore and the oversupply of enriched uranium from the 'cold' war era.

ANSTO Minerals revenue from the sale of consultancy services



Recently the inventory of stockpiled uranium has been depleted and, perhaps more importantly, there has been a realisation that over-use of fossil fuels is having negative climatic consequences and that nuclear power may be a preferable complementary source of energy. These two factors have led to a uranium supply shortage, a rapid rise in its price and a flurry of exploration and feasibility studies.

Apart from the uranium industry, many ores processed for the extraction of other metals also contain NORM. There is a growing awareness of the implications of this radioactivity for workforces exposed to process streams and tailings and for the community exposed to the products. In addition, there is a growing interest in the issue of radioactivity in mineral products, driven by stricter regulations and the threat of legal liability over exposure to NORM and the related environmental impact.

Commercial work

The diagram above shows revenue from the sale of consultancy services and expertise to the mining industry. It illustrates the results of ANSTO Minerals increasing its focus on interaction with industry.

A wide range of projects were carried out under contract for over thirty clients in the mining industry. The projects ranged from site surveys and analyses, to research and development projects at bench and pilot plant scales. These projects included mini-plant and pilot-plant uranium leaching of ores, improving the performance of uranium ion-exchange processing, surveying radioactivity at mine sites, removing radioactivity from effluent water, improving the neutralisation and thickening of waste sludges, and assessing waste dump covers.

Business at ANSTO

Research work

There are many regulatory requirements for the handling, processing and transportation of radioactive materials. These regulations are currently undergoing widespread change. Important avenues for the implementation and clarification of these changes include ARPANSA forums and IAEA committees. A core function of ANSTO Minerals is to provide advice and input to these agencies, ensuring our research is relevant to industry needs.

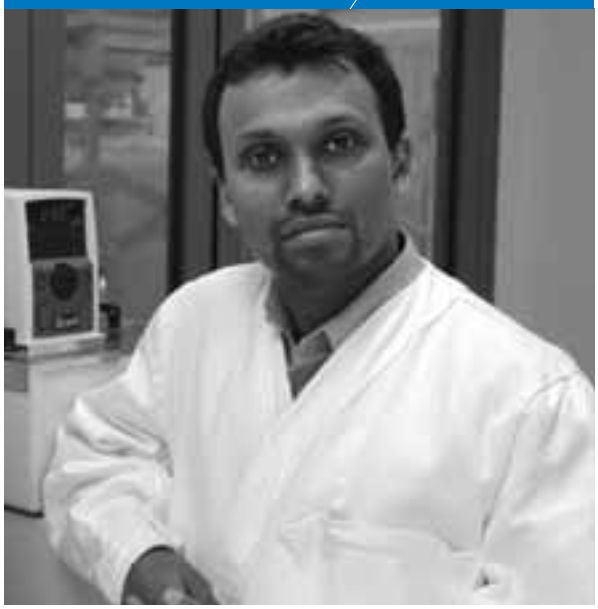
ANSTO is also a core member of the CRC for Sustainable Resource Processing and is especially active in supporting key projects aimed at improving the sustainability of the mining industry though conversion of minor elements into by-products and minimising the environmental impact of wastes.

Other longer-term research activities include:

- investigation of a novel process for the removal of impurities from ilmenite and management of the associated radioactivity
- upgrading sulfidic heap modelling software that predicts dissolution and precipitation of chemical compounds in a waste heap as a function of time (e.g. for 100 years)
- development of a more efficient oxidation process in uranium leaching.

SAFETY ARRANGEMENTS AT ANSTO

Safety Arrangements



Kapila Fernando is in charge of the Waste Treatment and Conditioning Group. Leading a team of 14 people, he is responsible for managing low-level radioactive waste and providing decontamination services to ANSTO. This year, Kapila was responsible for implementing a waste characterisation and clearance system that has successfully reduced the amount of radioactive waste the organisation generates. He is currently developing waste conditioning and decontamination infrastructure to provide long-term solutions for low-level radioactive waste management and to support the commissioning of the OPAL reactor.

Safety Arrangements

ANSTO is committed to ensuring a safe and healthy environment for employees, visitors, contractors and the external community.

Our objectives

In order to ensure that our activities do not have an adverse impact on the community, ANSTO's objectives are to:

1. protect human health and safety – this is the organisation's highest priority

2. develop and maintain safety systems and assessment procedures that comply with national and international standards

3. create and promote a positive safety culture

4. strive for continual improvement in safe work practices so that any risk to staff and the public from ANSTO's operations is as low as reasonably achievable.

Outcomes during the year

Following recognition by Comcare last year of the organisation's excellent Contractor Safety Management System, we gave presentations at a series of Australia-wide seminars. In addition, our Executive Director presented 'Managing contractor safety' at the Comcare 2005 Occupational Health and Safety Conference. This excellent safety initiative has continued to encourage ownership of safety at the individual level. There are now 154 ANSTO staff accredited as contractor supervisors.

Workplace consultation on safety issues, through effective Health and Safety Committees and the Central Safety Coordinating Committee, has strengthened a proactive commitment to safety.

We completed reviews of those activities in which employees may be exposed to radiation, to ensure that doses are kept as low as

reasonably achievable; and again this year employees' radiation doses remained well within regulatory limits.

The organisation continued to maintain an emergency response capability to protect employees and the public.

Measuring radiation by the dose

Everyone in the world is exposed to ionising radiation from natural sources. We may also be exposed to radiation from non-natural sources, including medical procedures such as X-rays. The effect of radiation on our body is called dose and this is measured in sieverts (Sv). Typical doses of radiation are so small that they are usually expressed in units of one thousandth of a sievert, known as a millisievert (mSv). Note that our different body organs are susceptible to radiation to different degrees and that dose estimates take this into account.

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

The regulatory limit for radiation workers is 20 mSv per year, averaged over five years.

Activities and outputs

ARPANSA licensing and regulation

All of ANSTO's major facilities are covered by operating licences issued by ARPANSA. The licences are monitored through the submission of Licence Reports and by an ARPANSA program of planned inspections. The results of inspections carried out during the year demonstrate that ANSTO has maintained standards of radiation safety in accordance with licence conditions. Consequently, ARPANSA has continued to license ANSTO's controlled facilities and sources.

Safety management

Our safety and environmental principles, values and commitments are set out in the ANSTO Health, Safety and Environment Policy. Under this policy is a framework of documents, including safety directives, that constitutes our safety management system.

ANSTO's safety goals are to:

- maintain the safety of ANSTO employees and the public
- improve the efficiency and effectiveness of our safety systems
- promote safety initiatives and safety awareness programs
- continually improve employee and public protection from radiation
- ensure that staff are trained to deal with all potentially hazardous activities
- comply with good practice, including the requirements of the safety regulators – Comcare and ARPANSA.

To achieve these goals, our Safety and Radiation Services staff work in collaboration with staff from other divisions and institutes.

A key element of ANSTO's safety management system is the monitoring of safety performance. The implementation of safety systems and the outcomes achieved are

Safety Arrangements

Table 1: Effective dose

	2000-01	2001-02	2002-03	2003-04	2004-05
Maximum effective dose mSv	8.6	8.7	9.7	9.8	10.2
Average effective dose mSv	0.8	0.9	0.8	0.8	0.8
Collective effective dose man-mSv	630	749	684	692	697

Table 2: Distribution of individual effective dose

dose ranges (mSv)	2000-01	2001-02	2002-03	2003-04	2004-05
0 to 2	700	726	756	824	807
2 to 5	65	77	80	82	66
5 to 10	23	25	23	18	20
10 to 15	0	0	0	0	1
> 15	0	0	0	0	0

overseen by an independent committee – the ANSTO Health, Safety and Environment Committee (AHSEC) – which includes external members as well as ANSTO general managers and senior staff. The committee monitors ANSTO's health, safety and environmental performance and advises our Executive Director of performance status. AHSEC met four times in 2004-05.

At the operational level our Safety Assessment Committee, which also has external membership, reviews all potentially hazardous activities undertaken at ANSTO. From July 2004 to June 2005 the committee assessed and endorsed 55 submissions.

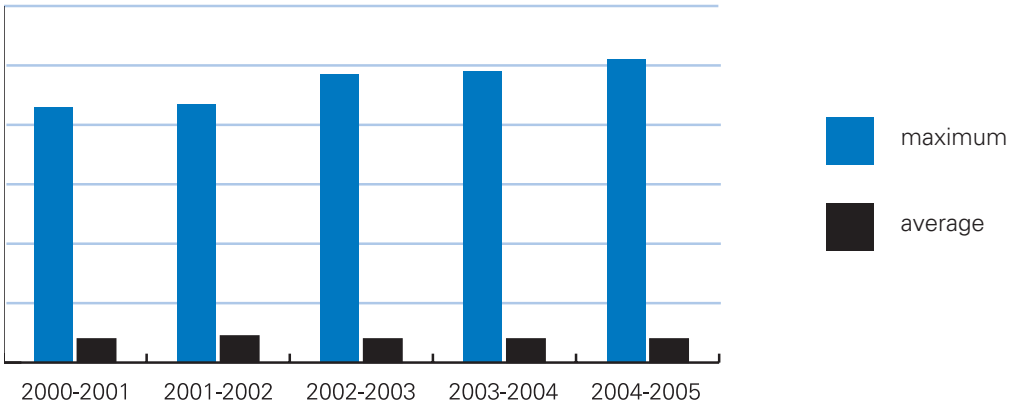
ANSTO has had self-audit status under Comcare for OH&S arrangements for the 2003-2005 financial years. The second year of the program has continued to focus on reviewing OH&S arrangements at a local level within ANSTO, and audits across the organisation have been completed successfully. Findings have been generally positive, with identified improvements implemented or scheduled for implementation in the coming months.

Radiation protection

ANSTO's Operational Health Physics group monitors radiological conditions and offers specialist assistance in developing procedures for working in controlled areas. Amongst other activities, the group conducts routine health physics monitoring of work areas to ensure that radiological hazards are kept under control and that safe working conditions are maintained.

ANSTO's Radiation Monitoring Group provides dosimetry services, measures airborne

Figure 1: Comparison of the maximum and average annual effective doses



discharges, and conducts radiation instrument calibration services. The dosimetry service monitors any radiation doses that workers receive from radiation sources. This is part of ANSTO's policy of assuring safety at work for all personnel. In 2004-05 the service monitored 894 workers, 84% of whom received less than 1 mSv. No person received more than 11 mSv. The highest dose is well below the regulatory annual dose limit of 20 mSv averaged over five years for radiation workers. 15 of the 21 workers with doses between five and 15 mSv were involved in the production of radiopharmaceuticals either at ANSTO's Lucas Heights site or its National Medical Cyclotron in Camperdown.

Table 1 shows the maximum, average and collective effective doses for the past five years. Table 2 shows the distribution of individual effective doses over the same period. The graph in Figure 1 compares maximum and average effective doses.

Regulations give annual dose limits for radiation workers for the whole body (effective dose), for the skin (shallow dose) and for extremities such as hands or feet. The dose limits are:

- whole body 20 mSv, averaged over five years
- shallow (skin) 500 mSv
- extremities 500 mSv

In 2004-05 the highest shallow dose to any individual was 20.9 mSv, which is a small fraction of the national and international annual dose limit of 500 mSv. Staff handling radiation sources may receive doses to their hands and fingers that are significantly different from the dose to their body, so extremity doses are monitored separately. The highest extremity dose to any individual was 187 mSv, which is again less than the annual dose limit of 500 mSv.

ANSTO routinely monitors staff working with unsealed sources for possible internal

Safety Arrangements

exposures. Methods include bioassay, and whole body and thyroid counting. Any internal doses are assessed and added to those from external radiation, to produce a total effective dose.

Occupational health and safety

Accidents and incidents

An important part of ANSTO's safety management system is the capturing of information on all safety-related events including accidents and 'near misses'. This ensures that all such events are properly investigated and safety improvements are implemented. It also gives us data for monitoring ANSTO's safety performance. We are required to notify Comcare of incidents which result in, or could result in, serious personal injury or incapacity.

In 2004-05 ANSTO informed Comcare of six notifiable incidents, one of which was reported as a serious personal injury (or possible serious injury), two as extended absences or incapacity, and three as dangerous occurrences. None of these was radiation related. We investigated all incidents and made improvements to work practices as a result.

Safety training

Over the year we gave safety induction training to 188 new employees and 351 contractors. We also fulfilled all requirements for role-specific safety training. In addition we:

- developed an interactive OH&S for Managers program
- ran one-day 'confined space' refresher courses to keep staff's accreditation up to date (100 staff)
- trained staff in the supervision of contractors, as part of ANSTO's Contractor Safety Management System (62 staff)
- organised OH&S induction for construction work to enable 73 staff to receive the Workcover Greencard, a requirement for access to the replacement research reactor site.

Overall, ANSTO ran 121 courses covering 43 different safety topics for a total of 1 285 participants.

Emergency preparedness and effective responses

ANSTO and emergency services organisations jointly maintain a 24-hour emergency response capability to deal with incidents at the Lucas Heights Science and Technology Centre (LHSTC).

The Response Plan for Accidents and Incidents at the LHSTC describes how an emergency response will be coordinated and identifies who is responsible for which actions. Details of how each organisation will respond are contained in the respective organisations' standing operating procedures.

Responses to emergencies with off-site consequences are covered by the Sutherland Shire Local Disaster Plan, the Georges River District Disaster Plan, and the NSW State Disaster Plan. In such emergencies, ANSTO staff will give technical assistance and practical support to emergency service organisations.

ANSTO maintains a close working relationship with emergency service organisations through the Local Liaison Working Party. The working party includes ANSTO specialists and

representatives of emergency service organisations, local government, and support organisations, including NSW Health. ARPANSA is an observer.

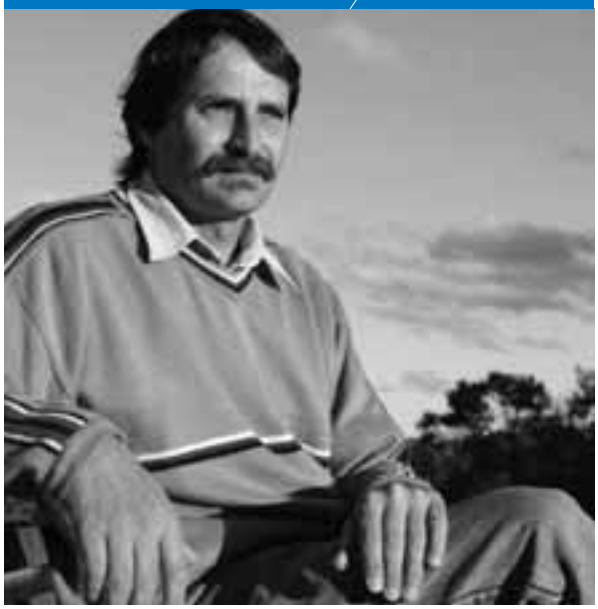
This year ANSTO focused on emergency response training for all staff. Following a review of existing arrangements, a new Standing Operating Procedure was developed for how individuals should respond to an emergency. A program to train everyone on site in the new procedure was drawn up, and training commenced. This will be followed up by exercises, developed in collaboration with building wardens, that are based on a risk management approach to identifying the scenario most likely to require an emergency response. In addition we conducted a walk-through exercise to test the procedures for responding to an emergency in the Gamma Technology Research Irradiator.

Finally, we continued to run the Radiological Awareness Program for local Emergency Service Organisations and functional groups (such as Transport, Environment and Agriculture), in cooperation with ARPANSA. Due to high demand, we conducted three programs in the first six months of 2005.

Safety Arrangements

ENVIRONMENTAL PROTECTION

Environmental Protection



Tom Loosz has been at ANSTO for 24 years and has worked across the organisation. Currently he is a member of the environmental management team, whose primary function is to ensure that ANSTO complies with international environmental standards. Tom collects environmental samples – stormwater, groundwater, air, sediments, and biological – and analyses them for traces of radioactivity. Tom also provides radio-analytical services to commercial clients, such as local councils wanting to assess drinking water quality, and to industry for the purpose of meeting environmental regulations.

Environmental Protection

ANSTO is committed to undertaking its activities in a manner that protects the environment and is consistent with Australian and international standards. We promote environmental awareness throughout the organisation and strive for continual improvement in environmental performance.

Environmental Management System

In line with the high priority ANSTO places on the environment, we have implemented an Environmental Management System (EMS) that was certified to the International Standard ISO 14001 in May 2004. This standard requires that environmental risks are understood and minimised, an appropriate measurement system is in operation, and that there is an organisational commitment to continuous improvement. The EMS encourages feedback from all staff about our environmental performance and this has already delivered benefits, such as a reduction in environmental impact of our activities and increased participation in recycling programs, as well as improved systems for monitoring and reducing consumption of resources such as water, paper and electricity.

Accurate measurements with independent verification

At ANSTO, we undertake systematic measurements of our air and liquid emissions and maintain a long-term monitoring program for sampling water, air, biota and soil in the local environment. We conduct measurements in specialised radio-analytical laboratories using calibrated equipment that is sensitive enough to detect radioactivity at the trace levels normally present in environmental samples.

The ANSTO program of environmental and effluent monitoring operates within a quality

system that complies with the ISO 9001:2000 standard for Quality Management Systems. To verify our results, we send key environmental samples to an external laboratory which undertakes parallel measurements.

Airborne doses low

In the course of normal operations, some ANSTO facilities produce gaseous radioactive emissions. These emissions are minimised by treatment and filtration before discharge and all are constantly monitored. The effect on the local environment is too small to be detected directly, so we estimate the doses to the surrounding region and to the public by using an independently evaluated computer model to assess atmospheric dispersion of airborne releases. The outcome of this modelling estimated that the maximum potential public dose derived from ANSTO in 2004-05 was 0.0047 mSv. This corresponds to less than 0.5% of the 1.0 mSv annual limit for members of the public recommended by the National Health and Medical Research Council. For our closest neighbours, ANSTO's activities add less than 0.4% to the dose that everyone receives from natural background radiation.

Liquid effluent discharges within limits

Effluent discharged from ANSTO into the sewer complied with all limits for radioactive discharges, in accordance with the Trade Waste Agreement with Sydney Water. Compliance with these limits ensures that water at the Cronulla Sewage Treatment Plant meets World Health Organisation drinking water standards for radioactivity. All discharges also complied with the Trade Waste Agreement limits for non-radioactive materials.

Good water quality

ANSTO regularly monitors stormwater leaving the site, as well as the nearby Woronora River and its tributaries. Results show that tritium concentrations were well below the Australian drinking water guidelines and that gross alpha and beta measurements were also below the levels required for Class C surface waters.

Monitoring of groundwater around the Lucas Heights site showed no detectable ANSTO-produced radionuclides apart from traces of tritium. All tritium, gross alpha and gross beta concentrations were well below the guideline levels for drinking water.

Detailed reporting

The results and findings from our monitoring programs are available to the public in the annual report series Environmental and Effluent Monitoring at ANSTO Sites. We also submit regular reports to government departments and regulatory organisations, including ARPANSA and Sydney Water.

CORPORATE GOVERNANCE

Corporate Governance

Renato De Leon is ANSTO's financial accountant. Along with the rest of the finance team, he prepares the organisation's financial statements and manages its taxation commitments for the purposes of reporting and compliance. He is also a member of the organisation's Business Improvement Committee, in which capacity he contributes to the implementation and continuous improvement of ANSTO's Business Management System. Next financial year ANSTO will adopt the new Australian Equivalent International Financial Reporting Standard, so this year Renato has been busy assessing the impact these new accounting standards will have on ANSTO's operations and financial reporting procedures.

Compliance

ANSTO is subject to the provisions of various Commonwealth Acts, regulations made under these various Acts and Commonwealth Awards.

The principal Acts are:

- *Australian Nuclear Science and Technology Organisation Act* 1987 *(ANSTO Act)*
- *Australian Nuclear Science and Technology Organisation (General) Award* 1990
- *Australian Radiation Protection and Nuclear Safety Act* 1998
- *Commonwealth Authorities and Companies Act* 1997 *(CAC Act)*
- *Nuclear Non-proliferation (Safeguards) Act* 1987
- *Occupational Health and Safety (Commonwealth Employment) Act* 1991

Other relevant Acts are:

- *A New Tax System (Goods and Services Tax) Act* 1999
- *Archives Act* 1983
- *Auditor-General Act* 1997
- *Australian Radiation Protection and Nuclear Safety (Licence Charges) Act* 1998
- *Environment Protection and Biodiversity Conservation Act* 1999
- *Freedom of Information Act* 1982
- *Industrial Relations Act* 1988.
- *Legislative Instruments Act* 2003
- *Long Service Leave (Commonwealth Employees) Act* 1976
- *Maternity Leave (Commonwealth Employees) Act* 1987
- *Privacy Act* 1988

- *Racial Discrimination Act* 1975
- *Safety, Rehabilitation and Compensation Act* 1988
- *Sex Discrimination Act* 1984
- *Superannuation Act* 1976
- *Superannuation Act* 1990
- *Superannuation Guarantee (Administration) Act* 1992
- *Superannuation (Productivity Benefit) Act* 1988
- *Workplace Relations Act* 1996

ANSTO has put in place policies and procedures to deliver compliance with the above Acts, Regulations and Awards. As a matter of policy, ANSTO abides by NSW legislation where there is no applicable Commonwealth legislation (e.g. conduct of research involving animals).

The functions of the Board

A Board established under Section 8 of the *Australian Nuclear Science and Technology Organisation Act* 1987 governs ANSTO.

The general functions of the Board, as set out in Section 10 of the *ANSTO Act*, are to ensure the proper and efficient performance of the functions of the organisation and to determine the policy of the organisation with respect to any matter, having regard to the current policies of the Commonwealth Government.

In particular, it has responsibility for:

- approval of organisational strategy and the annual business plan and budget
- monitoring financial performance
- monitoring managerial performance
- ensuring that any significant risks facing the organisation have been identified, and that appropriate control, monitoring and reporting mechanisms are in place.

The *Commonwealth Authorities and Companies Act* requires the Board to comply with certain accountability and corporate governance principles, including:

- the maintenance of an Audit Committee
- specific financial and reporting provisions
- disclosure of all Board members' personal interests
- provision of indemnities and indemnity insurance in certain circumstances.

All CAC Act requirements are currently being met.

Processes are in place for Board member induction and ongoing education to inform members of their responsibilities and rights. Processes are also in place for performance assessment of both the Board and its committees and individual members thereof.

The Board has established an Audit Committee. All matters considered by the Committee are submitted to the Board for information and, where appropriate, ratification. Details of the Audit Committee are provided below. The Board is also supported in its role by other committees or mechanisms relating to safety and environmental management and to technical assessment. These are also described below.

Corporate Governance

Board membership

During the 2004-05 financial year, the Board was composed of six non-executive members, drawn from the broader community, who are not involved in the day-to-day running of the organisation, and an Executive Director. The Executive Director, who is appointed by the Board, cannot be the Chair. The non-executive members are appointed by the Governor-General for specified periods.

Section 19 of the *ANSTO Act* provides that the Executive Director shall manage the affairs of the organisation, subject to the directions of, and in accordance with, policies determined by the Board. Senior management attend Board meetings as required to report on matters relevant to their individual areas of responsibility.

Each member brings complementary skills and experience to the Board. Its members during the 2004-05 financial year had experience in areas that included academia, public service, industry, mining, scientific research, medicine and the commercialisation of research.

The Board meets regularly in accordance with a formally approved timetable and agenda. Board members receive regular papers from management on financial and business performance and specific papers on a range of issues relevant to the organisation.

Seven Board meetings were held during the 2004-05 financial year. Details of the number of Board meetings attended by each member during the period in which each member held office during the financial year are provided below.

Remuneration and allowances

The remuneration and allowances of members of the Board, including the Executive Director, are determined by the Remuneration Tribunal.

Remuneration of Board members is disclosed in the Financial Statements.

Meetings – Board

Member	Held	Attended
Dr Ian D. Blackburne (Chair)	7	7
Mr Michael A. Eager (Deputy Chair)	7	7
Dr Ian O. Smith (Executive Director)	7	7
Dr Carmel J. Hillyard	7	7
Mr Grahame Cook	7	6
Dr Agatha A. van der Schaaf	7	7
Dr Klaus H. Schindhelm	7	6

Disclosure of interests

Section 21 of the *CAC Act* provides for the disclosure of material personal interests in a matter that is being considered by the Board, and prohibits participation, deliberation and decision making by any such member on these matters.

All these requirements were met during the year.

Independent professional advice

The Board has established procedures by which members, in the interests of their duties, may seek independent professional advice at ANSTO's expense. In summary, members must first seek permission from the ANSTO Chairman.

Report of operations

Section 9, Schedule 1 of the *CAC Act* requires that the organisation's annual report include a report of operations. *The Commonwealth Authorities and Companies (Report of Operations) Orders* 2005 set out the requirements for such a report. To avoid conflict with ANSTO's new organisational terminology, we have called this a Report of Research and Operations. The format and content of the 2004-05 annual report, including the financial statements, addresses these requirements in general, and Appendix 8 sets out details of compliance with the particular requirements of these Orders.

The Board reports that:

- ANSTO's mission has been revised and new strategic directions have been set
- actual performance is reported against approved performance indicators
- there were no significant events requiring disclosure in terms of Section 15 of the *CAC Act*
- there have been no significant changes in ANSTO's state of affairs or principal activities during the year
- ANSTO has continued to manage both the risks and opportunities it faces.

The Board also reports as to whether, in the opinion of senior management and the Board, at the time of making this report, adequate cash resources are, and will continue to be, available to cover the ANSTO's requirement for working capital, to pay existing debts, and meet obligations during the next financial year.

Safety

The Board places primary importance on the safe performance of all ANSTO activities. The monitoring of safety in general, and compliance with relevant legislation in particular, is designated as a responsibility of the whole Board. ANSTO's Health, Safety and Environment Policy clearly sets out the organisation's commitment to verifiable implementation of best practices in safety and environmental protection.

The Board attaches priority to the directions and recommendations on safety made by the Australian Radiation Protection and Nuclear Safety Agency. Under the *ARPANS Act* 1998, ANSTO has received licences for all ANSTO facilities and radioactive sources, as well as a construction licence for the OPAL Reactor. Procedures are in place to ensure compliance with all licence conditions.

ANSTO has the ANSTO Health, Safety and

Corporate Governance

Environment Committee to oversee health, safety and environmental management and advise the Executive Director on the effectiveness and compliance of ANSTO's performance in these areas.

The Board receives regular reports on health and safety issues. ANSTO was granted occupational health and safety self-audit status for two years by Comcare in 1999. Comcare renewed this self-audit status for two further periods of two years to 2005 and now to 2007. The audit program for 2004-05 was successfully completed.

Audit Committee

The Audit Committee, a formal sub-committee of the Board, comprised during the year Mr M. A. Eager (Chairman), Dr K. Schindhelm and a member external to ANSTO, Mr W. Wilton. Mr Wilton is a Chartered Accountant. The ANSTO Chairman is an ex officio member of the Committee. The Executive Director, the Board Secretary, the General Manager, Corporate Services, the Chief Financial Officer, representatives of the Australian National Audit Office and the Chief Internal Auditor attend all meetings, or relevant parts of all meetings, by invitation. Others attend meetings, as appropriate, at the invitation of the Committee. In accordance with best practice, all Board members receive copies of Audit Committee papers and meeting minutes, and can attend Committee meetings as a right.

This Committee was established by the Board under a formal written charter to oversee the organisation's risk management policies, practices and controls in relation to financial and commercial activities. These include the financial reporting process, legislative and regulatory conformance, corporate governance and asset protection. Its charter extends to the review of safety and environmental systems and performance.

The Committee also reviews summaries of the internal and external audit work schedules and reports. Additionally, in accordance with the provisions of the *CAC Act*, the Committee is responsible for assisting Board members to fulfil their specific responsibilities under that Act.

The Committee has unlimited access to both the internal and external auditors and to senior management.

The Committee scrutinises the annual financial statements of ANSTO and considers the appropriateness of accounting practices reflected therein. It receives a signed recommendation from the Chief Financial Officer, through the General Manager, Corporate Services and the Executive Director, as to the veracity of the financial statements signed by the Board.

Five Audit Committee meetings were held during the financial year. Details of the number of Committee meetings held and attended during the period in which each member held office during the financial year are provided in the table below.

The Committee generally meets quarterly. It is the only formal sub-committee of the Board.

Technical Advisory Committee

The Technical Advisory Committee, established in accordance with a Board decision, comprises four members, all of whom are external to ANSTO. Members are chosen on

Meetings – Audit Committee

Member	Held	Attended
Mr Michael A. Eager (Chair)	5	5
Dr Klaus Schindhelm (Member)	5	4
Mr Warren Wilton (External Member)	5	5

the basis of internationally recognised scientific expertise and experience. The current members (as at 30 June 2005) of the Committee are Dr Roy Green, Professor Alan Leadbetter, Professor Peter Robinson and Dr Dan Shochat.

This Committee operates under a written terms of reference and was established by the Board to advise the ANSTO Board on the quality and the relevance of the portfolio of research projects being undertaken at ANSTO.

Specifically the TAC provides an expert overview of the research and addresses the following matters:

- To provide strategic advice to the Board to guide research project portfolio shaping decisions
- To provide the Board with an overview of the quality of research within the portfolio through expert committee reviews
- To advise on any matters affecting the quality of research outputs as observed by the Committee.

The Committee was formally constituted in October 1996 and is required to meet at least once per year. It met during the 2004-05 financial year and presented a formal report to the Board. Committee members also participate in the advisory and review panels for each research institute.

Risk management

The Board recognises that developing and implementing ANSTO's strategies requires careful assessment and balancing of both risk and opportunity.

The Board is charged with the responsibility of ensuring that appropriate policies are in place to cover identified risks, and management is required to develop appropriate procedures to manage these risks.

The Board has endorsed a risk management framework introduced by management in 1997 and since then continually refined. As part of this framework, ANSTO's Internal Audit function undertakes a systematic program of risk assessments designed to identify, evaluate and prioritise high and significant risks, utilising a methodology consistent with the Australian Risk Management Standard AS/NZS - 4360/2004. The Audit Committee and the ANAO receive summaries of all risk assessment reports.

ANSTO's risk management policy states that it is the responsibility of the operational management of ANSTO to develop and implement risk mitigation strategies. The

Corporate Governance

overall risk framework is actively applied in ANSTO's operations and to new initiatives in particular. Project risk management remains a significant area of focus in the OPAL project and particular capital works projects.

In appropriate circumstances, insurance is used as a method to transfer the financial impact of risk.

The Board, supported by the Audit Committee, oversees the development and operation of business continuity planning and other emerging risk issues.

Ethical standards

ANSTO's ethics policy is set out in a document entitled *Ethics and Conduct – A Code for ANSTO Staff*. The policy provides a reference point for ethical behaviour and applies to members of the Board, management and all staff. The Code sets out the standards for ethical behaviour and conduct and provides guidance by defining the expected values and standards of workplace behaviour and performance. It was updated during the reporting year to reflect better practice.

Fraud control

The organisation has an established fraud control policy and plan, and has complied with fraud control guidelines set out by the Attorney General's Department, Criminal Justice Division.

External audit

Under the *CAC Act*, the Commonwealth Auditor-General, through the ANAO, is the external auditor for ANSTO.

The ANAO, as a matter of policy, provides only audit services to ANSTO.

The Audit Committee reviews the ANAO audit plan and reports and meets with ANAO representatives prior to recommending to the Board that the annual financial statements be accepted and the Statement by Directors signed.

Internal audit

The ANSTO Internal Audit function has a dual reporting line to the Audit Committee and the Executive Director. Its responsibility is to provide an independent, risk-based review function, as set out in a formal charter endorsed and periodically reviewed by the Audit Committee. The Audit Committee approves the annual Internal Audit plan and receives regular reports on progress against that plan.

Internal control

The Board is responsible for ensuring that appropriate policies and internal controls are in place and operating.

Compliance and review are monitored through the Audit Committee and the Internal Audit function.

Service charter

ANSTO's Service Charter sets out a statement of what ANSTO does and the standards of product and service that customers, stakeholders and the community can expect from the organisation. The Service Charter was released in June 1999.

Judicial decisions and reviews by outside bodies

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

During the reporting year the Commonwealth Auditor-General issued two cross agency audit reports which included commentary on aspects of the operations of ANSTO. The reports related to a performance audit on the investment of public funds (Audit Report Number 22 2004-05) and a business support process audit on the management of trust monies (Audit Report Number 46 2004-05).

There were no reports on the operations of ANSTO by a Parliamentary Committee or the Commonwealth Ombudsman during the reporting year.

Ministerial directions

In December 2004, the Minister for Finance and Administration issued the Finance Minister's (*CAC Act* Procurement) Directions 2004 under subsection 47 A (2) of the *CAC Act* 1997.

Indemnities and insurance premiums for officers

ANSTO's insurance coverage includes professional indemnity and directors' and officers' liability. Certain sections of the *CAC Act* contain prohibitions against ANSTO giving indemnities and paying insurance premiums relating to liabilities arising from conduct involving a lack of good faith by officers. There have been no exceptions to these provisions and no claims were made against ANSTO that required a claim on ANSTO's insurer, Comcover.

Nuclear safeguards

ANSTO undertakes continuing compliance with strict national and international safeguards guidelines and requirements established by the IAEA and the national safeguards regulator, the Australian Safeguards and Non-Proliferation Office (ASNO).

IAEA inspectors carried out inspections of ANSTO's nuclear material during a full Physical Inventory Verification in March-April 2005 and a short notice inspection in June 2005. During each of the inspections, the IAEA inspectors requested and were granted complementary access. The results of all inspections were satisfactory. The IAEA inspections were supplemented by ASNO's regular audits of ANSTO's nuclear material accounting system.

ANSTO is further strengthening its nuclear safeguards by putting greater emphasis on individual division/institute accountability for the nuclear material in the division's or institute's custody.

During 2004-05 ANSTO demonstrated, through ongoing implementation of all safeguards provisions, commitment to fulfilment of its obligations under both the *Nuclear Non-Proliferation (Safeguards) Act* and Australia's safeguards agreements with the IAEA.

Business continuity planning

Continuity of ANSTO business is a critical issue that has been considered and planned for by the Board, the Executive Director and senior management. Many services delivered by ANSTO are critical to the economic and social well-being of our society. A failure to deliver these could have significant consequences for those concerned.

Corporate Governance

ANSTO regularly reviews all aspects of its business continuity management to ensure a constant state of readiness.

Corporate social responsibility

A fundamental shift in community expectations has occurred in recent years, making responsible corporate behaviour an integral component of every organisation's day-to-day operation, rather than an additional, unwanted business burden.

ANSTO supports this development and took pride in releasing its first corporate social responsibility report in 2005, focusing not on its financial performance, but on the ways ANSTO responds to environmental, safety and social issues that effect staff, customers, the Australian community and key stakeholders.

ASSOCIATED ORGANISATIONS AND PROGRAMS

Associated Organisations and Programs

Andrew Wroe, a PhD student at the University of Wollongong's Centre for Medical Radiation Physics, is part of a collaborative research team set up by the CMRP and ANSTO to study the effects of radiation on the body. Andrew is examining how radiation interacts with DNA at a resolution of two nanometres – two millionths of a millimetre. Much of his week is spent at ANSTO developing computer simulations of what happens when human cells are irradiated with proton beams. This work will be used to improve proton therapy, a revolutionary new cancer treatment. Andrew's work is assisted by a grant from AINSE, and earlier this year he was awarded a Fulbright Scholarship to conduct further research at the Loma Linda Medical Center in California.

Australian Institute of Nuclear Science and Engineering

Located next to ANSTO's Lucas Heights site, the Australian Institute of Nuclear Science and Engineering Incorporated is a not-for-profit consortium of 38 universities and the Institute of Geological and Nuclear Science (NZ), in partnership with ANSTO. Thirty six of the universities are Australian and two are from New Zealand. AINSE was established by the Commonwealth Government in 1958 and is incorporated under the *NSW Associations Incorporation Act* 1984. It has three full-time staff.

AINSE's mission is to advance research, education and training in nuclear science and engineering and related fields within Australasia by being, in particular, the key link between universities, ANSTO and other member organisations and major nuclear science and associated facilities.

The mission is supported by four goals, to be achieved by the end of 2008, as follows.

1. Members will have access to major nuclear and related research facilities in Australia and some overseas through AINSE.
2. Research performance of our scientific outcomes will have increased substantially.
3. All universities in Australasia, some sections of the CSIRO, many major museums, many non-teaching hospitals and a significant proportion of the scientific institutes in Australasia will be members of AINSE.
4. AINSE will have expanded its existing set of excellent scientific networks.

Since AINSE operates on a calendar-year basis, this report covers the period 1 January to 31 December 2004. AINSE's income of $2 806 810 comprised:

- $1 464 335 from ANSTO

- $769 363 from university subscriptions
- $391 250 from external grants
- $165 261 from interest on investments
- $16 601 from other sources.

Core business

AINSE uses its funds primarily to provide access to nuclear and other facilities at ANSTO and to AINSE-supported facilities. In 2004, it supported 272 university projects (168 new projects and 104 carried over from 2003) and provided supplements to 52 postgraduate research students, with a total value of $1 927 923. Some 24% of these researchers had not previously had access to ANSTO's facilities; and for 21 of the postgraduates, the award was their first from AINSE.

The projects have applications in many fields and disciplines, including cultural heritage, advanced technology, manufacturing, mining, agriculture, medicine and environmental protection, all of which are vital to Australia's future.

AINSE has been notified that, over the course of the year, 454 papers, of which 251 appeared in refereed journals, were published as a result of AINSE-supported research.

AINSE provided continuing support for neutron scattering workshops organised by the Bragg Institute, in addition to running the 4th Symposium on Neutron Scattering in December. The introduction of the International Travel Scholarship to assist students and postdoctoral fellows to present their work at international meetings had a soft launch in November with two students receiving support to attend a conference in Rome. AINSE Postgraduate Scholar Andrew Wroe distinguished himself early in 2004 by winning a three-month International Atomic Energy Agency appointment as well as a Fulbright Scholarship to work at Loma Linda University, US in 2005.

The seventh AINSE Winter School was held in July 2004. A scholarship was offered to each of the 38 member universities to enable a nominated third-year student to participate. The program was judged an outstanding success and was held again in July 2005. AINSE is very grateful to the staff at ANSTO who give their time and expertise to this important program. The Winter School contributes significantly to AINSE's and ANSTO's public profiles, and it is a particularly good opportunity for potential users to see ANSTO's facilities in operation.

Additional projects

AINSE acts as a peak body on behalf of its member organisations in applying for and administering major research infrastructure grants.

An application in 2004 to the Australian Research Council Research Infrastructure and Equipment Fund was successful. The grant of $235 000 for access to the UK facility ISIS, the world's most powerful pulsed-neutron source, was supplemented by $122 500 from universities, $25 000 from ANSTO and $8 750 from AINSE. Twenty-two experiments were accepted for a total of 54 days on the facility; and AINSE was notified during the year that, based on the research, 16 papers were published.

Associated Organisations and Programs

Cathy Harland is a beamline scientist based at the Advanced Photon Source in Chicago, where she assists visiting Australian researchers with their experiments. Cathy's work is part of the Australian Synchrotron Research Program, an initiative designed to give our scientists access to state-of-the-art overseas research facilities and to build the synchrotron user community in Australia. Cathy is responsible for the X-ray Operations and Research beamlines, which are used for microprobes, diffraction and fluorescence experiments. This year she has helped visiting biologists, archaeologists, forensic scientists, chemists and physicists on a diverse range of projects. Cathy is also conducting her own research into the magnetic properties of materials.

Access to Major Research Facilities Program

ANSTO has operated the Access to Major Research Facilities Program since 1990, when it was established by the Australian Government. The term 'major research facilities' refers to large facilities not available in Australia, such as synchrotron radiation sources, high flux neutron beam sources, high energy physics facilities and astronomical facilities.

This project is supported by the International Science Linkages program established under the Australian Government's innovation statement, *Backing Australia's Ability*. Funding is administered by the Department of Education, Science and Training and stands at $731 500.

The cost of constructing large research facilities, which now dominate many aspects of scientific activity, can exceed several billion dollars. For Australian science to remain at the cutting-edge, and for Australia to benefit from developments in technology, mechanisms must be developed that enable our scientists to access these facilities overseas.

The objectives of the program are to provide financial support to Australian researchers from industry and from private and public research organisations and universities so that they can:

- travel to major international research facilities not available in Australia
- attend strategic planning meetings where it can be clearly demonstrated that this is essential to Australia's participation in projects that require the use of major international research facilities not available in Australia.

There are two unique demands that must be met for access to major facilities, and these underlie the current program:

- Access to the facilities is competitive and subject to heavy worldwide demand. Scientists who apply for access often receive very short notice that their application has been successful. It is therefore vital that the program has a fast turnaround time.
- In many cases, use of these facilities is complex and more than one person may be required to operate the equipment. Consequently postgraduate students and technicians are often involved in running experiments. Our program provides for multiple personnel to visit the facilities.

During the 2004-05 financial year the AMRFP funded 94 teams to perform experiments using facilities in the USA, Europe and Asia. Although no preference is given to our own research, 15 ANSTO teams received funding to visit overseas neutron scattering, synchrotron and accelerator facilities.

Australian Synchrotron Research Program

The Australian Synchrotron Research Program (ASRP) gives Australian researchers access to state-of-the-art synchrotron radiation research capabilities at three overseas synchrotron light source facilities:

- The Australian National Beamline Facility at the Photon Factory, Tsukuba Science City, Japan
- The Advanced Photon Source at the Argonne National Laboratory in Chicago, USA
- The National Synchrotron Radiation Research Centre in Hsinchu, Taiwan.

These facilities can assist research in the fields of physics, chemistry, materials science, structural biology, polymer research, environmental science and geophysics. The facilities are open to any scientist working at an Australian research institution, including government and industry research laboratories. Access is on the basis of scientific merit via a peer-reviewed proposal system, and includes travel and subsistence funding for successful applicants. The ASRP stations scientific staff at each overseas facility to assist visiting Australian research teams.

The ASRP is funded by the Australian Federal Government's Major National Research Facilities program. Initial funding was for five years. This was extended in 2001 by another five years, taking us to mid-2007. ANSTO has been the ASRP's managing agent since its inception in 1996.

The Australian synchrotron user community has grown steadily since the ASRP was established. The ASRP currently supports visits to these overseas synchrotron facilities by more than 100 Australian research teams a year, with a total user community of more than 300. Scientists from 24 universities, four government laboratories including ANSTO, and five CRCs, have used ASRP beamlines in the past seven years.

In addition to acting as the ASRP's managing agent, ANSTO is a significant user of its facilities. In the last year ANSTO scientists from the Nuclear Geophysiology, Materials and Engineering Science and Bragg Institutes were awarded beamtime on the ASRP's overseas beamlines. Projects included the characterisation of novel materials such as metal oxides and ceramics, investigations of magnetic properties of materials, and studies of polymer structure and industrial processing.

Associated Organisations and Programs

The ASRP administers a postdoctoral fellowship program funded by subscriptions from its member organisations. In 2004, the ASRP awarded the final five fellowships of this program, to be taken up at ANSTO, the Australian National University, the CSIRO, the University of Queensland and the University of Western Australia. The newly appointed ANSTO candidate is Dr Naveen Bhatia, who is studying hyper-accumulation of metals in certain plants.

Member organisations

Australian National University, Curtin University of Technology, Monash University, University of Canberra, University of Melbourne, University of Newcastle, University of NSW, University of Queensland, University of South Australia, University of Sydney, University of Western Australia, CSIRO, and the state governments of NSW and Victoria.

FINANCIAL STATEMENTS

Independent Audit Report

Australian National Audit Office

To the Minister for Education, Science and Training

Scope

The financial statements and Board members' responsibility

The financial statements comprise:

- Statement by Board members and Chief Financial Officer;
- Statements of Financial Performance, Financial Position and Cash Flows;
- Schedules of Commitments and Contingencies; and
- Notes to and forming part of the Financial Statements

of the Australian Nuclear Science and Technology Organisation (ANSTO) for the year ended 30 June 2005.

The Board members are responsible for preparing the financial statements that give a true and fair view of the financial position and performance of ANSTO, and that comply with Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act* 1997, accounting standards and other mandatory financial reporting requirements in Australia. The Board members are also responsible for the maintenance of adequate accounting records and internal controls that are designed to prevent and detect fraud and error, and for the accounting policies and accounting estimates inherent in the financial statements.

Audit approach

I have conducted an independent audit of the financial statements in order to express an opinion on them to you. My audit has been conducted in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing and Assurance Standards, in order to provide reasonable assurance as to whether the financial statements are free of material misstatement. The nature of an audit is influenced by factors such as the use of professional judgement, selective testing, the inherent limitations of internal control, and the availability of persuasive, rather than conclusive, evidence. Therefore, an audit cannot guarantee that all material misstatements have been detected.

While the effectiveness of management's internal controls over financial reporting was considered when determining the nature and extent of audit procedures, the audit was not designed to provide assurance on internal controls.

I have performed procedures to assess whether, in all material respects, the financial statements present fairly, in accordance with Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act* 1997, accounting standards and other mandatory financial reporting requirements in Australia, a view which is consistent with my understanding of ANSTO's financial position, and of its performance as represented by the statements of financial performance and cash flows.

The audit opinion is formed on the basis of these procedures, which included:

- examining, on a test basis, information to provide evidence supporting the amounts and disclosures in the financial statements; and
- assessing the appropriateness of the accounting policies and disclosures used, and the reasonableness of significant accounting estimates made by the Board members.

Independence

In conducting the audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the ethical requirements of the Australian accounting profession.

Audit Opinion

In my opinion, the financial statements of ANSTO:

(a) have been prepared in accordance with Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act* 1997; and

(b) give a true and fair view of ANSTO's financial position as at 30 June 2005 and of its performance and cash flows for the year then ended, in accordance with:

(i) the matters required by the Finance Minister's Orders; and

(ii) applicable accounting standards and other mandatory financial reporting requirements in Australia.

Australian National Audit Office

P Hinchey
Senior Director
Delegate of the Auditor-General
Sydney
18 August 2005

PO Box A456 Sydney South NSW 1235
130 Elizabeth Street
SYDNEY NSW
Phone (02) 9367 7100 Fax (02) 9367 7102

Statement by Board Members and Chief Financial Officer

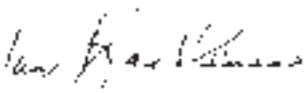
Australian Government

Australian Nuclear Science and Technology Organisation

In our opinion, the attached financial statements for the year ended 30 June 2005 have been prepared based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act* 1997.

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

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



Ian D Blackburne
Chairman

18th August 2005
Sydney

Ian O Smith
Executive Director

18th August 2005
Sydney

Peter Ontatzis
Chief Financial Officer

18th August 2005
Sydney

Statement of Financial Performance
for the year ended 30 June 2005

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
REVENUE			
Revenues from ordinary activities			
Revenues from Government	5A	**124 683**	121 054
Goods and services	5B	**36 449**	36 708
Grants	5C	**329**	410
Interest	5D	**3 792**	3 065
Revenue from sale of assets	5E	**606**	425
Net foreign exchange gains - non speculative	5F	**22**	32
Revenues from ordinary activities		**165 881**	161 694
EXPENSES			
Expenses from ordinary activities (excluding borrowing costs expense)			
Employees	6A	**58 714**	**56 357**
Suppliers	6B	**66 563**	58 012
Depreciation and amortisation	6C	**27 603**	28 617
Write down and impairment of assets	6D	**252**	2 150
Grants	6E	**2 253**	2402
Value of assets sold	6F, 5E	**447**	241
Expenses from ordinary activities (excluding borrowing costs expense)		**155 832**	147 779
Borrowing costs expense	6G, (a)	**148**	140
Operating surplus from ordinary activities		**9 901**	13 775
Net (debit) credit to asset revaluation reserve	10	**391**	(37 284)
Decrease in accumulated results on application of transitional provision in accounting standard AASB 1041 *Revaluation of Non-current Assets*	10	-	(2 754)
Total revenues, expenses and valuation adjustments recognised directly in equity		**391**	(40 038)
Total changes in equity other than those resulting from transactions with the Australian Government as owner		**10 292**	(26 263)

Statement of Financial Performance
for the year ended 30 June 2005

Note:

(a) This amount relates to interest attributable to prepaid revenue under a lease of property (refer Note 9A).

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

Statement of Financial Position
as at 30 June 2005

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
ASSETS			
Financial assets			
Cash	7A, 22	**4 926**	6 742
Receivables	7B, 22	**36 348**	86 873
Investments	7C, 22	**76 307**	55 690
Total financial assets		**117 581**	149 305
Non-financial assets			
Land and buildings	8A	**166 094**	162 219
Infrastructure, plant and equipment and major facilities	8B	**503 576**	450 811
Inventories	8C	**6 296**	7 480
Intangibles	8D	**3 397**	1 425
Other	8E	**3 433**	811
Total non-financial assets		**682 796**	622 746
Total assets		**800 377**	772 051
LIABILITIES			
Interest bearing liabilities			
Other	9A, 22	**2 614**	2 466
Total interest bearing liabilities		**2 614**	2 466
Provisions			
Employees	9B	**21 443**	20 557
Other	9C	**3 053**	5 569
Total provisions		**24 496**	26 126
Payables			
Suppliers	9D, 22	**9 126**	18 672
Grants	9E, 22	**50**	57
Other	9F, 22	**782**	14 503
Total payables		**9 958**	33 232
Total liabilities		**37 068**	61 824
NET ASSETS		**763 309**	710 227

Statement of Financial Position
as at 30 June 2005

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
EQUITY	10		
Contributed equity		393 369	350 579
Reserves		295 496	289 950
Accumulated surpluses		74 444	69 698
Total equity		763 309	710 227
Current assets		122 998	153 399
Non-current assets		677 379	618 652
Current liabilities		35 526	60 049
Non-current liabilities		1 542	1 775

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

Statement of Cash Flows
for the year ended 30 June 2005

	Notes	FINANCIAL YEAR 2005 $'000 Inflows (Outflows)	2004 $'000 Inflows (Outflows)
OPERATING ACTIVITIES			
Cash received			
Goods and services		35 458	32 529
Interest		3 737	3 112
GST received from ATO		15 011	17 470
Appropriations		124 683	121 054
Total cash received		178 889	174 165
Cash used			
Employees		(57 829)	(56 234)
Suppliers		(92 321)	(73 668)
Grants		(2 253)	(2 402)
Total cash used		(152 403)	(132 304)
Net cash from operating activities	11	26 486	41 861
INVESTING ACTIVITIES			
Cash received			
Proceeds from sales of property, plant and equipment		606	425
Proceeds from sales/maturity of investments		-	26 000
Total cash received		606	26 425
Cash used			
Purchase of property, plant and equipment	(a)	(86 278)	(123 053)
Purchase of investments		(20 617)	(28 607)
Total cash used		(106 895)	(151 660)
Net cash used by investing activities		(106 289)	(125 235)

Statement of Cash Flows
for the year ended 30 June 2005

	Notes	FINANCIAL YEAR 2005 $'000 Inflows (Outflows)	2004 $'000 Inflows (Outflows)
FINANCING ACTIVITIES			
Cash received			
Appropriation - contributed equity		77 987	84 690
Total cash received		77 987	84 690
Net cash from financing activities		77 987	84 690
Net increase/(decrease) in cash held		(1 816)	1 316
Cash at 1 July		6 742	5 426
Cash at 30 June		4 926	6 742

Note:
(a) Includes the cash flow impact of the replacement research reactor (OPAL) of $76.824 million (2004: $93.801 million).

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

Schedule of Commitments not recognised as Liabilities for the year ended 30 June 2005

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
BY TYPE			
CAPITAL COMMITMENTS			
Infrastructure, plant and equipment		16 223	10 133
Fuel elements purchase		6 135	3 863
Total capital commitments		22 358	13 996
By maturity			
Capital commitments payable			
One year or less		17 561	13 523
From one to five years		4 797	473
		22 358	13 996
OTHER COMMITMENTS			
Replacement Research Reactor Project (OPAL)	(b)	39 322	111 401
Disposition of spent fuel	(a)	46 471	46 287
Operating lease	(c)	2 685	2 425
Total other commitments		88 478	160 113
Total commitments payable		110 836	174 109
Other commitments receivable			
Replacement Research Reactor Project (OPAL)	(b)	39 322	111 401
Disposition of spent fuel	(a)	46 471	32 452
GST recoverable from Australian Taxation Office		2 033	1 272
Total other commitments receivable		87 826	145 125
Net other commitments		652	14 988
By maturity - operating lease - minimum payments			
One year or less		137	118
From one to five years		685	591
Over five years		1 863	1 716

Schedule of Commitments not recognised as Liabilities
for the year ended 30 June 2005

Note:

(a) In 1997-1998 the Government determined to provide $98.991 million in 2005 dollars ($86.4 million in 1997 dollars) to remove spent fuel rods from the Lucas Heights Science and Technology Centre and meet the costs of reprocessing offshore. An amount of $52.500 million has been drawn down. The amount of $46.471 million is not included in the commitment by maturity figures as the commitment payable is fully offset by the commitment receivable.

(b) A contract was executed on 13 July 2000 between ANSTO and INVAP SE for the design, construction and commissioning of a replacement research reactor at Lucas Heights. The amount of $39.322 million (excluding GST) is not included in the commitment by maturity figures as the commitment payable is fully offset by the commitment receivable.

(c) ANSTO has a twenty five year lease contract with Central Sydney Area Health Services with an annual rental payable of $137 000. The annual rental is subject to review every three years.

The timing of the other commitments payable is matched to the receipt of other commitments receivable.

The amounts reported as commitments payable includes GST where relevant. Recoveries due from the Australian Taxation Office in relation to commitments payable are disclosed as commitments receivable.

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

Schedule of Contingencies as at 30 June 2005

	FINANCIAL YEAR	
	2005 $'000	2004 $'000
Contingent Liabilities		
Guarantee (a)	**15**	15
Other (b)	**-**	-
Total Contingent Liabilities	**15**	15

Note:

(a) The amount reported as contingent liabilities refers to a 3 year security bond in favour of Energy Australia.

(b) The main contractor for the Replacement Research Reactor (OPAL) has lodged two claims against ANSTO for additional compensation aggregating approximately $14 million. These claims are currently under review by ANSTO.

ANSTO is in dispute with a supplier in relation to a contract. It is not possible at this time to quantify the impact of this dispute.

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

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

1 Economic dependency

The Australian Nuclear Science and Technology Organisation is dependent on appropriations from the Parliament of the Commonwealth Government for its continued existence and ability to carry out its normal activities.

2 Summary of significant accounting policies

(a) Basis of accounting

The financial statements are required by clause 1(b) of Schedule 1 to the *Commonwealth Authorities and Companies Act* 1997 *(CAC Act)* and are a general purpose financial report.

They have been prepared:

i. having regard to the provisions of the *Australian Nuclear Science and Technology Organisation (ANSTO) Act* 1987 (as amended)

ii. in accordance with:

- Finance Minister's Orders (being the *Commonwealth Authorities and Companies (Financial Statements for reporting periods ending on or after 30 June 2005) Orders) (FMO's)*;
- Australian Accounting Standards and Accounting Interpretations issued by the Australian Accounting Standards Board (AASB); and
- Urgent Issues Group (UIG) Abstracts.

Schedule 1 of the CAC Act requires statements to be prepared having regards to:

- The explanatory Notes;
- The Statements of Accounting Concepts (SACs); and
- Finance Briefs, Finance Circulars and other Guidance Notes issued by Dept. of Finance and, in addition in 2004-05, Estimates Memoranda and Financial Management Guidance.

The Statements of Financial Performance and Financial Position have been prepared on an accrual basis and are in accordance with the historical cost convention, except

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

for certain assets which, as noted, are at valuation. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the Statement of Financial Position when and only when it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured. Assets and liabilities arising under agreements equally proportionately unperformed are, however, not recognised unless required by an Accounting Standard. Liabilities and assets that are unrecognised are reported in the Schedule of Commitments and the Schedule of Contingencies.

Revenues and expenses are recognised in the Statement of Financial Performance when and only when the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

(b) Changes in accounting policies

The accounting policies used in the preparation of these financial statements are consistent with those used in 2003-04.

(c) Reporting by outcomes

A comparison of current and prior years' figures by outcome as specified in the Appropriation Acts relevant to ANSTO, is presented in Note 4.

(d) Revenue recognition

Parliamentary appropriations

From 1 July 1999, the Commonwealth Budget has been prepared under an accruals framework. Under this framework, Parliament appropriates money to ANSTO as revenue appropriations and as equity injections (refer Notes 5 and 10).

Revenue from Government - Output appropriations

Revenues from Government are revenues for the core activities of ANSTO and are recognised generally in accordance with policy 2A.5 of the Finance Ministers Orders 2004-05. Any undrawn appropriation at the end of financial year is recognised as Appropriation Receivable in accordance with policy 2A.4 of the FMOs.

Equity injections

Appropriations for capital items are recognised directly into equity in full as appropriated by the Parliament (refer Note 10).

Operating revenue from goods and services

Operating revenue from independent sources comprises revenue earned from the provision of products, or services, to entities outside ANSTO. Revenue is recognised when the goods are provided, or when the fee in respect of the services provided is receivable.

Receivables for goods and services are recognised at the nominal amounts due less any provision for doubtful debts. Collectibility of debts is reviewed at balance date. Provision is made when collectibilty of the debt is judged to be less rather than more likely.

Revenue received in advance

Revenue received in advance is initially brought to account as "unearned revenue" and subsequently recognised as revenue when earned.

Contract revenue

Revenue from the rendering of a service is recognised by reference to the stage of completion of each contract. The stage of completion is determined by reference to the proportion that the completed physical contract work bears to the estimated total physical contract work.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

Interest revenue
Interest revenue is recognised as the interest is received or is entitled to be received.

Revenue from sale of assets
Revenue is recognised when control of the asset has passed to the buyer.

Core operations
All material revenues described in this note are revenues relating to the core operating activities of ANSTO. Details of revenue amounts are given in Note 5.

(e) Employee benefits

Benefits
Liabilities for services rendered by employees are recognised at the reporting date to the extent that they have not been settled.

Liabilities for wages and salaries (including non-monetary benefits) and annual leave are measured at their nominal amounts. Other employees benefits expected to be settled within 12 months of their reporting date are also measured at their nominal amounts.

The provision for the employee entitlements encompasses annual leave and long service leave that ANSTO has a present obligation to pay resulting from employee services provided up to balance date. The leave liabilities are calculated on the basis of employees' remuneration, including employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability. The current Enterprise Agreement pay rates applicable on 1 July each year are considered in the calculation. The financial effect of this was an accrual of $0.417 million (2004: $0.599 million).

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

(f) Superannuation

The Australian Nuclear Science and Technology Organisation contributes to the Commonwealth Superannuation (CSS) and the Public Sector (PSS) superannuation schemes which provide retirement, death and disability benefits to employees. Contributions to the schemes are at rates calculated to cover existing and emerging obligations. Current contribution rates in 2005 were 9.5% of salary (PSS) and 17.9% of salary (CSS). An additional 3% is contributed for employer productivity benefits. The vast majority of staff are covered by one of these two schemes. For those staff who do not contribute to either of these two schemes, ANSTO contributes 9% of salary to the Australian Government Employees Superannuation Trust fund. Additional employer contributions are made to nominated complying funds on behalf of several term employees at a rate of 9% where the employee chooses not to make a personal contribution, or 11% where the employee chooses also to contribute. Contributions during the year are detailed in Note 6A. No liability is shown for superannuation in the Statement of Financial Position as the employer contributions fully extinguish the accruing liability which is assumed by the Commonwealth.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

(g) Leases

Operating leases are expensed on a basis which is representative of the pattern of benefits derived from the leased assets.

(h) Cash

For the purposes of the Statement of Cash Flows, cash includes short term deposits held in a bank, cash on hand and cash equivalents.

(i) Financial instruments

Accounting policies for financial instruments are stated at Note 22.

(j) Bad and doubtful debts

Bad debts are written off during the period in which they are identified. Provision for doubtful debts are made when collection of the debt is judged to be less rather than more likely.

(k) Buildings, infrastructure, plant and equipment and major facilities

Acquisition

Items of buildings, infrastructure, plant and equipment and major facilities are recorded at cost on acquisition and depreciated as outlined below. Items of plant and equipment with a cost of less than $3 000 are expensed in the year of acquisition.

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

Revaluations

Basis of valuation

Schedule 1 of the *Commonwealth Authorities and Companies Act* 1997 *(Financial Statements 2004-05) Orders* and AASB 1041 requires that from 1 July 2002, entities must revalue every class of asset that includes land, building, infrastructure, plant and equipment to fair value. Clause 3C.1.2 of the FMOs allows entities to utilise the transitional arrangements as stated in AASB 1041. Entities that are progressively revaluing a class of asset over a number of years may continue to do so, provided that the requirements of AASB 1041 in respect of progressive revaluations are met.

Land was revalued in 2004-05 in accordance with the fair value method of valuation and will be valued in successive three year cycles on the basis of its highest and best use, unless disposal is restricted by legislation zoning or government policy.

The requirements of Schedule 1 of the *Commonwealth Authorities and Companies Act* 1997 *(Financial Statements 2004-05) Orders* have been implemented as follows:

- Freehold land was revalued as at 30 June 2004
- Buildings on freehold land were revalued at 30 June 2004
- Plant and equipment were revalued at 30 June 2004
- Infrastructure was revalued at 30 June 2004
- The major national facility, HIFAR reactor including instrumentation was revalued at 30 June 2004
- Other national and major facilities were revalued at 30 June 2004

Other class of assets: buildings, infrastructure, plant and equipment including national and other major facilities were also revalued at 30 June 2004 on a fair value basis. FMOs required that all asset classes, carried at valuation under clause 3C.1 must be valued on a fair value basis by the end of the first reporting period after 30 June 2004 and must be kept up-to-date at fair value from 2004-05 onwards. Assets acquired this year and during the financial year of revaluation are reported at cost.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

Asset Class	Fair Value Measured at	Deprival Value Measured at
Land	Market selling price	Market selling price
Buildings	Market selling price	Depreciated replacement cost
Site infrastructure	Market selling price	Depreciated replacement cost
Electrical infrastructure	Market selling price	Depreciated replacement cost
Plant and equipment	Market selling price	Depreciated replacement cost
National & major facilities	Market selling price	Depreciated replacement cost

Fair and deprival values for each class of asset are determined as shown above.

Land and building assets are subject to a formal valuation every three years. Plant and equipment assets are subject to a formal valuation every four years.

All valuations are carried out by qualified parties, independent of ANSTO.

Any assets classified as "not to be replaced" or which are surplus to requirements are valued at net realisable value at balance date.

The valuation of land, buildings, infrastructure, plant and equipment including national and other major facilities were performed by independent valuers of the Australian Valuation Office (AVO), Mr. Frank Andreatta and Mr. Simon O'Leary (registered Valuer Nos. 2388 and 1128 respectively) at 30 June 2004.

Depreciation and amortisation

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

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

	2005	2004
Buildings on freehold land	**30 years**	30 years
Plant and equipment	**2 to 30 years**	2 to 30 years
Infrastructure	**20 years**	20 years
National and major facilities	**5 to 30 years**	5 to 30 years

The depreciation rates (useful lives) of ANSTO's property, plant and equipment have been reviewed during the year and found to be appropriate.

The aggregate amount of depreciation allocated for each class of asset during the reporting period is disclosed in Note 6C.

Recoverable amount test

Those assets carried at cost (less accumulated depreciation) are reviewed to determine whether this is in excess of the recoverable amount. If an excess exists as at the reporting date, the asset is written down to its recoverable amount. In assessing recoverable amounts, the relevant cashflows have been discounted to their present value.

(I) Inventories

Stores are valued at cost. Provision is made for obsolete inventory and diminution in value.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

Inventories of Cobalt-60 and enriched, natural and depleted uranium are valued on the basis of net realisable value.

Stocks of reactor fuel, heavy water and stores are valued at average purchase price.

(m) Intangibles

Software

Items of software are recorded at cost and depreciated as outlined below. Items with a cost of less than $3 000 are expensed in the year of acquisition.

There is no material internal software development.

Software which was revalued in 2001 in terms of AASB 1041 paragraph 8.7 (a) is reported at deemed cost.

Licences

Licences which were revalued in 1999 in terms of AASB 1041 paragragh 8.7 (a) are reported at deemed cost.

Amortisation

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

Amortisation rates applying to intangibles are as follows:

	2005	2004
Purchased software	**2 to 7 years**	2 to 7 years
Licences	**3 years**	3 years

The amortisation rates (useful lives) of ANSTO's software and licences have been reviewed during the year and found to be appropriate.

The aggregate amount of amortisation allocated for each class of asset during the reporting period is disclosed in Note 6C.

Recoverable amount test

Those assets carried at cost (less accumulated depreciation) are reviewed to determine whether this is in excess of the recoverable amount. If an excess exists as at the reporting date, the asset is written down to its recoverable amount. In assessing recoverable amounts, the relevant cashflows have been discounted to their present value.

(n) Patents

Due to the uncertain commercial value of patents, trademarks, designs and applications, and because benefits extending beyond one accounting period cannot be assured, the costs associated with the development and registration of patents are expensed in the year in which they are incurred, unless recoverability is assured beyond any reasonable doubt. At 30 June 2005 there were 105 patents, trademarks, design and applications (144 at 30 June 2004) registered to ANSTO and no associated costs are recognised as an asset (nil at 30 June 2004).

(o) Foreign currency

Transactions denominated in a foreign currency are converted to Australian currency at a rate of exchange prevailing at the date of the transaction. At balance date, amounts receivable and payable in foreign currency to Australian currency are translated at the exchange rate prevailing at that date and any exchange differences are brought to account in the Statement of Financial Performance.

(p) Taxation

ANSTO is exempt from all forms of taxation in Australia except fringe benefits tax and goods and services tax (GST). The Organisation is not subject to exemption from any foreign taxation laws relative to its overseas operations.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

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

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

(q) Assets received free of charge

The acquisition of property, plant and equipment free of charge, or for a nominal amount, is recognised at fair value.

(r) Principles of consolidation

ANSTO's sole subsidiary company ANSTO Inc., a company incorporated in Delaware, USA, had ceased trading in 2002 and amount owed to the parent company of $0.204 million has been forgiven as foreseeable future was not known. In November 2004, the Board decided to reactivate ANSTO Inc. to promote the commercialisation of ANSTO technology in the US. An evaluation of the ongoing role of ANSTO Inc in the commercialisation of ANSTO Technology in the US is currently underway. The net transaction for this financial year is an expense of AUD 6 514 (USD 5 245). As the amount was not material, no consolidated financial statements have been prepared.

(s) Comparatives

Where necessary, comparative information for the preceding financial year has been reclassified to achieve consistency in disclosure with current financial year amounts and other disclosures.

(t) Rounding

Amounts are rounded to the nearest one thousand dollars except in relation to:

- remuneration of members of the Board
- remuneration of executives
- remuneration of auditors
- financial information about the subsidiary company, notes 2(s) and 7D.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

3 Adoption of Australian Equivalents to International Financial Reporting Standards from 2005-06

The Australian Accounting Standards Board has issued replacement Australian Accounting Standards to apply from 2005-06. The new standards are the Australian Equivalents to International Financial Reporting Standards (IFRSs) which are issued by the International Accounting Standards Board. The new standards cannot be adopted early. The standards being replaced are to be withdrawn with effect from 2005-06, but continue to apply in the meantime, including financial year ending 30 June 2005.

The purpose of issuing Australian Equivalents to IFRSs (AEIFRS) is to enable Australian entities reporting under the *Corporations Act* 2001 to be able to more readily access overseas capital markets by preparing their financial reports according to accounting standards more widely used overseas.

For-profit entities complying fully with the Australian Equivalents will be able to make an explicit and unreserved statement of compliance with IFRSs and as well as a statement that the financial report has been prepared in accordance with Australian Accounting Standards.

It is expected that the Finance Minister will continue to require compliance with the Accounting Standards issued by the AASB, including the Australian Equivalents to IFRSs, in his Orders for the Preparation of Authorities' financial statements for 2005-06 and beyond.

The Australian Equivalents contain certain additional provisions which will apply to not-for-profit entities, including Non-Commercial Authorities, such as ANSTO. Some of these provisions are in conflict with IFRSs and therefore ANSTO will only be able to assert compliance with the Australian Equivalents to the IFRSs.

Existing AASB standards that have no IFRS equivalent will continue to apply.

3.1 Management of the transition to AEIFRS

3.1.1 ANSTO's Audit Committee was tasked with the oversight of the transition to and implementation of AEIFRS.

3.1.2 The Chief Financial Officer is formally responsible for the project and reported regularly to the Audit Committee on the progress against the approved formal plan.

3.1.3 The plan required the following key steps to be undertaken and set deadlines for their achievements.

3.1.4 All major accounting policy differences between current AASB standards and AEIFRS were identified.

3.1.5 System changes necessary to be able to report under AEIFRS, including those necessary to capture data under both sets of rules for 2004-2005 were completed. This included the testing and implementation of those changes.

3.1.6 Contractors were engaged where necessary to assist with each of the above steps.

3.2 Key policy differences arising from the adoption of AEIFRS

3.2.1 Property, Plant and Equipment

Under the Australian standard AASB116, cost of an asset includes the estimated cost of dismantling, removing the asset and restoring the site to the extent that is recognised as a provision under AASB 138, refer 3.2.4 .

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

3.2.2 Intangible assets

Under the Australian Standard AASB 138, certain costs, including research arising from internal projects, are excluded from being capitalised as Intangibles Assets. Carrying amounts in respect of these items would have to be expensed upon adoption of AEIFRS.

3.2.3 Employee Benefits

Australian Standard AASB 119 requires annual leave which is not expected to be taken within 12 months of the financial year, to be discounted using market yields on National Government Bonds as at the reporting date. There is an adjustment of $154 000 to reflect expected portion of non - current annual leave.

3.2.4 Provisions, Contingent Liability and Contingent Asset

The Australian Standard AASB 137 defines the new criteria under which items may be called provisions. The present obligation must be "virtually certain" and not probable that the event will occur.

ANSTO, under this standard will be required to recognise provisions for decommissioning and removal of assets, and site restoration. The value must be recognised as part of the cost of the underlying asset (deferred expense), as a separate amount. A reliable estimate of the impact cannot be determined as at the end of this current financial year due to the complexities involved mainly with decommissioning and restoring nuclear infrastructure.

ANSTO is assessing the potential strategies associated with the eventual decommissioning and remediation of its facilities located at the Lucas Heights Science and Technology Centre and at Camperdown.

Approval for the recommended strategy when determined, will be sought from the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). It is possible that ARPANSA requirements may result in changes to the anticipated costs of the final strategy.

Notes to and forming part of the Financial Statements
for the year ended 30 June 2005

3.3 Known or reliable information about the impact of AEIFRS on the financial report

ANSTO Management's review of the quantitative impacts of AEIFRS represents the best estimate of the impacts of the changes as at the reporting date. The actual effects of the impact of AEIFRS may differ from these estimates due to:

- continuing review of the impacts of AEIFRS ;
- potential amendments to the AEIFRS and AEIFRS interpretation; and
- Emerging interpretation as to the accepted practice in the application of AEIFRS and AEIFRS interpretations.

	AGAAP 2005 $'000	**AEIFRS 2005 $'000**	Difference 2005 $'000
ASSETS			
Financial assets			
Cash	4 926	**4 926**	-
Receivables	36 348	**36 348**	-
Investments	76 307	**76 307**	-
Total financial assets	117 581	**117 581**	-
Non-financial assets			
Land and buildings	166 094	**166 094**	-
Infrastructure, plant and equipment and major facilities	503 576	**503 576**	-
Inventories	6 296	**6 296**	-
Intangibles	3 397	**3 397**	-
Other	3 433	**3 433**	-
Total non-financial assets	682 796	**682 796**	-
Total assets	800 377	**800 377**	-
LIABILITIES			
Interest bearing liabilities			
Other	2 614	**2 614**	-
Total interest bearing liabilities	2 614	**2 614**	-
Provisions			
Employees	21 443	**21 275**	154
Other	3 053	**3 053**	-
Total provisions	24 496	**24 328**	154
Payables			
Suppliers	9 126	**9 126**	-
Grants	50	**50**	
Other	782	**782**	-
Total payables	**9 958**	9 958	-
Total liabilities	37 068	**36 900**	154
NET ASSETS	763 309	**763 477**	(154)

Notes to and forming part of the Financial Statements
for the year ended 30 June 2005

4 Segment and outcomes reporting

Reporting by segments
ANSTO operates in a single industry within Australia, namely in the nuclear scientific research industry.

Reporting by outcomes:
ANSTO has three outcomes and each have one output.
- Outcome 1: Replacement Research Reactor Project
- Outcome 2: Disposal of spent fuel
- Outcome 3: Core business: science and technology

Major Classes of Departmental Revenues and Expenses by Output Groups and Output

	Outcome 1		Outcome 2		Outcome 3		Total	
	Output 1		Output 2		Output 3			
	2005 $'000	2004 $'000	**2005 $'000**	2004 $'000	**2005 $'000**	2004 $'000	**2005 $'000**	2004 $'000
Operating revenues								
Revenue from Government			**13 835**	14 512	**110 848**	106 542	**124 683**	121 054
Sale of goods and services					**36 449**	36 708	**36 449**	36 708
Interest					**3 792**	3 065	**3 792**	3 065
Revenue from sale of assets					**606**	425	**606**	425
Other					**351**	442	**351**	442
Total operating revenues	**0**	0	**13 835**	14 512	**152 046**	147 182	**165 881**	161 694
Operating expenses								
Employees			**344**	269	**58 370**	56 088	**58 714**	56 357
Suppliers			**11 441**	13 743	**55 122**	44 269	**66 563**	58 012
Depreciation and amortisation					**27 603**	28 617	**27 603**	28 617
Other					**3 100**	4 933	**3 100**	4 933
Total operating expenses	**0**	0	**11 785**	14 012	**144 195**	133 907	**155 980**	147 919

Note:
The net costs include intra-government costs that would be eliminated in calculating the actual Budget outcome.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

5 Revenue

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
5A. Revenues from Government			
Appropriation for outputs		124 683	121 054
5B. Goods and services			
Radioisotope sales		20 730	20 066
Services and contract research		5 389	6 018
Silicon irradiation		3 907	3 445
CSIRO site support		950	937
Training courses		100	97
Land management		2 538	2 853
Australian Synchrotron Research Project		1 623	2 226
AINSE interactions		1 212	1 066
Total sales of goods and services		36 449	36 708
5C. Grants		329	410
5D. Interest		3 792	3 065
5E. Net gain from sale of assets			
Infrastructure, plant and equipment:			
Revenue from sale of assets		606	425
Value of assets sold	6F	(447)	(241)
Net gain from disposal of infrastructure, plant and equipment		159	184
5F. Net foreign exchange gains - non speculative		22	32
Total operating revenue from independent sources		41 198	40 640
Total revenues from ordinary activities		165 881	161 694
5G. Sales of goods and services	5B		
Goods		20 730	20 066
Services		15 719	16 642
Total sales of goods and services		36 449	36 708

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

5 Revenue (continued)

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
Provision of goods to:			
Related entities		-	-
External entities		20 730	20 066
Total sales of goods		20 730	20 066
Rendering of services to:			
Related entities		1 785	937
External entities		13 934	15 705
Total rendering of services		15 719	16 642
Cost of sales of goods		23 283	19 802

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

6 Operating expenses

The breakdown of operating expenses is:	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
6A. Employee expenses:			
Salaries		45 988	41 462
Superannuation		5 850	6 312
Annual leave		4 636	4 762
Long service leave		1 826	2 622
Separation and redundancy		96	547
Total employee benefits expenses		58 396	55 705
Workers compensation premiums		318	652
Total employee expenses		58 714	56 357
6B. Supplier expenses:			
Goods from external entities		13 616	16 576
Services from related entities		7 807	7 215
Services from external entities (a)		45 015	34 162
Operating lease rentals		125	59
Total supplier expenses		66 563	58 012
6C. Depreciation and amortisation			
Depreciation of property, plant and equipment (b)	8B	24 778	26 866
Amortisation of intangible assets - licence	8D	2	301
Amortisation of intangible assets - software	8D	2 823	1 450
Total depreciation and amortisation		27 603	28 617
6D. Writedown of assets			
Financial assets:			
Provision for doubtful debt no longer required	7B	(274)	-
Receivables for goods and services		3	1 567
Foreign exchange loss	7A	67	115

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

6 Operating expenses (continued)

		Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
	Non financial assets:			
	Materials - Write off obsolete stock		1	4
	Fixed Assets Revaluation Writedown/Impairment		234	-
	Nuclear material stock devaluation		221	464
	Total writedown of assets		252	2 150
6E.	Grants		2 253	2 402
6F.	Value of assets sold		447	241
	Total operating expenses		155 832	147 779
6G.	Borrowing costs expense	9A	148	140
(a)	This includes adjustments of $14.4 million (2004: Nil) for buildings, infrastructure, plant and equipment no longer considered of economic benefit			
(b)	Depreciation of property, plant and equipment:			
	The aggregate amounts of depreciation expensed during the reporting period for each depreciable class of property, plant and equipment are as follows:			
	Buildings on freehold land		5 693	4 877
	Plant and equipment		11 040	11 665
	Infrastructure		2 088	2 138
	National and major facilities		5 957	8 186
	Total allocated		24 778	26 866

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

7 Financial assets

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
7A. Cash			
Cash at bank for operating needs		4 926	6 742
Total cash		4 926	6 742
7B. Receivables			
Goods and services (a)		7 270	9 287
Less provision for doubtful debts of 90 days and over		1 653	1 943
		5 617	7 344
Interest accrued		186	130
Other (b)		28 933	77 867
GST receivable		1 612	1 532
Total receivables (net)		36 348	86 873
(a) Goods and services (trade debtors)			
Age analysis of trade debtors			
Current		4 468	4 961
Overdue:			
Less than 30 days		811	1255
30 to 60 days; and		181	739
60 to 90 days		72	465
More than 90 days		1 738	1 867
		7 270	9 287

(b) In 2005, $28.800 million appropriations receivable from Government for undrawn equity injection (2004, $77.832 million including spent fuel appropriation). It is expected that the remaining equity injection of $28.800 million will be drawn next year.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

7 Financial assets (continued)

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
7C. Investments			
Bank accepted bills		67 307	49 690
Term deposit		9 000	6 000
Fixed term investments (a)		76 307	55 690

(a) The majority of the value held is to meet contracted future payments, including construction of the Replacement Research Reactor (OPAL) and new main entrance as well as commitments for capital projects

7D. Investment in subsidiary

ANSTO Inc. was incorporated in Delaware, USA on 27 October 1999. At 30 June 2005: US$100 (2004: US$100) of capital has been invested in this wholly owned subsidiary. Refer note 2(r).

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

8 Non-financial assets

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
8A. Land and buildings			
Land - at independent valuation - 30 June 2004 (fair value)	(a), (b)	82 027	82 027
		82 027	82 027
Buildings - at cost		9 568	-
Less accumulated depreciation		455	-
		9 113	-
Buildings - at independent valuation - 30 June 2004 (fair value)	(a), (b)	80 192	80 192
Less accumulated depreciation	(a), (b)	5 238	-
		74 954	80 192
Total buildings		84 067	80 192
Total land and buildings		166 094	162 219
8B. Infrastructure, plant, equipment and major facilities			
(i) Plant and equipment			
Plant and equipment - at cost		6 431	6 431
Less accumulated depreciation		1 053	410
		5 378	6 021
Current years additions - at cost		13 475	-
Less accumulated depreciation		1 652	-
		11 823	-

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

8 Non-financial assets (continued)

		Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
	Plant and equipment - at independent valuation - 30 June 2004 (fair value)	(a), (b)	69 403	70 487
	Less accumulated depreciation	(a), (b)	8 713	-
			60 690	70 487
	Plant and equipment under construction		21 281	42 632
	Total plant and equipment		99 172	119 140
(ii)	Infrastructure			
	Electrical/site services			
	Electrical/site services facilities - at cost		2 059	-
	Less accumulated depreciation		100	-
			1 959	-
	Electrical/site services facilities at independent valuation - 30 June 2004 (fair value)	(a), (b)	20 992	20 992
	Less accumulated depreciation	(a), (b)	1 988	-
			19 004	20 992
	Total infrastructure		20 963	20 992

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

8 Non-financial assets (continued)

	Notes	FINANCIAL YEAR 2005 $'000	2004 $'000
(iii) Major national and major research facilities			
Major national research facilities - at cost		1 808	35
Less accumulated depreciation		368	13
		1 440	22
Major national research facilities at independent valuation - 30 June 2004 (fair value)	(a), (b)	21 923	21 923
Less accumulated depreciation	(a), (b)	4 677	-
		17 246	21 923
Major research facilities at independent valuation - 30 June 2004 (fair value)	(a), (b)	10 156	10 156
Less accumulated depreciation	(a), (b)	803	-
		9 353	10 156
Replacement Research Reactor (OPAL) Project capitalised cost to date		355 402	278 578
Total major national and major research facilities		383 441	310 679
Total infrastructure, plant, equipment and major facilities		503 576	450 811
Total land, buildings, infrastructure, plant, equipment and major facilities		669 670	613 030

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

8 Non-financial assets (continued)

Movement summary 2004-05 for all assets irrespective of valuation basis (excluding intangibles)

	Land	Buildings	Total Land and Buildings	Infrastructure, plant, equipment national and major facilities	Total
	$'000	$'000	$'000	$'000	$'000
Gross value as at 1 July 2004	82 027	80 192	162 219	451 234	613 453
Additions - new assets	-	9 569	9 569	71 876	81 445
Transfer/reclassification	-	-	-	36	36
Revaluations				391	391
Disposals	-	-	-	(608)	(608)
Gross value as at 30 June 2005	82 027	89 761	171 788	522 929	694 717
Accumulated depreciation/ amortisation 1 July 2004	-	-	-	423	423
Depreciation/amortisation	-	5 693	5 693	19 085	24 778
Transfer/reclassifications	-	-	-	36	36
Revaluations	-	-	-	(29)	(29)
Adjustment for disposals	-	-	-	(161)	(161)
Accumulated depreciation/ amortisation 30 June 2005	-	5 693	5 693	19 354	25 047
Net book value as at 30 June 2005	82 027	84 068	166 095	503 575	669 670
Net book value as at 30 June 2004	82 027	80 192	162 219	450 811	613 030

Note:

(a) In 2003-2004, an independent valuation of land, buildings, plant & equipment and infrastructure was performed by Mr. Frank Andreatta and Mr. Simon B O'Leary (registered valuer Nos. 3775 and 1128 respectively) of the Australian Valuation Office. Refer Note 2(k).

(b) In accordance with the requirements of Schedule 1 of the *Commonwealth Authorities and Companies Act 1997 (Financial Statements 2004-2005) Orders*, all revalued assets are shown on a gross basis: asset values are at fair value and accumulated depreciation has been written back. The resulting adjustment has been transferred directly to the asset revaluation reserve and/or Statement of Financial Performance if the reserve is insufficient.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

8 Non-financial assets (continued)

Movement summary 2004-05 for all assets at valuation

Item	Land	Buildings	Total Land and Buildings	Infrastructure, plant, equipment national and major facilities	Total
	$'000	$'000	$'000	$'000	$'000
As at 30 June 2005					
Gross value	82 027	89 761	171 788	122 474	294 262
Accumulated depreciation/amortisation	-	(5 693)	(5 693)	-	(5 693)
Net value	82 027	84 068	166 095	122 474	288 569
As at 30 June 2004					
Gross value	82 027	80 192	162 219	123 558	285 777
Accumulated depreciation/amortisation					
Net value	82 027	80 192	162 219	123 558	285 777

Summary of all assets under construction as at 30 June 2005

Item	Land	Buildings	Total Land and Buildings	Infrastructure, plant, equipment national and major facilities	Total
	$'000	$'000	$'000	$'000	$'000
As at 30 June 2005					
Gross value	-	-	-	376 683	376 683
Accumulated depreciation/amortisation					
Net value as at 30 June 2005	-	-	-	376 683	376 683
Net value as at 30 June 2004	-	-	-	321 210	321 210

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

8 Non-financial assets (continued)

	FINANCIAL YEAR	
	2005 $'000	2004 $'000
8C. Inventories		
Raw materials and stores - not held for resale		
Stores - at cost	**2 055**	1 669
Cobalt-60 sources - at net realisable value	**147**	216
Reactor fuel and heavy water - at average purchase price	**2 163**	4 287
Nuclear materials - at net realisable value	**135**	101
Provision for stock diminution	**(392)**	(305)
	4 108	5 968
Work in progress		
Work in progress - at cost	**819**	883
Finished goods - at cost	**1 369**	629
Total inventories	**6 296**	7 480
8D. Intangibles		
Licences at deemed cost	**999**	1 109
Less accumulated amortisation	**999**	1 066
	-	43
Design fees at cost	**80**	-
Less accumulated amortisation	**70**	-
	10	-
Software at cost	**9 435**	4 606
Less accumulated amortisation	**6 048**	3 319
	3 387	1 287
Software at deemed cost	**458**	458
Less accumulated amortisation	**458**	363
	-	95
Total intangibles	**3 397**	1 425

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

8 Non-financial assets (continued)

Movement summary 2004-05 for all intangibles irrespective of valuation basis

	Licences $'000	Software $'000	Total $'000
Gross value as at 1 July 2004	1 109	5 064	6 173
Additions - new assets	5	4 828	4 833
Transfer/reclassification	(36)	-	(36)
Gross value as at 30 June 2005	1 078	9 892	10 970
Accumulated depreciation/amortisation 1 July 2004	1 066	3 682	4 748
Depreciation/amortisation	2	2 823	2 825
Accumulated depreciation/amortisation 30 June 2005	1 068	6 505	7 573
Net book value as at 30 June 2005	10	3 387	3 397
Net book value as at 30 June 2004	43	1 382	1 425

	FINANCIAL YEAR	
	2005 $'000	2004 $'000
8E. Other		
Prepayments	3 433	811
Total non-financial assets	682 796	622 746

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

9 Liabilities

		FINANCIAL YEAR	
		2005 $'000	2004 $'000
9A.	Interest bearing liabilities		
	Other - (a)	**2 614**	2 466
	Total interest bearing liabilities	**2 614**	2 466
	Provision and payables		
9B.	Employees		
	Accrued salaries and wages	**185**	-
	Annual leave	**8 070**	7 745
	Long service leave	**13 188**	12 812
	Aggregate employee entitlement liability	**21 443**	20 557
9C.	Other		
	HIFAR spent fuel rods (b)	**1 000**	1 000
	Superannuation fluctuation (c)	**592**	1 692
	Waste management cost (d)	**1 427**	1 320
	Common law and other claims (e)	**34**	1 557
		3 053	5 569
9D.	Suppliers		
	Trade creditors	**9 126**	18 672
		9 126	18 672
9E.	Grants		
	Non-profit entities	**50**	57
		50	57
9F.	Other		
	Revenue received in advance	**782**	668
	Unearned revenue (f)	**-**	13 835
		782	14 503
	Total provisions and payables	**34 454**	59 358
	Total liabilities	**37 068**	61 824

Note:

(a) Relates to prepaid revenue under a lease of property.

(b) Provision for HIFAR spent fuel rods.

In 1995 ANSTO created a provision for the overseas transport and reprocessing of HIFAR spent fuel rods. The balance has been retained, as expenditure is expected to be incurred in the future.

This provision is separate from and precedes the Government's 1997 determination to fund disposition of the balance of spent fuel rods.

(c) A provision has been established for expected future contributions to staff superannuation funds for past service.

(d) A specific appropriation to cover costs associated with the movement of low level waste to a repository yet to be established.

(e) Provision for Common Law Claim of $1.5 million has been written back in 2004-2005. The likelihood of a claim against ANSTO is still present, this however is covered by Department of Finance and Administration provision dealing with asbestos related claims against any agencies including ANSTO in the event of any litigation or claim for compensation.

(f) Revenue to cover costs of spent fuel shipment originally scheduled for year ended 30 June 2003, have now been drawn.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

10 Equity

	FINANCIAL YEAR	
	2005 $'000	2004 $'000
Contributed equity		
Replacement research reactor equity injections		
Balance 1 July	**328 148**	248 938
Equity injections from Government - Replacement Research Reactor (OPAL)	**37 201**	79 210
Balance 30 June (d)	**365 349**	328 148
Other equity injections		
Balance 1 July	**22 431**	16 951
Equity injections from Government - Other	**5 589**	5 480
Balance 30 June (d)	**28 020**	22 431
Total contributed equity	**393 369**	350 579
Reserves, including movements		
Asset revaluation reserve		
Balance 1 July	**256 895**	294 179
Net revaluation	**391**	(37 284)
Balance 30 June	**257 286**	256 895
Fuel elements reserve		
Balance 1 July	**12 400**	12 400
Transferred from accumulated surpluses	**-**	-
Balance 30 June - (a)	**12 400**	12 400
Instrumentation reserve		
Balance 1 July	**6 200**	6 200
Transferred from accumulated surpluses	**-**	-
Balance 30 June - (b)	**6 200**	6 200
Spent fuel reserve		
Balance 1 July		
Transferred to accumulated surpluses - (c)	**2 010**	-
Balance 30 June	**2 010**	-

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

10 Equity (continued)

	FINANCIAL YEAR	
	2005 $'000	2004 $'000
RRRP training & business initiatives reserve		
Balance 1 July	**6 800**	6 800
Transferred from accumulated surpluses	**-**	-
Balance 30 June - (e)	**6 800**	6 800
New main entrance reserve		
Balance 1 July	**5 155**	-
Transferred from accumulated surpluses - (f)	**3 145**	5 155
Balance 30 June	**8 300**	5 155
Reactor licensing reserve		
Balance 1 July	**2 500**	-
Transferred from accumulated surpluses - (g)	**(1 000)**	2 500
Balance 30 June	**1 500**	2 500
Australian research project reserve		
Balance 1 July		
Transferred from accumulated surpluses - (h)	**1 000**	-
Balance 30 June	**1 000**	-
Total reserves	**295 496**	289 950
Accumulated surpluses		
Accumulated surpluses 1 July	**69 698**	66 332
Transfer to spent fuel reserve	**(2 010)**	-
Transfer to Australian research project reserve	**(1 000)**	-
Transfer to new main entrance reserve	**(3 145)**	(5 155)
Transfer from/to reactor licensing reserve	**1 000**	(2 500)
Operating surplus from ordinary activities	**9 901**	13 775
Decrease in accumulated results due to revaluation	**-**	(2 754)
Accumulated surpluses 30 June	**74 444**	69 698
Total equity	**763 309**	710 227

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

10 Equity (continued)

(a) Fuel elements reserve

This reserve was established to fund the purchase of core fuel and development cost for the first few years of the replacement research reactor operation.

(b) Instrumentation reserve

In addition to the 1997 Government decision to fund the construction of a replacement research reactor at Lucas Heights, ANSTO has identified a planned future capital investment for the development of instrumentation associated with the replacement research reactor.

(c) Spent fuel reserve

This reserve represents unused spent fuel appropriation that will be used to establish for future costs associated with the return of reprocessed fuel back to Australia.

(d) Equity injection

The total drawdown of $77.897 million (2004: $84.690 million) is for expenditure on capital projects.

Total equity injections for $393.369 million includes undrawn amount of $28.880 million, refer note 7B(b). These will be drawn as required.

(e) RRRP training and business initiatives reserve

In addition to the 1997 Government decision to fund the construction of a replacement research reactor at Lucas Heights, ANSTO has identified a planned future capital investment for the development of ancillary facilities, business initiatives and operator training to fully utilise the replacement research reactor capabilities.

(f) New main entrance reserve

This reserve, is to meet contracted construction costs relating to a new main entrance has been created.

(g) Reactor licensing reserve

This reserve, is to meet future licensing costs for decommissioning the HIFAR reactor and commissioning the replacement research reactor.

(h) Australian Synchrotron Project Reserve

A reserve to meet future costs for Australian Synchrotron Operations has been created.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

11 Cash flow reconciliation

	FINANCIAL YEAR	
	2005 $'000	2004 $'000
Reconciliation of Operating Surplus to Net Cash from Operating Activities:		
Operating surplus	**9 901**	13 775
Non-cash items		
Depreciation/amortisation	**27 603**	28 617
Gain on disposal of assets	**(159)**	(184)
Write off obsolete stock	**1**	4
Nuclear materials (devaluation)	**(221)**	(464)
Changes in assets and liabilities		
(Increase)/decrease in receivables	**1 727**	(2 854)
(Increase)/decrease in other receivables	**13 744**	128
Decrease/(increase) in GST receivables	**(80)**	986
(Increase)/decrease in prepayments	**(2 622)**	(431)
Decrease/(increase) in inventories	**1 404**	1 094
Increase/(decrease) in creditors	**(9 546)**	3 965
Increase/(decrease) in employee entitlements	**886**	124
Increase/(decrease) in other creditors	**(13 728)**	293
Increase in unearned revenue	**-**	-
Increase/(decrease) in accrued interest	**(56)**	48
(Decrease)/increase in other provision	**(2 516)**	(3 380)
Increase in revenue in advance	**148**	140
Net cash from operating activities	**26 486**	41 861

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

12 Appropriations

Particulars	Departmental Outputs		Equity		Total	
	2005	2004	**2005**	2004	**2005**	2004
	$'000	$'000	**$'000**	$'000	**$'000**	$'000
Year Ended 30 June 2005						
Balance carried forward from previous year	**13 835**	13 835	**63 997**	63 997	**77 832**	77 832
Appropriation Acts 1	**124 683**	121 054	-	-	**124 683**	121 054
Appropriation Acts 2	-	-	-	84 690	-	84 690
Balance carried forward to next year	-	13 835	**28 800**	63 997	**28 800**	77 832
Available for payment of CRF	**138 518**	134 889	**63 997**	148 687	**202 515**	283 576
Payments made out of CRF	**138 518**	121 054	**35 197**	84 690	**173 715**	205 744
Represented by: Appropriation Receivable	-	**13 835**	**28 800**	**63 997**	**28 800**	**77 832**

This table reports on appropriations made by Parliament from Consolidated Revenue Fund (CRF) for payment to ANSTO.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

13 Remuneration of members of the Board

	FINANCIAL YEAR	
	2005 $	2004 $
Members' remuneration is determined by the Remuneration Tribunal and payment is made in accordance with Section 12 of the *ANSTO Act* 1987 (as amended).		
Included in operating expenses (Note 6) are:		
Aggregate amounts of superannuation payments in connection with the retirement of members of the Board	**17 508**	17 763
Other remuneration received, or due and receivable by members of the Board	**453 491**	554 003
	470 999	571 766
The number of members included in these figures is shown below in each relevant remuneration band:		
Remuneration between	**Number**	Number
$Nil and $9 999	**1**	1
$20 000 and $29 999	**3**	3
$30 000 and $39 999	**-**	1
$40 000 and $49 999	**2**	2
$300 000 and $309 999 (a)	**1**	-
$320 000 and $329 999 (b)	**-**	1
	7	8

(a) Includes incentives payment

(b) Includes payment of special allowance

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

14 Remuneration of executives

	FINANCIAL YEAR 2005 $	2004 $
Executive remuneration is determined by the ANSTO Enterprise Agreement 2002 which is underpinned by the ANSTO Award. Included in operating expenses (Note 6) is total remuneration received or due and receivable, by executives (excluding the Executive Director who is included in Note 13) who earn $100 000 or more in connection with the management of ANSTO.	2 479 167	2 074 431
The number of executives included in these figures is shown below in each relevant remuneration band:		
Remuneration between	Number	Number
$100 000 and $109 999	1	1
$110 000 and $119 999	2	-
$120 000 and $129 999	-	1
$130 000 and $139 999	3	1
$140 000 and $149 999	-	-
$150 000 and $159 999	2	1
$160 000 and $169 999	1	1
$170 000 and $179 999	1	1
$180 000 and $189 999	1	3
$190 000 and $199 999	1	1
$210 000 and $219 999	2	1
$220 000 and $229 999 (a)	-	1
$260 000 and $269 999 (a)	1	-
	15	12

(a) Includes termination payment

15 Replacement research reactor project (OPAL) costs

Following the requisite approval from the Minister for Industry, Science and Resources, a contract was executed on 13 July 2000 between ANSTO and INVAP SE for the design, construction and commissioning of a replacement research reactor at Lucas Heights. The cost of construction of the replacement research reactor is A$278.5 million excluding GST (November 1999 dollars).

The Government has agreed to maintain the purchasing power of the $278.5 million in regard to foreign currency movements, changes in prices arising from movements in price indices attributable to the contract, and for the changes in the Government parameters where appropriate.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

16 Insurances

Insurance risks, including professional indemnity, general liability, industrial special risk for property used substantially for commercial purposes, directors and officers, and travel, are placed through Comcover, the Government's insurable risk managed fund.

Workers compensation is insured through Comcare Australia and by virtue of statute under the *Safety Rehabilitation and Compensation Act* 1988.

A Deed of Indemnity between the Commonwealth Government and ANSTO, under which the government has formally agreed to indemnify ANSTO and ANSTO Officers from any loss or liability arising from claims caused by ionising radiation, remains in place.

17 Remuneration of auditors

	FINANCIAL YEAR	
	2005 $	2004 $
Remuneration to the Auditor-General for auditing the financial statements for the reporting period	**98 000**	96 000

No other services were provided by the Auditor-General during the reporting period.

18 Board membership

The members of the Board during the financial year and to the date of the report on the statements were:

Member	Appointed	Term Concludes
I O Smith	11 May 2004	16 May 2008
I D Blackburne	1 July 2001	30 June 2006
A Van der Schaaf	25 July 2002	24 July 2007
K Schindhelm	20 March 2003	19 March 2008
G Cook	13 June 2001	4 April 2006
M Eager	1 January 2002	31 December 2006
C Hillyard	21 July 1999	21 July 2004
C Hillyard	22 July 2004	21 July 2009

For the 2004-05 financial year the aggregate remuneration paid to members of the Board is disclosed in Note 13.

The aggregate of superannuation payments paid to the Commonwealth Superannuation Scheme (CSS) and Public Sector Superannuation Scheme (PSS), in connection with the retirement of members of the Board was $17 508 (2004: $17 763).

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

19 Related party disclosures

Several ANSTO Board members were associated with entities with which ANSTO had commercial transactions during the year. All such transactions were in accordance with ANSTO's normal commercial terms and conditions.

20 Average staffing levels (full time equivalent)

	FINANCIAL YEAR	
	2005	2004
The average staffing levels for ANSTO during the year were:	**840**	837

21 Trust money

	$'000	$'000
ANSTO receives monies from trade creditors as security deposits for contracts to be performed. These monies are held in a Trust Account and refunded to the respective trade creditors on satisfactory completion of the contract.		
Balance 1 July	**6**	6
Add: receipts	**-**	-
interest received	**1**	-
Deduct: payments	**-**	-
Balance 30 June	**7**	6

Recent audit conducted by Australian National Audit Office (ANAO) relating to trust monies revealed that ANSTO's trust monies only relate to security deposits.

Three trust monies reported in 2003-2004 have been removed as these monies were not deemed to be legal trust monies by the ANAO and as such are no longer reported separately.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

22 Financial instruments

(a) terms, conditions and accounting policies

Financial Instruments	Notes	Accounting Policies and Methods (including recognition criteria and measurement basis)	Nature of underlying instrument (including significant terms & conditions affecting the amount, timing and certainty of cash flow)
Financial assets		Financial assets are recognised when control over future economic benefits is established and the amount of the benefit can be reliably measured.	
Cash at bank	7A	Cash is recognised at cost. Interest is accrued as it is earned.	All Australian dollar cash balances are with the Commonwealth Bank of Australia. At 30 June current rates were 4.25%pa (2004 3.73%pa), calculated daily
Fixed term investment	7C	The deposits or investments are recognised at cost. Interest is accrued as it is earned.	The deposits & investments are with the Commonwealth Bank of Australia, and earn an effective rate of interest of 5.38% for 90 days (2004 4.74%pa for 90 day terms) payable on maturity.
Receivables for goods & services	7B	Receivables are recognised at the nominal amounts due less any provision for bad and doubtful debts. Provisions are made when collection of the debt is judged to be less rather than more likely.	Credit terms are net 30 days (2004 - 30 days).
Other debtors	7B	Receivables are recognised at the nominal amounts due less any provision for bad and doubtful debts.	Majority of the amount ($28.800 million) is receivable from Department of Finance and Administration for undrawn equity injection.
Financial Liabilities (recognised)		Financial liabilities are recognised when a present obligation to another party is entered into and the amount of the liability can be reliably measured.	
Trade creditors	9D	Creditors and accruals are recognised at their nominal amounts, being the amounts at which the liabilities will be settled. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).	Settlement is usually made net 30 days.
Revenue received in advance	9E, 9F	Revenue received in advance is initially brought to account as "other payables" and subsequently recognised as revenue when earned.	Revenue earned is brought to account when the transaction is completed.
Financial liabilities (unrecognised)		Outstanding foreign currency hedges not recognised in the Statement of Financial Position	Hedge contracts that were entered into prior to the Department of Finance and Admistration implementing its new policy regarding foreign currency hedging. Contracts total $0.323 million maturing August and October 2004. These hedges have now been disposed in 2004-2005.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

22 Financial instruments (continued)

(b) Interest rate risk - consolidated

Financial Instruments	Notes	Floating Interest Rate		Fixed Interest Rate				Non-Interest Bearing		Total		Weighted Average Effective Interest Rate	
				1 year or less		2 - 5 years							
		2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000	2005 $'000	2004 $'000
Financial assets (recognised)													
Cash at bank	7A	4 925	6 741							4 925	6 741	4.25%	3.73%
Cash on hand	7A							1	1	1	1	n/a	n/a
Fixed term investment	7C	76 307	55 690							76 307	55 690	5.38%	4.74%
Receivables for goods and services	7B							7 229	8 876	7 229	8 876	n/a	n/a
Interest accrued	7B							186	130	186	130	n/a	n/a
Other	7B							28 933	77 867	28 933	77 867	n/a	n/a
Total financial assets (recognised)		81 232	62 431					36 349	86 874	117 581	149 305		
Total assets										800 377	772 051		
Total financial liabilities (recognised)													
Trade creditors	9D							9 126	18 672	9 126	18 672	n/a	n/a
Grant received in advance	9E							50	57	50	57	n/a	n/a
Interest bearing liablities	9A					2 614	2 466			2 614	2 466	6%	6%
Other	9F							782	14 503	782	14 503	n/a	n/a
Total financial liabilities (recognised)						2 614	2 466	9 958	33 232	12 572	35 698		
Total liabilities										37 068	61 824		
Total financial liabilities (unrecognised)								323		323			

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

22 Financial instruments (continued)

(c) Net fair values of financial assets and liabilities

		FINANCIAL YEAR			
		2005		2004	
	Note	Total carrying amount $'000	Aggregate net fair value $'000	Total carrying amount $'000	Aggregate net fair value $'000
Financial assets (recognised)					
Cash at bank	7A	**4 925**	**4 925**	6 741	6 741
Cash on hand	7A	**1**	**1**	1	1
Fixed term investments	7C	**76 307**	**76 307**	55 690	55 690
Receivables for goods and services	7B	**7 229**	**7 229**	8 876	8 876
Interest accrued	7B	**186**	**186**	130	130
Other	7B	**28 933**	**28 933**	77 867	77 867
Total financial assets		117 581	117 581	149 305	149 305
Financial liabilities (recognised)					
Trade creditors	9D	**9 126**	**9 126**	18 672	18 672
Grant received in advance	9E	**50**	**50**	57	57
Interest bearing liabilities	9A	**2 614**	**2 614**	2 466	2 466
Other	9F	**782**	**782**	14 503	14 503
Total financial liabilities		12 572	12 572	35 698	35 698
Financial liabilities (unrecognised)				323	323

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

22 Financial instruments (continued)

(c) Net fair values of financial assets and liabilities (continued)

Financial assets

The net fair values of cash, deposits on call and non-interest-bearing monetary financial assets are in accord with their carrying amounts.

Loans receivable are carried at cost, which is above their net fair value, because it is intended to hold them to maturity.

Financial liabilities

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

(d) Credit risk exposures

ANSTO's maximum exposures to credit risk at reporting date in relation to each class of recognised financial assets is the carrying amount of those assets as indicated in the Statement of Financial Position.

23 Overseas Pension Schemes

A number of defined benefit pension/superannuation schemes are maintained at overseas Australian Government posts for the benefit of local engaged staff. The Department of Foreign Affairs and Trade maintains such a scheme for local staff formally employed by ANSTO in London. The position is as follows:

	2005	2004
	$'000	$'000
Accrued Benefits (Present Value)	**129**	139
Plan Assets (Fair Value)	**110**	129
Net Assets	**19**	10
Vested Benefits	**114**	124

(1) Accrued Benefits (30 June 2005) have been based on the data used for the actuarial valuation prepared for funding purposes as at 1 July 2003, plus information provided by the administrator on the membership as at 1 July 2004 and the expected membership movement up to 30 June 2005. Accrued Benefits (30 June 2004) was based on as a 1 July 2003 actuarial valuation updated by the actuary for membership data up to 30 June 2004.

(2) Plan Assets (30 June 2005) have been valued by the actuary as at 30 June 2005 based on actual values as at 31 May 2005. Plan Assets (30 June 2004) have been valued by the actuary as at 30 June 2004 based on actual values as at 31 May 2004.

Notes to and forming part of the Financial Statements for the year ended 30 June 2005

22 Financial instruments (continued)

(3) Vested Benefits (30 June 2005) have been based on the data used for the actuarial valuation prepared for funding purposes as at 1 July 2003, plus information provided by the administrator on the membership as at 1 July 2004 and the expected membership movement up to 30 June 2005. Vested Benefits (30 June 2004) was based on as a 1 July 2003 actuarial valuation updated by the actuary for membership data up to 30 June 2004.

The above figures represent approximately 1% of the total value of the fund.

24 Events subsequent to reporting date

Since the end of the financial year, ANSTO has signed the contract with CERCA to purchase 16 HIFAR fuel rods valued at USD$1.544 million (AUD$2.035 million)

APPENDICES

APPENDIX 1
Equality of Employment Opportunity

Objectives

1. To ensure that Equal Employment Opportunity (EEO) principles and practices are actively incorporated into all people management practices.
2. To ensure that the structures and processes used to implement EEO adjust to changing employment needs.
3. To confirm and communicate the vision that ANSTO's employment activities reflect ANSTO's values.

ANSTO actively seeks to implement EEO and diversity principles in its management practices. Human resource processes and systems were reviewed and documented as part of ISO 9001 certification and EEO practices have been included in these processes. All new employees are introduced to the principles of EEO as part of their induction program.

While there is a predominance of male employees in ANSTO, women are relatively well represented in key executive and research scientist roles.

ANSTO has sought to accommodate employees seeking part-time employment wherever feasible, and this has been utilised by both male and female employees.

All employees and their families continue to have access to the services of counsellors through the Employee Assistance Program, provided as an employee benefit through an external provider.

Staff in specific employment categories

This information is based on data obtained from 860 staff.
Note: Staff had the option of choosing not to provide information when answering questions.

	Number employed		% of total staff		Average salary	
	2003-04	**2004-05**	2003-04	**2004-05**	2003-04	**2004-05**
Female	203	**208**	23%	**24%**	$48 841	**$53 074**
Male	656	**652**	76%	**75%**	$60 083	**$63 042**

	Number employed		% of total staff		Average salary	
	2003-04	**2004-5**	2003-04	**2004-05**	2003-04	**2004-05**
People with disabilities	20	**15**	2.3%	**2%**	$55 770	**$56 034**
Aboriginal and Torres Strait Islanders	11	**8**	1.2%	**0.9%**	$52 097	**$53 213**
Non-English speaking background	19	**22**	2.2%	**2.4%**	$56 760	**$61 096**

APPENDIX 2
Freedom of Information

In compliance with Section 8 of the Freedom of Information (FOI) Act (1982), the following is the annual statement on consultative arrangements, categories of documents maintained, and facilities and procedures for access to documents relating to ANSTO. Details of the functions of the organisation, membership of the Board and decision-making powers of the Board and the Executive are provided elsewhere in the annual report.

Arrangements for external participation

Liaison groups

A technical advisory committee advises the Board on the appropriateness of ANSTO's scientific research program, ANSTO's ability to achieve the scientific goals of that program and how the results of the research can best be presented and implemented. Members are drawn from both Australia and overseas.

The Local Liaison Working Party (LLWP), established in 1967, comprises representatives from the NSW Police, Ambulance, Fire Brigades, Rural Fire Service, the NSW Department of Environment and Conservation, the NSW Department of Health, the Australian Federal Police, the Georges River District Emergency Management Officer, the State Emergency Management Committee, the State Emergency Service, Sutherland Shire Council and ANSTO, as well as an observer from the Australian Radiation Protection and Nuclear Safety Agency. The LLWP reviews procedures applicable to a potential accident at the Lucas Heights Science and Technology Centre (where ANSTO is located) that could have implications for the public.

The ANSTO Health, Safety and Environment Committee provides an overview of the safety and environmental arrangements for ANSTO activities and compliance with the ARPANSA regulations. It is chaired by an external member with extensive safety experience who works with Airservices Australia and has one other external member with wide experience in safety and environmental management who is a past Chairman of the Queensland Mines Rescue Service.

ANSTO state government arrangements

As it is located in New South Wales, ANSTO liaises with a range of NSW departments and authorities responsible for safety, environmental planning and related matters.

Associated organisations

The Australian Institute of Nuclear Science and Engineering, an association of ANSTO, the Institute of Geological and Nuclear Science (NZ) and 38 universities, arranges access by staff and students of Australasian universities to the major facilities at ANSTO.

Other arrangements

Less formal arrangements exist for discussions, the exchange of views and/or collaboration with organisations outside the Commonwealth administration. These organisations include local government authorities, universities, standards bodies, professional societies, unions and staff associations, industrial groups and international nuclear agencies.

Categories of documents held

Computer software packages, computer printouts, technical books and reports, and

APPENDIX 2
Freedom of Information

International Nuclear Information System documents are available for purchase. Single copies of the annual report, *Nuclear Matters*, strategic plans, ANSTO emergency plans, environmental monitoring reports, general information literature and videos (under loan arrangements) are available on request.

Documents relating to decision-making processes include Cabinet documents about matters in which ANSTO has an interest, ministerial correspondence and directions, ANSTO Board agenda, memoranda and decisions, deeds, legal contracts and formal agreements, minutes and submissions, employment, delegations, security, finance and accounting handbooks and manuals.

General correspondence includes ministerial briefs, speeches, conference papers for national and international meetings, parliamentary questions and answers, cables, telexes and facsimiles, and general records files. Technical documents held include scientific and technical reports and laboratory notes comprising patents and inventions; computer media; plant and equipment operating manuals; maintenance, quality assurance and safety manuals; reactor operating authorisations, records and log books; radioisotope quality control procedures manuals; radioisotope catalogues and price lists; engineering service general records; nuclear material movement vouchers and accounting records; photographs; and radiographs. Health and safety documents include staff medical records; safety-related survey records; film badge and radiological records; accident reports; and emergency response procedures.

Administration documents held include personnel records such as staff promotion files; organisation and establishment reports; compensation files; computer media with administrative instructions and information storage; staff lists and classifications; accounting records; pay-roll, flexitime and overtime records; tender and contract documents; building plans, specifications and instructions; directives; orders; memoranda; bulletins; notices; and information. Other documents held include drawing office records such as plans, microfilm, drawings, maps and photographs.

Facilities for access

By arrangement, FOI inquirers can peruse information in the Reception and Information Centre at the entrance to the Lucas Heights Science and Technology Centre. Other arrangements for access may be made by contacting the FOI Coordinator, ANSTO, Private Mail Bag 1, Menai, NSW 2234, Australia (email samantha.van.de.geest@ansto.gov.au).

ANSTO also has a free enquiry service for members of the public requiring information about the Organisation and its research, called the Community Right to Know Charter. Interested parties are encouraged to contact enquiries@ansto.gov.au for any information you would like.

Information about ANSTO is available on the internet through the organisation's homepage at www.ansto.gov.au.

The ANSTO Chief of Operations has been appointed as an authorised officer under Section 23 of the FOI Act.

APPENDIX 3
Functions and powers of the organisation under the ANSTO Act

This appendix describes the functions and powers of the organisation under the *Australian Nuclear Science and Technology Organisation Act* 1987 (the ANSTO Act), which is ANSTO's enabling legislation. In the text below, 'Organisation' means the Australian Nuclear Science and Technology Organisation.

Section 5: Functions of the organisation

(1) The functions of the organisation are:

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

(i) nuclear science and nuclear technology; and

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(e) to provide advice on aspects of:

APPENDIX 3
Functions and powers of the organisation under the ANSTO Act

(i) nuclear science and nuclear technology; and

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

(iii) other matters related to its activities; and

(ea) to make available to other persons, on a commercial basis, the knowledge, expertise, equipment, facilities, resources and property of the Organisation by:

(i) providing training and management expertise; or

(ii) selling or leasing equipment; or

(iii) leasing land, buildings and facilities; or

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

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

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

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

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

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

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

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

(1B) In subsection (1A): *national nuclear waste repository* means a site chosen by the Commonwealth, after the commencement of this subsection, for the storage of nuclear waste with a view to it never being moved to another site.

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

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

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

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

(4) The Minister shall not give a direction under subparagraph (1)(a)(iii) to the Organisation to undertake research or development in relation to a matter unless

the Minister is satisfied that research or development by the Organisation in relation to that matter would be an effective use of the staff of the Organisation, and would not duplicate unnecessarily any activity being carried on, or proposed to be carried on, by any other agency or authority of the Commonwealth.

(5) The Organisation may perform its functions to the extent only that they are not in excess of the functions that may be conferred on it by virtue of any of the legislative powers of the Parliament, and, in particular, may perform its functions:

(a) in so far as it is appropriate for those functions to be performed by the Organisation on behalf of the Government of the Commonwealth as the national Government of Australia;

(b) for purposes for which it is appropriate for the Parliament as the national Parliament of Australia to authorise the Organisation to perform functions;

(c) by way of expenditure of money that is available for the purposes of the Organisation in accordance with an appropriation made by the Parliament;

(d) in the course of, or in relation to, trade and commerce with other countries, among the States, between Territories or between a Territory and a State;

(e) for purposes related to external affairs; and

(f) for purposes in or in relation to a Territory.

Section 6: General powers of Organisation

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

(a) to enter into contracts;

(b) to acquire, hold and dispose of real or personal property;

(c) to occupy, use and control any land or building owned or held under lease by the Commonwealth and made available for the purposes of the Organisation;

(d) to erect buildings and structures and carry out works;

(e) to form, or participate in the formation of, a company or partnership;

(f) to appoint agents and attorneys, and to act as an agent for other persons;

(g) to engage persons to perform services for the Organisation;

(h) to design, produce, construct and operate equipment and facilities; and

(j) to do anything incidental to any of its powers.

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

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

APPENDIX 4
Replacement Research Reactor Environmental Impact Assessment Status Report

Tenth status report on the implementation of the conditions arising from the environmental impact assessment of the replacement research reactor at Lucas Heights. Submitted to the Minister for the Environment and Heritage by the Australian Nuclear Science and Technology Organisation

March 2005

Introduction

The then Minister for the Environment and Heritage indicated in a Media Release on 30 March 1999 that he had decided that there were no environmental reasons, including on safety, health, hazard or risk grounds, to prevent construction of the replacement research reactor (RRR) at Lucas Heights, subject to a number of conditions. On 3 May 1999, the then Minister for Industry, Science and Resources announced that he had accepted the Minister for the Environment's recommendations, and noted that their implementation will ensure that the replacement reactor at Lucas Heights is built and operated in accordance with best international practice.

This is the tenth report to the Minister for the Environment and Heritage on the status of ANSTO's implementation of the 29 conditions arising from the environmental approval for the replacement research reactor at Lucas Heights. This report is required by Condition 29. Subsequent reports will be completed on a six-monthly basis until such time that the Minister is satisfied that all conditions have been satisfied.

Work on the RRR building structure is almost complete, with the ANSTO team, INVAP and JHEDI performing well.

Since the last report of September 2004:

- The Neutron Guide Hall was finished to a stage allowing access to ANSTO scientists in December 2004;
- Minister Nelson announced the name for the RRR during a ceremony in the Neutron Guide Hall on Monday 24th January. The reactor has been named the Open Pool Australian Light-water reactor (OPAL), a name that describes the type of reactor and gives an Australian flavour; and
- Spent fuel management arrangements with the United States, France and Argentina have been confirmed.

Manufacturing and procurement are well advanced, and the focus is now on installation activities.

The application for a licence to operate was submitted to ARPANSA on 13 September. The application demonstrates construction compliance with the approved design and ANSTO's capability to operate and manage the RRR. ARPANSA recently retained the services of four IAEA peer reviewers, who examined the documentation for Conduct of Operations, Commissioning Plans and the Operational Limits and Conditions. A report on the outcome of the Peer Review is expected to be issued by ARPANSA in the near future.

Individual Conditions

The 29 approval conditions are given below, and the current status of implementation of each condition is discussed.

1. The construction and operation of the proposed reactor at the Lucas Heights Science and Technology Centre (LHSTC)

must be in accordance with the undertakings and commitments provided by the Australian Nuclear Science and Technology Organisation (ANSTO) in the Final Environmental Impact Statement (Replacement Nuclear Research Reactor, 1997/98, Volumes 1, 2 and 3), and as summarised in Chapter 18 of Volume 3. If there is conflict between the ANSTO undertakings and the recommendations below, the recommendations will take precedence.

Compliance with all undertakings and commitments given by ANSTO within the EIS was a mandatory component of the tender process. INVAP demonstrated that it would comply with those EIS undertakings and commitments through all phases of the replacement reactor project, and compliance with those EIS undertakings and commitments is now part of the contractual arrangements. Construction commitments, as documented in Chapter 18 of the EIS Volume 3, were included in the Construction Environmental Management Plan (CEMP) (see Condition 2) in the form of a checklist. This checklist provides a direct reference between the EIS commitments and the actions taken during construction to ensure compliance.

2. ANSTO must prepare a construction environmental management plan (EMP), to the satisfaction of the Minister for the Environment and Heritage, prior to construction commencing. The EMP will address all commitments and undertakings made by the proponent for environmental management during construction, and as summarised in Chapter 18 (Volume 3) of the Final Environmental Impact Statement. The following associated recommendations must also be addressed:

- *an Erosion and Sedimentation Control Plan must be prepared as part of the EMP. Measures proposed to be implemented must be referred to the NSW Environment Protection Authority (EPA) and the NSW Department of Land and Water Conservation for comment prior to their adoption in the EMP. The Plan shall conform with the principles and objectives of the following NSW EPA handbooks:*
  - *Managing Urban Stormwater: Treatment Techniques 1997;*
  - *Managing Urban Stormwater: Soils and Construction 1998; and*
  - *Managing Urban Stormwater: Source Control (draft release 1998);*
- *a Remedial Action Plan must be developed, as part of the EMP, in accordance with NSW EPA guidelines for the treatment of hydrocarbon-impacted soil. Any requirements for off-site disposal of contaminated soils must be to the satisfaction of the NSW EPA;*
- *an Air Quality Management Plan must be prepared, as part of the EMP, in consultation with the NSW EPA and the NSW Department of Land and Water Conservation. A primary objective of the Plan will be to ensure that particulate levels at the nearest residence are below 50 µg m-3 (PM10) during construction works;*
- *appropriate works must be installed to protect the identified Aboriginal shelter*

APPENDIX 4
Replacement Research Reactor Environmental Impact Assessment Status Report

site (PAD 1) from construction water run-off and sediment. Provision will be made in the EMP for liaison between the proposed ANSTO EMP Environmental Officer and the NSW National Parks and Wildlife Service concerning environmental management in the vicinity of the site, if required;

- *a Noise Management Control Plan must be prepared, as part of the EMP, with the objective of ensuring that noise impacts to the public are minimised. The Plan must be prepared to meet NSW EPA requirements;*
- *the EMP must include a comprehensive monitoring program to ensure that run-off and discharges from the construction site meet nutrient, sediment and other surface water quality criteria for protection of the environment. At least 12 months baseline data must be collected prior to construction works commencing. The program will include measures to be implemented should acceptability criteria be exceeded; and*
- *a program of groundwater monitoring must commence at least twelve months prior to construction commencing. This program will be detailed in the EMP. Prior to construction commencing, an independent report reviewing the results of the program and requirements for further monitoring during construction and operation of the reactor must be prepared (see also Recommendation 11 below). This report must be submitted to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and the Department of the Environment and Heritage for agreement.*

As noted above, the Minister for the Environment and Heritage approved the Construction Environmental Management Plan (CEMP) in April 2002. The CEMP was reviewed in November 2004, and no significant changes were required.

See response to Condition 11 for discussion of groundwater monitoring.

3. ANSTO must consult with the NSW Roads and Traffic Authority to determine if upgrading of the intersection between New Illawarra Road and the LHSTC entrance is needed, in particular extension of the southbound deceleration lane. Any works required will be completed prior to construction commencing and at ANSTO's expense.

The Department of the Environment and Heritage advised on 27 March 2002 that they regarded this condition as having been satisfied.

4. Monitoring of water quality must continue into the operational phase until sufficient data has been collected to indicate that the site, and stormwater run-off, has stabilised.

This condition flows on from Condition 2. The water quality monitoring program will continue into the operational phase until sufficient data has been collected to indicate that the site, and stormwater run-off, has stabilised.

5. A Stormwater Control Plan must be developed during the design stage to ensure that the site system is constructed to

current best practice and in accordance with NSW EPA guidelines. The plan will also consider options for containment of one-off larger volume spills, such as fire fighting foams. The plan must be prepared to the satisfaction of the Department of the Environment and Heritage.

As advised in the fourth report, the Department of the Environment and Heritage has advised that they are satisfied that the site Stormwater Control Plan fulfils the requirements of this condition. The Stormwater Control Plan was reviewed in November 2004, and no significant changes were required.

6. ANSTO must review the Lucas Heights Buffer Zone Plan of Management (1986), in consultation with relevant stakeholders, to ensure measures required for the protection of the environment during the construction and operation of the proposed replacement reactor are implemented, and to ensure that the biological and conservation values of the buffer zone are maintained. The revised plan must be prepared to the satisfaction of the Department of the Environment and Heritage.

As advised in the fourth report, the Department of the Environment and Heritage has advised that they are satisfied that the revised Buffer Zone Plan of Management fulfils the requirements of this condition.

7. Radioactive gaseous emissions discharged via stacks from buildings associated with radiopharmaceutical production (primarily Buildings 23 and 54) must not increase above existing levels regardless of any future production increases. This requirement should be recognised by ARPANSA as part of its licensing of emissions from radiopharmaceutical facilities at the LHSTC. The objective of this approach is to ensure implementation of existing and emergent technologies to further contain or reduce such emissions.

Emissions remain above the levels achieved in 2000. However, they are still well within the limits specified in the condition, and have not resulted in any measurable increase to off-site dose. The steps reported in the previous report have resulted in significant reductions in emissions as compared to last year. Further steps have recently been taken, chief among them being a reversion to hand-packing of target cans to ensure adequate heat transfer during irradiation. The new process discussed in the response to Condition 9 also has the potential for further significant reduction in emissions.

8. ANSTO, in consultation with ARPANSA, should re-examine the issue of coordination and timing of processes which give rise to gaseous emissions from stacks with a view to minimising the impacts of radioactive gaseous discharges, to the extent practicable.

Approximately four years of development and testing has generated a database of discharge patterns emanating from building 54. Data have been recorded at approximately 15 minute intervals. As indicated in previous reports, the work on timing of process steps in Building 54 has resulted in a reduction in airborne emissions. Similar equipment is being installed to monitor HIFAR and Building 23a

APPENDIX 4
Replacement Research Reactor Environmental Impact Assessment Status Report

facilities, with the intention being to monitor all critical stacks in real time. Since the previous report, the prototype equipment for HIFAR has been demonstrated to be working and is being refined and copied in the other critical stacks.

9. A review of the method of molybdenum-99 production process must be undertaken by ANSTO, in consultation with ARPANSA, to investigate means whereby the isotope can be produced and isolated with decreased releases of subsidiary radioactive waste products. This should be completed to the satisfaction of ARPANSA.

The Mo-99 production process has been thoroughly reviewed, and a new process identified that will enable ANSTO to meet increasing demand for technetium-99m whilst reducing emissions. A contract has been entered into with INVAP for supply of components and processing technology for this well-proven process that has been used successfully overseas for a number of years. The approval of the CEO of ARPANSA is required before this process can be implemented, and issues related to this approval were discussed with ARPANSA officers in November 2004. Current planning is for the implementation of this new process during 2006.

10. A high priority must be given to the review and licensing of radioactive waste discharges to sewer by ANSTO. As part of this, ANSTO should be required to undertake further assessment and analysis to ensure that all possible exposure pathways and future events at the Cronulla Sewage Treatment Plant are taken into account. Monitoring and assessment of individual discharges within the LHSTC is also desirable, to enable understanding of the various sources and their relative contributions. This assessment must be prepared to the satisfaction of ARPANSA and prior to reactor operations commencing.

As previously reported, this condition has been satisfied.

11. As part of the groundwater monitoring program (see Recommendation 2 above), ANSTO must establish bores at appropriate locations in the LHSTC and the buffer zone to ensure coverage of contaminants from the site overall and aquifer flows downstream of the proposed reactor. The locations and monitoring regimes must be agreed with ARPANSA.

As previously reported, this condition has been satisfied.

12. ANSTO must consult with ARPANSA with a view to establishing a radiological site characterisation, or 'footprint' for the reactor site and LHSTC/buffer zone in general. The objective of this characterisation is to provide a fundamental basis for ongoing radiological monitoring programs and the detection of radiological trends over time. The current radiological monitoring should be reviewed on the basis of the site characterisation. The characterisation and monitoring review must be completed prior to commissioning of the proposed reactor.

As previously reported, this condition has been satisfied.

13. The Preliminary Safety Analysis Report (PSAR), to be prepared at the detailed

design stage, must be subject to independent peer review to the satisfaction of ARPANSA.

As previously reported, this condition has been satisfied.

14. The assumptions used in deriving the Reference Accident effectively constitute design parameters for the proposed reactor and must be incorporated in the final design to the satisfaction of ARPANSA. In the event of changes, such that the Reference Accident examined may no longer be valid, agreement to any major design changes must be sought from the Minister for the Environment and Heritage prior to design finalisation.

As previously reported, this condition has been satisfied.

15. The PSAR must demonstrate that the design of reactor components (eg reactor pool, beam tube penetrations) effectively excludes the failure of these components for earthquakes of lower frequency than the design basis earthquake, to rule out a fast loss of coolant accident as a credible incident. This will need to be demonstrated to the satisfaction of ARPANSA.

As previously reported, this condition has been satisfied.

16. The consequences resulting from loss of off-site electricity for water supply and fire fighting purposes must be examined as part of the PSAR. If risks are significant, on-site power provisions for water pumps should be provided to the satisfaction of ARPANSA.

As previously reported, this condition has been satisfied.

17. The safety implications of an inter-linked store for spent fuel elements must be assessed in detail in the PSAR, to the satisfaction of ARPANSA.

As previously reported, this condition has been satisfied.

18. The final design of the reactor should include a fixed and possibly automatic fire suppression system within the containment building, to the satisfaction of ARPANSA. The PSAR should also examine the need for a drencher system for the cooling towers.

As previously reported, this condition has been satisfied.

19. The risk of a common mode failure involving both HIFAR and the replacement reactor during the commissioning period, and resourcing requirements to ensure adequate infrastructure and staffing safety, must be addressed as part of the PSAR to the satisfaction of ARPANSA. The results of the PSAR analysis should also be reflected in emergency plans.

As previously reported, this condition has been satisfied.

20. In the event of dual operation occurring for a longer period than six months, ANSTO must obtain separate approval and authorisation from ARPANSA. This authorisation should specify safety, infrastructure and occupational requirements to ensure that doses are minimised during any extended commissioning period.

ANSTO does not expect the period of dual operation to be longer than six months. If required, it will be subject to authorisation by ARPANSA.

APPENDIX 4
Replacement Research Reactor Environmental Impact Assessment Status Report

21. The Safety Analysis Report for the reactor must include provision for ongoing monitoring and audit of the frequency and severity of external events to ensure that assessed risks to the replacement reactor remain valid and acceptable, taking into account new developments in the vicinity of the reactor over time.

External events were analysed in the PSAR, and were subsequently re-visited in the Safety Analysis Report submitted to ARPANSA as part of the Application for the Facility Licence, Operating Authorisation, and will be further analysed at regular intervals during operation. The results of these analyses have been, and will be, subject to review by ARPANSA.

22. Existing emergency plans and arrangements must be updated and subject to independent review at the detailed design stage and prior to the proposed reactor becoming operational. This must be completed to the satisfaction of ARPANSA. The independent review of the plans should include opportunities for input by relevant State emergency agencies and the general public.

An independent review of the emergency plans and arrangements has been undertaken by Emergency Management Australia, in accordance with this condition. The results of that review were taken into account in finalising the emergency plan which forms part of the application for an operating licence for the replacement research reactor.

Periodic review of emergency management plans will continue throughout the life of the replacement reactor.

As previously reported, in November 2003 NSW authorities announced a change in responsibilities for emergency planning for the LHSTC, with the State Emergency Management Committee now assuming those responsibilities from Sutherland Local Emergency Management Committee. As previously reported, revised emergency plans are currently being prepared by the NSW Government but have not yet been finalised.

23. The emergency management plan must also include a specific plan aimed at facilitating community understanding of credible hazards and risks from the reactor, mitigation measures, emergency arrangements and implications for the community. The plan should consider the best combination of media to achieve the above objectives. The plan must be prepared to the satisfaction of the Minister for the Environment and Heritage, in consultation with the Minister for Industry, Science and Resources and the Minister for Health, prior to the reactor being commissioned.

The NSW Government has taken responsibility for providing public information about the revised emergency plans.

24. ANSTO must develop a specific program for ongoing community consultation and dissemination of information during the design, construction and commissioning phases of the reactor, to the satisfaction of the Minister for the Environment and Heritage.

In July 2001 the then Minister for the Environment and Heritage advised that he was satisfied with the draft community information

program, and the results of that programme have been previously reported.

However, in order to specifically ensure ongoing community consultation and dissemination of information related to the RRR and ANSTO's operations more generally, an external company was engaged to work with ANSTO officers in facilitating an ongoing series of Community Discussions. To date, three of these Discussions have been held, in June and September 2004 and March 2005, in order to provide information to the local community and to invite any questions about the reactor or any other aspects of ANSTO operations. These Discussions were widely advertised throughout surrounding areas, and parties previously identified as having an interest in ANSTO and the RRR were directly invited. The aim of using external facilitators was to ensure that all participants felt engaged and comfortable in contributing to the discussions and asking questions. Various issues of concern were noted during the Discussions, and questions asked and the answers have been or will be published on the ANSTO web site.

Presentations have also been given to six local businesses and community groups since September 2004, and we have undertaken two mail outs to about 2,000 primarily local residents of our 'News Flash', a regular publication that contains stories on ANSTO work and research often related to the replacement reactor.

25. A high priority must be given by ANSTO to finalising a 'Community Right to Know Charter' between ANSTO and the community. This charter, as a minimum, must establish principles for information exchange, the obligations of parties in providing and using information, timely mechanisms for dispute resolution, and a process for periodic review and update. The use of a recognised mediator to facilitate completion of the charter should be considered. If a charter has not been agreed within 12 months of the date of these recommendations, the outstanding issues of dispute should be referred to the Minister for the Environment and Heritage for resolution, in consultation with the Minister for Industry, Science and Resources and the Minister for Health.

As previously reported, this condition has been satisfied.

26. Reactor construction should not be authorised until arrangements for the management of spent fuel rods from the replacement reactor have been demonstrated to the satisfaction of ARPANSA and the Minister for the Environment and Heritage.

As previously reported, this condition has been satisfied.

27. The Minister for Industry, Science and Resources and the Minister for Health should give timely consideration to strategies for the long term management and eventual permanent disposal of Australia's long-term intermediate-level nuclear wastes, and associated issues.

This is not a matter for which ANSTO is responsible. However, the process announced by the Minister on 11 August 2000, and further detailed by Ministers in announcements of 8

APPENDIX 4
Replacement Research Reactor Environmental Impact Assessment Status Report

February 2001 and 14 July 2004, for finding a site for the national store for long-lived intermediate level waste generated by Commonwealth agencies, including ANSTO, ensures that the necessary facilities will be available in ample time to accommodate the small volume of wastes from the reprocessing of research reactor spent fuel from the reactor facility to be returned to Australia. We would further note that as the United States Department of Energy has extended its policy of accepting back foreign research reactor spent nuclear fuel until May 2016, the initial fuel from the RRR can now be sent to the United States, with no waste being returned to Australia.

28. ANSTO must continue, as a high priority, to review and upgrade its environmental management systems (EMS) to achieve ISO 14000 standards. The EMS should be certified by a suitably accredited independent body and be in place prior to the replacement reactor being commissioned.

As previously reported, this condition was met following a successful audit of the Environmental Management System (EMS) by NCS International in May 2004. A surveillance audit of November 2004 confirmed that the EMS continued to meet the requirements of the ISO 14001 standard, and the external auditors noted that the environmental culture has become well established within the organisation.

29. ANSTO must report to the Minister for the Environment and Heritage on measures taken, or to be taken, to implement the above recommendations, including the undertakings and commitments referred to at Recommendation 1. This is to be done by way of an initial written report to the Minister prior to construction commencing and thereafter at six monthly intervals until all recommendations have been addressed to the satisfaction of the Minister for the Environment and Heritage. These reports must be made publicly available by ANSTO, following their acceptance by the Minister.

This report constitutes the tenth report to the Minister for Environment and Heritage as provided by this condition. Previous reports have been published on the ANSTO web site following their acceptance by the Minister.

APPENDIX 5
Ecologically sustainable development and environmental performance

Ecologically sustainable development and environmental performance

This appendix constitutes ANSTO's report on its performance in relation to ecologically sustainable development and environmental matters as required under Section 516A of the Environment Protection and Biodiversity Conservation Act 1999.

ANSTO's Health, Safety and Environment Policy places the protection of human health and safety and the environment as ANSTO's highest priority. To meet this commitment, we have implemented processes and practices in accordance with an ISO 14001 compliant Environmental Management System, which is an internationally recognised framework for continuous improvement in environmental performance. Accreditation to this standard was achieved in May 2004 and has been sustained through ongoing audit by the independent certification organisation.

ANSTO is regulated under the *Australian Radiation Protection and Nuclear Safety (ARPANS) Act* 1998, which specifically refers to the protection of the environment from the harmful effects of radiation, and stringent emission targets are set at levels designed to protect both humans and the environment.

Under ANSTO's Health, Safety and Environment Policy, we commit to providing verifiable evidence that ANSTO has fulfilled the policy's objectives. This is done through a comprehensive program of monitoring and auditing. The details of the environmental sampling and measurement program, together with its results, are published in a series of annual reports entitled *Environmental and Effluent Monitoring at ANSTO Sites*. The monitoring program covers not only the Lucas Heights Science and Technology Centre, but also the 1.6 km buffer zone and other locations that could be affected by ANSTO's activities, such as the Cronulla Sewage Treatment Plant and the sea surrounding the effluent outlet at Potter Point.

An Environmental Principles and Compliance Plan that incorporates ecologically sustainable development principles is being implemented throughout all stages of the replacement research reactor project. A specific Construction Environmental Management Plan has also been implemented by the contractor during construction. To ensure it is complied with, we evaluate the contractor's quarterly reports on the results of the RRR Construction Environmental Monitoring and Testing Program.

ANSTO has recently released its first Corporate and Social Responsibility report, which focuses on the ways in which we respond to environmental, safety and social issues that affect staff, the Australian community, our customers and other stakeholders. We also report annually to the Department of Environment and Heritage about any of our activities that fall under the National Environmental Protection Measures.

Finally, ANSTO's commitment to ecologically sustainable development ensures that we manage our past and current waste in a manner that protects human health and the environment, now and in the future. It also means that we place special emphasis on minimising waste, and reducing the

APPENDIX 5
Ecologically sustainable development and environmental performance

consumption of electricity and water. The procedures adopted by ANSTO to achieve these commitments are documented in environmental management plans which form part of the ANSTO Environmental Management System.

APPENDIX 6
Commonwealth Disability Strategy

ANSTO's primary role under the Commonwealth Disability Strategy is as an employer, and as such we are committed to equity and fairness in the workplace and in our recruitment practices.

All our job advertisements state that ANSTO is an equal opportunity employer. All new employees are made aware of our practices during induction and in our orientation program. Our human resources policies, which include our approach to employees with disabilities, are incorporated into ANSTO's Business Management System and are available to employees online.

Formal complaints and grievance processes are set out in ANSTO's 2002 Enterprise Agreement. It is through this Agreement that any complaints or grievances raised by people with disabilities in relation to ANSTO's employment practices may be directed. No such complaints or grievances were made in 2003-04.

We maintain a network of internal contact officers with whom difficulties may be discussed. These contact officers have all undergone training during this financial year.

All staff have access to an independent employee assistance program, which is publicised throughout the organisation. ANSTO has secondary roles as a policy adviser and as a regulator.

As a policy adviser, we consider what effect our products and services may have on people with disabilities, and we provide explanatory information where required.

As a regulator, we ensure that internal policies and procedures comply with the relevant legislation and that staff are kept informed of requirements under organisational policy.

APPENDIX 7
National Research Priorities

The five research themes established during 2004-05 have a closer alignment with the National Research Priorities than ANSTO's previous research management structure. Broadly speaking, the Isotopes in the Environment theme relates to the Environmentally Sustainable Australia NRP; the Health theme to the Promoting and Maintaining Good Health NRP; the Materials, and X-ray and Neutron Scattering themes to the Frontier Technologies for Building and Transforming Australian Industries NRP; and the National Interest and Capability Enhancement theme to the Safeguarding Australia NRP. Individual projects within the themes have specific relationships to priority goals, and some projects contribute to more than one NRP.

Under the Strategic Directions for the coming five years, ANSTO will invest in research and development that addresses issues to which the Government clearly gives priority, especially as expressed in National Research Priorities; focus research on issues of national importance, notably counter-terrorism and climate change; align targeted research in particular to National Research Priorities that build on ANSTO's core capabilities; and further strengthen its collaborative relationships.

Progress toward National Research Priority Goals

NRP – An Environmentally Sustainable Australia

PRIORITY GOAL **- Water – a critical resource**

HIGHLIGHTS FROM 2004-05

ANSTO and the University of Technology, Sydney made a research breakthrough in applying stable water isotopes to identify the cycling of water through transpiration, evaporation and run-off. This established the relationship between loss of forests and changes in rainfall patterns. We are now applying similar techniques in a forest near Tumbarumba, NSW.

LOOKING FORWARD TO 2005-06

Key stakeholders in natural resource management in the Sydney Basin have helped ANSTO to identify the Nattai River as the subject for a case study that will be crucial for planning future water supply options for Sydney and other Australian cities and towns, and Homebush Bay as a case study in ecological risk assessment. We also intend to target difficult or otherwise intractable stream–groundwater interactions for applications of our isotope hydrology methodology. See the Research Group report for more detail.

PRIORITY GOAL **- Transforming existing industries**

HIGHLIGHTS FROM 2004-05

A new process enables amorphous silica to be produced from rice hulls faster and using less power. A client has purchased a large rotary calciner from ANSTO to further develop this process.

A new approach using photo-decomposition of organic dye could lead to the treatment of organic contaminants in water, and thus the purification of contaminated water and minerals processing.

A pilot study with a student from the Laboratoire Risques Chimiques et Procédés, France, used our Cold Crucible Melter laboratory to process fly ash and convert it to a building material which has good chemical durability and low environmental impact.

A study undertaken as a member of the CRC for Sustainable Resource Processing showed that lead at 1 per cent by weight can be immobilised in a geopolymer, thus passing the United States Environmental Protection Agency test protocol for landfills.

LOOKING FORWARD TO 2005-06

ANSTO's new Food Science project expertise in neutron and X-ray scattering will seek ways to improve food safety and enhance our understanding of how bacterial and fungal spores respond to new food processing methods. This research will be undertaken with Food Sciences Australia, the CSIRO Food Futures Flagships and the Australian Food Safety Centre of Excellence.

PRIORITY GOAL **- Reducing and capturing emissions in transport and energy generation**

HIGHLIGHTS FROM 2004-05

With funding from an Australian Research Council grant with the University of New South Wales, novel lithium battery electrodes from microporous inorganic adsorbents have been investigated and their electrode performance and capacity improved.

Research on the application of micro- and mesoporous titanate materials to the photocatalytic splitting of water has begun with the CSIRO Energy Transformed Flagship. A focus of collaboration with this Flagship will be the development of materials for the generation and storage of hydrogen.

PRIORITY GOAL **- Responding to climate change and variability**

HIGHLIGHTS FROM 2004-05

ANSTO is a partner in new infrastructure for monitoring of air movement, including six high-precision radon detectors to measure vertical mixing in the lower atmosphere and analyse aerosol pollution sources; an airborne radon detection system; and the world's highest sensitivity radon system, for evaluating sea–air gas exchanges. We also developed a new statistical modelling of aerosol pollution sources which combines radionuclide tracers and accelerator-based elemental analysis. See the Research Group report for related information.

APPENDIX 7
National Research Priorities

Our assertion that glacial climate transitions are not *a priori* global in nature was boosted by results of cosmogenic beryllium-10 exposure-dating of terrestrial glacial sequences in New Zealand. Examination of exposure ages at mountains in Antarctica also provided the first direct evidence to contradict models that predict little change has occurred since the Last Glacial Maximum, 12 000 to 14 000 years ago. This research was undertaken in collaboration with Macquarie University and the Australian National University which has ARC Discovery grant funding.

The Research Group report includes information on our research on Indian Ocean circulation.

LOOKING FORWARD TO 2005-06

By analysing carbon-14, ANSTO is profiling coral and ocean sediment from the Pacific and Indian Ocean to compare the modern behaviour of the El Niño-Southern Oscillation to that during glacial and interglacial periods. We also aim to provide the first carbon-14 paleo-atmospheric record for the Southern Hemisphere at the end of the last glacial period using Tasmanian Huon Pine trees which are 12 000 years old.

ANSTO will join the Antarctic 2005-06 expedition to obtain ice-core samples to measure atmospheric methane changes.

NRP – Promoting and Maintaining Good Health

PRIORITY GOAL - **Ageing well, ageing productively**

HIGHLIGHTS FROM 2004-05

An Australian Academy of Science international travel grant enabled ANSTO to further collaboration with leading UK institutions applying technology patented by ANSTO and the Australian National University to new copper-64 positron emission tomography radiopharmaceuticals. Potential applications have been identified for cancer, neuroblastoma and respiratory disease. At Boston's Children's Hospital, Harvard University, the technology is being used to radiolabel a novel antibody for neuroblastoma.

Research on neurodegenerative diseases and cancers, radiation dosimetry for proton and synchrotron X-ray therapy and the application of CeramiSphere's technology in health care are discussed in the Research Group report.

LOOKING FORWARD TO 2005-06

Professor Jeremy Smith from the University of Heidelberg has been awarded a Federation Fellowship to be taken up at ANSTO. Professor Smith is an international leader in computational molecular biophysics and has made major contributions to the understanding of enzyme reaction mechanisms, retinal proteins, ion pumping mechanisms, large-scale conformational change, muscle contraction and cancer detection and design of an AIDS vaccine. His research program at ANSTO will use data from neutrons and synchrotron X-rays to elucidate metabolic pathways and support drug design.

ANSTO's Radiopharmaceutical Research Institute will lead the CRC for Biomedical Imaging Development's research on metabolic markers, receptor-based radiopharmaceuticals, central and peripheral benzodiazepine markers, and apoptosis. See the Research Group report for further details. In related research ANSTO will pursue the development of fluorine-18 and iodine-123 labelled molecules for imaging a protein implicated in Alzheimer's Disease.

PRIORITY GOAL **- Preventive healthcare**

LOOKING FORWARD TO 2005-06

The new food science project discussed above aims to identify features of resistant starch that yield physiological and nutritional benefits. This work will be undertaken in partnership with the CSIRO Preventative Health Flagship and the University of Queensland Centre for Nutrition and Food Sciences.

NRP – Frontier Technologies for Building and Transforming Australian Industries

PRIORITY GOAL **- Breakthrough science**

LOOKING FORWARD TO 2005-06

ANSTO's first Federation Fellow, Jill Trewhella – a joint appointment with the Sydney University – arrived in July 2005. Dr Trewhella is an international leader in using small angle neutron scattering in structural biology. ANSTO's second Federation Fellow will be Professor Jeremy Smith, who is a leading researcher in computational molecular biophysics, as discussed above. These Federation Fellows will significantly enhance the biological applications of OPAL and the Australian Synchrotron.

PRIORITY GOAL **- Frontier technologies**

HIGHLIGHTS FROM 2004-05

The development of the neutron beam instruments for OPAL has progressed well and by the end of 2004-05 major components were arriving. Through instrument advisory panels and meetings of expert and potential users, ANSTO has worked to increase understanding of the enormous contribution that these instruments will make to Australian research, especially in frontier technologies.

ANSTO has filed provisional patents for a new process to increase and control the size of acid catalysed sol-gel particles; new technology for producing multilayered 'onion style' nanoparticles; and a novel, bio-friendly chemistry for the encapsulation and release of proteins in silica spheres. These significantly increase the scope of ANSTO's controlled release technology to applications requiring release of proteins in cosmetic, homecare and healthcare products. A novel process platform uses double emulsion (oil/water/oil).

APPENDIX 7
National Research Priorities

A dedicated proto-company called CeramiSphere has been established to demonstrate the commercial viability of our controlled release technology. Potential applications include oral care, food and healthcare, including treatment of burn scars. More information regarding CeramiSphere is in the Research Group report.

LOOKING FORWARD TO 2005-06

Seven out of eight OPAL neutron beam instruments are scheduled to be completed ahead of the commissioning of OPAL.

Biodeuteration capabilities are being strengthened, to expand neutron beam research in natural biosciences and biomedical applications, spanning structural biology and biotechnology.

Studies in the basic physics of radiation tolerance, radiation damage kinetics, damage accumulation, percolation theory and mineral–ceramic waste interactions will be of interest in ion conductivity, superconductivity, electrical conductivity, magnetic materials, solid oxide fuel cells and nuclear transmutation targets. Investigations will also begin into the fundamental science of producing adaptive nanostructured barrier layers on wasteforms, in collaboration with the French Atomic Energy Commission.

PRIORITY GOAL **- Advanced materials**

HIGHLIGHTS FROM 2004-05

ANSTO has signed a contract with Nexia Solutions for a plant to immobilise plutonium waste residues at Sellafield, UK in a customised glass-ceramic mix.

As a member of the CRC for Welded Structures, ANSTO has measured stress in low pressure steam turbines blades repaired *in situ* by laser welding. Collaborators include universities, CSIRO and power station operators. See the Research Group report for details. A new procedure has also been prepared for emergency welds in power stations.

As a member of the CRC for Polymers, ANSTO made a significant contribution to the development of rapidly acting photochromic dyes, which led to a CRC patent. ANSTO also assisted in the enhancement of a software package widely used for injection mould design and prediction of the properties of injection moulded components. Other research showed that tough clear materials for long-wear contact lenses could be formed by appropriately combining novel polymers and using a precise dose of gamma radiation. Our investigations of the structure of modified polyethylene terephthalate chains will assist the adoption of PET in a wide range of applications. Also see the Research Group report for details of small angle X-ray scattering studies of PET drink bottles.

Recent achievements in nanostructural engineering include a provisional patent application covering new bioreactor technology, with potential applications in such diverse areas as antibiotic production, sewage treatment, bioleaching and bioremediation. Another important outcome,

demonstrated in ANSTO's work on the production of self assembling organic/inorganic nanohybrids, is the ability to control the size and shape of domains in the nanostructured materials and to "solubilise" hydrophobic molecules, suggesting potential controlled release applications for topical delivery of hydrophobic drugs.

LOOKING FORWARD TO 2005-06

Further work on the application of photochromatic dyes and mould design is anticipated in the new CRC for Polymers, which has been funded as a successor to the current CRC. ANSTO will also lead research on nanostructured, multilayed, multifunctional inorganic coatings for ophthalmic lenses in the new CRC. Proof-of-concept investigations to scale-up our new bioreactor technology will be undertaken with potential stakeholders.

NRP – Safeguarding Australia

PRIORITY GOAL **- Understanding our region and the world**

HIGHLIGHTS FROM 2004-05

See the Operations Group report regarding ANSTO's involvement in Indonesia with BATAN and on the progress of our project to secure radioactive sources in the Asia-Pacific region.

PRIORITY GOAL **- Protecting Australia from terrorism and crime**

HIGHLIGHTS FROM 2004-05

ANSTO, the Defence Science and Technology Organisation, CSIRO and Geoscience Australia have formed the Publicly-funded Agencies' Collaborative Counter-Terrorism Research Program to enhance science, engineering and technology support for Australia's counter-terrorism needs.

See the Research Group report regarding our extensive collaborations in counter-terrorism research.

LOOKING FORWARD TO 2005-06

ANSTO and its collaborators will increase their expertise in nuclear and radiological forensics, including finger-printing Australian-origin nuclear materials. The Australian Federal Police and ANSTO have agreed to conduct collaborative research and cross-train staff.

APPENDIX 8
Index of compliance with reporting guidelines

Index of compliance with reporting guidelines under various Acts, Regulations and Orders applicable to ANSTO as a Commonwealth authority

ANSTO Act 1987 (As amended)

Commonwealth Authorities and Companies Orders (Financial statements for reporting periods ending on or after 30 June 2005) under the Commonwealth Authorities and Companies Act 1997 (As amended)

Commonwealth Authorities and Companies (Report of Operations) Orders 2005 under the Commonwealth Authorities and Companies Act 1997 (As amended)

Requirements under other guidelines and legislation

GLOSSARY

ABMS	ANSTO Business Management System
AHSEC	ANSTO Health, Safety and Environment Committee
AINSE	Australian Institute of Nuclear Science and Engineering
AMRFP	Access to Major Research Facilities Program
AMS	Accelerator mass spectrometry
ANAO	Australian National Audit Office
ANSTO	Australian Nuclear Science and Technology Organisation
ANTARES	Australian National Tandem Accelerator for Applied Research
ARC	Australian Research Council
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASNO	Australian Safeguards and Non-proliferation Office
ASRP	Australian Synchrotron Research Program
ATO	Australian Taxation Office
CEMP	Construction Environmental Management Plan
CFOD	Core Nuclear Facilities Operation and Development
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSR	Corporate social responsibility
DSTO	Defence Science and Technology Organisation
EIS	Environmental impact statement
EMP	Environmental Management Plan
EMS	Environmental management systems
EPA	Environment Protection Authority
FOI	Freedom of Information
HEU	Highly enriched uranium
HANARO	Korean research reactor
HIFAR	High Flux Australian Reactor
IAEA	International Atomic Energy Agency
IBA	Ion beam analyses

INVAP	Company building OPAL
iPILPS	Intercomparison of Land-Surface Parameterisation Schemes
ISI	Institute of Scientific Information
ISO	International Organisation for Standardisation
JHEDI	John Holland Evans Deakin Industries Joint Venture
KARTINI	Research reactor in Yogyakarta, Indonesia
LEU	Low enriched uranium
LHSTC	Lucas Heights Science and Technology Centre
LLWP	Local Liaison Working Party
LNHB	Laboratoire National Henri Becquerel
MNRF	Major National Research Facilities
mSv	millisieverts
NGH	Neutron Guide Hall
NISSR	National and International Safeguards and Security Research project
NORM	Naturally-ocurring radioactive materials
NRP	National Research Priority
OH&S	Occupational health and safety
PET	Polyethylene terephthalate
PSAR	Preliminary Safety Analysis Report
RCA	Regional Cooperation Agreement
RERTR	Reduced Enrichment for Research and Test Reactors
RRR	Replacement research reactor
RRRP	Replacement research reactor project
STAR	Small tandem for applied research
TAC	Technical Advisory Committee
TAIPAN	ANSTO's thermal-neutron 3-axis spectrometer
TFA	Triennium Funding Agreement
UNSW	University of New South Wales
WT&PF	Waste Treatment and Packaging Facility

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