Annual Report 2002-03

Celebrating 50 Years of Nuclear Science Benefiting Australia

ansto

Australian Nuclear Science & Technology Organisation

ANSTO scientific facilities

- THE 10MW HIFAR MULTIPURPOSE RESEARCH REACTOR
- THE ANTARES 8MV TANDEM ACCELERATOR
- THE 3 MV VAN DER GRAAFF ACCELERATOR
- 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
- A RANGE OF X-RAY DIFFRACTION FACILITIES
- NUCLEAR MAGNETIC RESONANCE SPECTROMETERS
- PLASMA IMMERSION ION IMPLANTATION FACILITIES
- SECONDARY ION MASS SPECTROMETER
- MATERIALS TESTING LABORATORY
- ORE PROCESSING AND WASTE TREATMENT FACILITIES
- A RANGE OF ENVIRONMENTAL FACILITIES THAT ALL CAN BE UTILISED UNDER SERVICE ARRANGEMENTS

Australian Nuclear Science & Technology Organisation

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Annual Report 2002-03

Chairman's Letter

18 September 2003

The Hon. Peter McGauran MP
Minister for Science
Parliament House
CANBERRA ACT 2600

Dear Minister

In accordance with Section 9 of the *Commonwealth Authorities and Companies (CAC) Act* 1997, I am pleased to present the Annual Report of the Australian Nuclear Science and Technology Organisation for the period 1 July 2002 to 30 June 2003.

This Annual Report includes a Report of 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 (R&D) organisation and the centre of Australian nuclear expertise.

With a salaried staff of approximately 830, 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, delivery of quality services and 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.

ANSTO also operates the National Medical Cyclotron (NMC), 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.

Located at the Lucas Heights Science and Technology Centre (LHSTC), 40 km south west of Sydney's central business district, ANSTO's main site occupies 70 hectares, 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 translated into action through corporate drivers of vision, mission and strategic goals.

ANSTO's vision

Our vision is to benefit all Australians and the international community through the innovative applications of nuclear science and technology and for ANSTO to be recognised as a leader in selected fields of expertise.

ANSTO's mission

Our mission is to:

- provide expert scientific and technical advice across the nuclear fuel cycle to government and support Australia's national strategic and nuclear policy objectives;
- operate large nuclear science and technology-based facilities in Australia and overseas for the benefit of industry and the Australian research and development community, including postgraduate students and staff in higher education;
- undertake research on specific topics to advance the understanding of nuclear science and the nuclear fuel cycle; and
- apply resulting technologies and other relevant, unique capabilities to focussed research and development and other scientific activities to increase the competitiveness of Australian industry and improve the quality of life for all Australians.

ANSTO's core values

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

- safety and quality in our operations;
- excellence, creativity and innovation in our work;
- commitment to cooperation and interdisciplinary responses;
- understanding and meeting stakeholder needs;
- integrity in the pursuit of excellence and service to Australia; and
- perceptive leadership and good management.

External environment

ANSTO's strategic directions are also influenced by external issues and national policies. Factors that could impact on ANSTO are:

- nuclear policy (government policy on international nuclear developments, involvement in bilateral or multilateral initiatives) and the replacement research reactor program;
- science policy (government policy which impinges on ANSTO, allocation of funding to priority science areas, government priority to areas where ANSTO's research capability can influence public policy);
- industry policy (government policy on uranium mining, the radiopharmaceutical industry, research and development incentives);
- public attitudes; and
- fiscal policy.

Strategic goals

ANSTO, to be acknowledged as an innovative organisation at the leading edge of its field, must provide excellent service to stakeholders and high quality research in its speciality areas. To fulfil its vision and mission, ANSTO's strategic goals are to:

- provide timely delivery of valued scientific advice and technical services to government and other customers and stakeholders;
- fulfil Australia's national and international nuclear obligations, advancing Australia's interests through international nuclear science and technology and its applications;
- enhance and improve core nuclear science and technology based facilities to produce research, products and services at the highest possible standard to meet the needs of universities, industry and others in the innovation cycle;
- contribute, either alone or in partnership with others, to new knowledge in selected, relevant research areas in the applications of nuclear science, in the nuclear fuel cycle and in related technologies;
- focus on core business opportunities where innovative solutions can generate economic, environmental or social benefits;

- empower and motivate staff to be at the cutting edge of their disciplines, able to adjust to new ideas and information in an evolving internal and external environment; and
- embrace continuous improvement in business management practices.

Enabling legislation

The Australian Nuclear Science and Technology Organisation is a body corporate established by the *Australian Nuclear Science and Technology Organisation Act* 1987. The functions and general powers of ANSTO are set out in Part 2, Sections 5 and 6 of the Act. See also "Functions of the Organisation under the ANSTO Act", Appendix 3 of this report.

Responsible Ministers

The responsible Minister during the reporting period was the Hon Peter McGauran MP, Minister for Science.

Statement of compliance

This report is written according to the reporting guidelines provided for statutory authorities in *Requirements for Departmental Annual Reports*, published by the Department of the Prime Minister and Cabinet in June 2002 and the *Commonwealth Authorities and Companies (Report of Operations) Orders 2003*. An index of compliance is provided in Appendix 9.

As at 30 June 2003

Minister

The Hon Peter McGauran MP (Minister for Science)

The Board

Dr Ian Blackburne (Chairman)

Professor Helen Garnett (Executive Director)

Mr Michael Eager (Deputy Chairman)

Mr Grahame Cook

Dr Klaus Schindhelm

Dr Carrie Hillyard

Dr Agatha van der Schaaf

Chief Executive and Executive Director

Professor Helen Garnett

Division Directors

Mr Robert Muir
Business Development

Dr George Collins
Materials and Engineering Science

Mr Ian Cullen
Corporate Services

Mr Jack Dillich
Nuclear Technology

Mr Barrie Hill
Engineering Services

Dr Stuart Carr
Radiopharmaceuticals

Professor Ann Henderson-Sellers
Environment

Mr David Woods (acting)
Safety and Radiation Science

Dr Ron Cameron
Government and Public Affairs

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 Grahame Cook
PSM BEC, AIMM
Deputy Secretary, Department of Education, Science and Training
Appointed 13 June 2001
Term concludes 4 April 2006

Mr Michael 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

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

Professor Helen M Garnett
BSc (Hons), PhD, FTSE, FAICD
Executive Director, ANSTO
Member of the Board by virtue of Section 9 (1) of the ANSTO Act
Appointed 11 May 1995
Reappointed 11 May 2000
Term concludes 10 May 2005

Dr Klaus Schindhelm
BE, PhD
Senior Vice President Operations, ResMed Ltd
Appointed 20 March 2003
Term concludes 19 March 2008

Dr Carrie (Carmel) J Hillyard
BSc (Hons), PhD, FTSE
Venture Capital Partner
Appointed 21 July 1999
Term concludes 21 July 2004

Mr John M Craker
BE, BSc, MAusIMM, MIMM (UK)
Appointed 2 June 1998
Term concluded 31 December 2002

ANSTO BOARD MEMBERS 2002/03

Chairman's Report

In this landmark year, it's a pleasure for me to present ANSTO's 2003 annual report.

It is **50 years** since the passing of the *Atomic Energy Act* 1953 by the Federal Parliament, an Act which led to a most significant milestone in Australian history when at 11.15 pm on 26 January 1958 at the Lucas Heights High Flux Australian Reactor (HIFAR) the process of criticality, a self-sustaining chain reaction which splits atoms, was achieved. This was the first nuclear chain reaction conducted in the southern hemisphere. It was a step that would ultimately make Australia a world leader in the application, research and development of nuclear based science and other technologies.

Fifty years on, although many people know about important medical procedures that employ radioactive materials, they remain unaware of the widespread uses and benefits of other nuclear-based services in our daily lives.

ANSTO has gone on to achieve international recognition for its **innovative applications of nuclear science and technology.**

Today ANSTO works in the development and application of new knowledge and expertise, important to sustainability, human health, national security and the economic development of Australia.

One of HIFAR's major uses has been the production of **radiopharmaceuticals and industrial isotopes** for medical diagnosis and therapy. Radiopharmaceutical sales rose 6% over the previous year. Achievements in the year included the approval by the Therapeutic Goods Administration of the CEA-scan, a diagnostic agent for staging of colorectal cancer. The rapid growth in nuclear medicine has required ANSTO to upgrade handling facilities and plan for a building extension so the manufacture of radioisotope products can continue to meet community needs.

I am pleased to report that **HIFAR** has operated safely and efficiently throughout its history and continues to do so. ANSTO complies with the conditions of its operating licence in all respects.

During the last financial year, reactor availability was 96.4 per cent of scheduled operating time. Changes in operating and maintenance routines were introduced which improved the efficiency of operation and the ability to fulfil the needs of customers.

When completed in late 2005, the **replacement research reactor – Australia's largest scientific investment** – will have enormous additional potential for unlocking knowledge associated with biotechnology, engineering, materials, nanoscience and environmental science. It will be world class in its scientific and radioisotope production capabilities, meeting Australia's scientific and medical needs for the foreseeable future.

Despite overcoming a few obstacles during the last financial year, including a legal challenge and geotechnical delays, which were resolved to ARPANSA's satisfaction, work on the replacement reactor is proceeding at an accelerated rate with increased resources.

ANSTO is well advanced in its **plans for implementing national research priorities (NRPs).** The ANSTO plan describes our strategies for enhancing collaboration with other institutions, addresses investment in NRPs, highlights activities that ANSTO has recently initiated in priority areas, and sets out our approach to reporting on implementation.

ANSTO's capabilities mean that it is well positioned to make a significant contribution to Australia's research priorities.

We have been active in working group meetings with the Defence Science and Technology Organisation and CSIRO regarding research that supports various aspects of national security. We are also engaged in international nuclear security issues through our membership of the International Atomic Energy Agency (IAEA).

During 2002-03, some 447 papers were published in scientific journals or presented to conferences.

ANSTO's scientific program is reviewed annually by an independent technical advisory committee for quality and relevance, and its reports are particularly reassuring to the Board.

The **launch of the Bragg Institute** in December 2002 was an initiative that will place Australia at the forefront of research. Designed to be an international leader in neutron beam and x-ray science, our aim is to make the Bragg Institute a centre of excellence for scientific endeavours in its field. Through the Institute, we intend to forge extensive linkages between ANSTO and other national and international organisations using joint staff, project teams and students.

Chairman's Report

At ANSTO we recognise the important **link between science and business** in building Australia's economic strength. Commercialisation of our work includes the manufacture and distribution of radioisotopes, for medical applications in diagnosing and treating life-threatening diseases and for environmental and industrial applications. These provide a significant community benefit.

ANSTO has a number of important **partnerships with Australian industry,** particularly with the national and international mining industry due to our large range of research skills that contribute to the industry's development of innovative products and processes. We specialise in handling and treating ores and wastes, particularly where radioactivity is present, and the oxidation and subsequent leaching of sulfides relating to waste rock, stockpiles and heap leach piles.

We undertook a number of commercially important projects during the year, such as irradiation services for silicon used in computers and semi conductors. Neutron transmutation doped (NTD) silicon revenue exceeded $3 million for the year, and approximately 16,000 samples from industry and research organisations were irradiated for analysis.

ANSTO also provides consulting services to clients, including collaborative strategic research and development projects. One of our strategic partners, SIRTeX, announced this year that it has been awarded approval to market SIR-Spheres (used to treat secondary liver cancer) on the European market – significant in business terms for Australia. It also means that a proven and effective cancer fighting treatment is now accessible to patients in Europe as well as in Australia and adds to the range of medical options for practitioners.

In 2002-03, ANSTO received parliamentary appropriations of $217.4 million (2001-02 $158.7 million). This included $104.2 million for the replacement reactor construction (2001-02 $59.1 million), $99.1 million for operational and capital expenses for science and technology activities (2001-02 $93.9 million), and $14.1 million for disposition of spent fuel (2001-02 $0.8 million).

In 2002-03 ANSTO also generated $38.1 million from external sales of research services, radioisotopes for medicine and industrial products and other services (2001-02 $35.3 million).

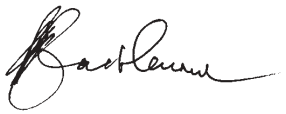
Total operating expenditure on research and related activities was $137.3 million (2001-02, $128.8 million) resulting in an operating surplus of $0.2 million (2001-02, $0.8 million).

In 2003-04 ANSTO will receive $11.1 million, spread over two years, for a major redevelopment of its security systems.

In closing, I would like to thank the Chief Executive, Professor Helen Garnett, and all ANSTO staff for maintaining the high quality of product and service for which ANSTO has become recognised.

I would particularly like to extend our best wishes to Professor Garnett, who announced her resignation from ANSTO to take up the role of Vice-Chancellor, Northern Territory University and foundation Vice-Chancellor elect of the Charles Darwin University in October this year. She has contributed enormously to ANSTO's success in making it a leading science and technology organisation.

I would also like to thank all Board members for their valuable contributions and service to ANSTO, especially Mr John Craker who retired as a Board member on 31 December 2002. We welcome to the Board Dr Klaus Schindhelm, who was appointed 20 March 2003.



Ian D Blackburne
Chairman

Executive Director's Report

Welcome to ANSTO's 51st annual report.

This year is a significant milestone for ANSTO and the Australian research and development community, as it is the 50th anniversary of the passing of the *Atomic Energy Act* 1953.

The passing of 50 years gives us the opportunity to reflect, not only on past achievements, but also to look to the future.

Since inception, ANSTO's work has evolved significantly. The one constant, however, has been ANSTO's commitment to maximising the benefits from our facilities and know-how for Australia's and the world's sustainability, health and economic development.

ANSTO remains a crucial part of Australia's science and innovation infrastructure as our facilities provide essential capabilities to a range of educational institutions, research and development bodies, and industry.

And our reputation for excellence is fundamental to ANSTO's research as it is a prerequisite for the outputs and outcomes that yield value to the organisation. Applications of our research and development activities are demonstrated throughout this report, indicating both the value and potential of the organisation.

ANSTO's potential was highlighted by the announcement by the Prime Minister last December of the National Research Priorities – into which much of ANSTO's research and development activities fall.

Backed by a long history of collaboration with educational bodies and other publicly-funded research organisations, the Government's new priorities will serve to sharpen our research focus and collaborative relationships. We have identified specific goals where we most expect to make a discernible difference to research in Australia over the coming few years.

The launch of the Bragg Institute last December was another great milestone for ANSTO. A tribute to the father and son team of William and Lawrence Bragg, the institute is at the forefront of research and development in neutron scattering and the use of x-rays. We will use the institute to forge extensive partnerships with other research organisations, international agencies and industry.

Australia's largest project in new scientific infrastructure is taking shape – the replacement research reactor. As a state-of-the-art facility, it will keep Australia virtually self-sufficient in nuclear medicines and enable the development of new therapeutic and diagnostic substances. It will also allow us to expand our commercial capability and further contribute to the economical development of Australia in areas such as biotechnology, sustainability, engineering, materials, nanoscience and environmental science as well as contributing to history and archeology.

In the future, the replacement reactor will no doubt attract researchers from educational and research institutions around the world. Construction is proceeding on schedule and budget. Commissioning is planned for 2005.

At ANSTO, our goal is to turn good science into good business for our clients, global partners and stakeholders. With this in mind, we have put in place processes to fast track some possible commercial ventures.

In March 2003 we launched the ANSTO Business Lab – a total 'cradle to grave' environment for the evaluation, management and commercialisation of ANSTO's intellectual properties and technologies.

In a knowledge-based organisation such as ANSTO, our staff are integral to delivering excellent outcomes. During the year ANSTO implemented an enhanced performance management system, in conjunction with our enterprise bargaining agreement.

Designed to foster open employer and employee communication, the system will establish clear accountabilities and provide benefits to both parties. ANSTO's aim over the past few years has been to establish itself as a knowledge management and learning organisation. The new performance management system is another major step in that direction.

One of ANSTO's greatest achievements is its support for students. We provide work experience opportunities for school students, as well as access to our facilities and expertise for undergraduate and postgraduate university students (for example, year in industry scholarships) – either directly or through the Australian Institute of Nuclear Science and Engineering (AINSE). ANSTO also hosts postgraduate students from some Cooperative Research Centres (CRCs).

On Anzac Day this year, current and former ANSTO staff, advisers and Board members featured among recipients of the prestigious Centenary Medal, awarded for contributions or achievements at the time of the centenary of federation.

Those honoured included current and former Board members, Dr Ian Blackburne, Dr Carrie Hillyard, Dr Max Richards and Mr Michael Codd AC; current and former members of our Technical Advisory Committee, Dr Roy Green and Dr John Zillman; and current and former staff

Executive Director's Report

members, Professor Ann Henderson-Sellers, Dr Brian Spies, Dr Adam Jostsons, Dr John Friend and myself.

These awards are testament to the important contribution made by ANSTO to the Australian community today, where many applications of nuclear science and technology are used in everyday life.

Backed by the commitment of our staff, our unique facilities and ever strengthening cooperation with universities, industry and other publicly-funded research agencies, ANSTO is moving more strongly into the future.

We see our research contributing significantly to the National Research Priorities, along with more effective application of our science and technology through business ventures.

This will be my last report as Chief Executive. It has been a privilege to lead ANSTO toward the future.

Given the enthusiastic workforce and the investment in facilities, I have no doubt that ANSTO will underpin socioeconomic development in Australia for many years ahead.

Professor Helen Garnett

Chief Executive and Executive Director

Highlights

1 July 2002 to 30 June 2003

July 2002

- Russian nuclear science delegation visits ANSTO to establish a basis for future commercial opportunities for radioactive waste immobilisation.
- ANSTO Green Trends established as a marketing strategy for technology-based services in the field of nuclear sciences applied to environmental problems.
- Provisional patent is granted for improved process for microwave heating as a spin-off from waste immobilisation development.
- A combined exercise is held with ANSTO first response personnel and NSW Ambulance Rescue.
- The Australian Institute of Nuclear Science and Engineering hosts third year university students for its fifth Winter School.

August 2002

- US pollution researchers choose ANSTO to analyse New York smog samples.
- Gentech® technetium-99m radiopharmaceutical generator accepted as part of the Australian Technology Showcase.
- Collaborative work with Industrial Research Limited (New Zealand) commenced on geopolymers for waste immobilisation.
- Finalist in the prestigious Sherman Eureka Prize for Environmental Research into the potential threat to resident estuarine crocodiles in Kakadu National Park.
- An ANSTO patent application regarding controlled release encapsulation materials and process technology enters the national phase.
- The National Synchrotron Radiation Research Centre (NSRRC) in Taiwan signs an agreement to give the Australian Synchrotron Research Program (ASRP) access to facilities.

September 2002

- Geological fault information provided to ARPANSA.
- ANSTO and the South African Nuclear Energy Corporation agree to establish joint research and activities.

October 2002

- ARPANSA concludes that research reactor construction can proceed.
- ANSTO strategic partner, SIRTeX gets European approval for Australian cancer "magic bullets".
- New small tandem accelerator delivered to ANSTO.

November 2002

- AusAID announces funding of $1.42 million to support a regional radiological safety program proposed by ANSTO.
- Successful full-scale demonstration by ANSTO and French colleagues of immobilisation in a glass-ceramic of wastes from the Idaho National Engineering and Environmental Laboratory, USA.

Highlights
1 July 2002 to 30 June 2003

December 2002

- First concrete poured on the replacement research reactor site.
- Launch of the Bragg Institute.
- ANSTO welcomes the Prime Minister's announcement of National Research Priorities.
- Cooperative Research Centre for Sustainable Resource Processing announced, with ANSTO as a member.

January 2003

- A new elemental analyser/isotope ratio mass spectrometer, purchased by AINSE, is delivered to ANSTO.

February 2003

- An ANSTO provisional patent application is filed regarding methods and systems for measuring rate of change in gaseous oxygen concentration and for measuring intrinsic oxidation rate in a pile of material.

March 2003

- ANSTO launches innovative ANSTO Business Lab to commercialise next generation R&D.
- ANSTO hosts the International Group of Research Reactors Ninth Conference at Darling Harbour, with over 100 attendees representing research reactors from around the world.
- ANSTO and the University of Sydney sign a Memorandum of Understanding which leads to the establishment of a joint Centre for Structural Biology and Chemistry.

April 2003

- ANSTO celebrates 50 years since Parliament passed the *Atomic Energy Act*.
- ANSTO finalises Northern Territory radioecology study to assess the impact of radioactivity in the tropical environment.
- An ANSTO patent application regarding transition metal oxide compositions enters the national phase.
- An ANSTO patent regarding peripheral benzodiazepine receptor binding agents is granted in the United States.
- An ANSTO provisional patent application is filed regarding methods and systems suitable for use in determination of intrinsic oxidation rate.

May 2003

- ANSTO staff and Board members awarded Centenary Medals for achievements in science.
- One of ANSTO's Chief Research Scientists, Dr Lou Vance, is elevated to Fellow of the American Ceramic Society.
- ANSTO submits its implementation plan for the National Research Priorities.
- An ANSTO international patent application for an oxidation process is filed under the Patent Cooperation Treaty.
- The Australian Government allocates additional funding for major redevelopment of ANSTO security.

Key Performance Indicators

Key performance indicators

Triennium Funding Agreements between the Government and the science agencies – ANSTO, CSIRO and the Australian Institute of Marine Science (AIMS) – were renewed in 2000 for the years 2000-01 to 2002-03. In the 2003-04 Budget, the Government announced that the Agreements would be extended for a further year, to 30 June 2004, particularly to take account of the Government's program to evaluate research and innovation.

The principles of the Triennium Funding Agreement offer the Government and the science agencies a more stable financial environment and a realistic timeframe in which to plan for resources and activities that extend for much longer than budget cycles. The Government has developed with the science organisations the framework and operational elements of arrangements for the three years, including performance reporting requirements containing agreed performance indicators. These indicators are used to monitor and evaluate ANSTO's performance and achievement of its objectives in relation to the Agreement. They should be read in conjunction with ANSTO's Report of Operations included in this annual report.

Comparative figures for the prior years of the triennium are shown.

1. Research and development

This set of indicators measures the performance in terms of ANSTO's objectives to maintain and encourage the highest level of research (both at the national and international levels) which will meet the future needs of industry and other users, and to ensure the effective and efficient use of resources to conduct that research. The performance indicator is the level and quality of scientific and technical publications and conference contributions (see Table 1).

List of distinguished awards and major prizes:

- Short-listed in International St Andrews Prize for the Environment
- Finalist in Telstra Business Women's Awards
- Election as Fellow of the American Ceramic Society
- Election as Fellow of Australian Institute of Company Directors

In addition, several ANSTO staff were recognised as adjunct professors at Australian universities.

Key Performance Indicators

- *Number of nominations as host agency by internationally recognised researchers*

10 nominations
(25 in 2002, 11 in 2001)

Publications level 2002-03

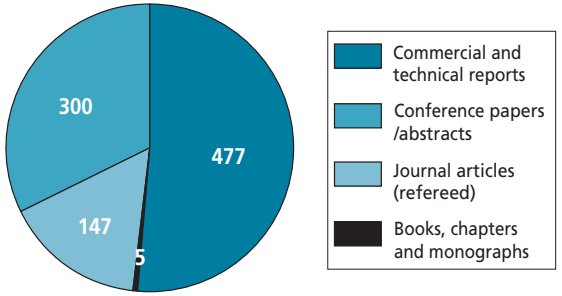


Table 1: Publication level measured by number and categorised by type of publication

	2002-03	2001-02	2000-01
Books, chapters & monographs	5	7	19
Journal articles (refereed)	147	125	135
Conference papers/ abstracts	300	268	194
Commercial & technical reports	477	553	391
Total	**929**	**953**	**739**

2. Liaison and collaboration

This set of indicators measures the performance of our objective to encourage the transfer of research through liaison and collaboration with industry, government and other uses (includes science and academic communities). The performance indicator is the level of use of ANSTO's facilities (see Table 2).

Table 2: Level of use of ANSTO's facilities

	2002-03	2001-02	2000-01
Postgraduate/undergraduate students	215	181	191
Postdoctorals	50	57	45
Collaborative research projects	305	376	276
Others	9	42	28
Total	**579**	**656**	**540**

3. Technology transfer and commercialisation

This performance indicator measures the performance in terms of ANSTO's objective to encourage and facilitate the application of knowledge and technology developed by the organisation for the benefit of industry and others for the maximum long-term benefit of Australia.

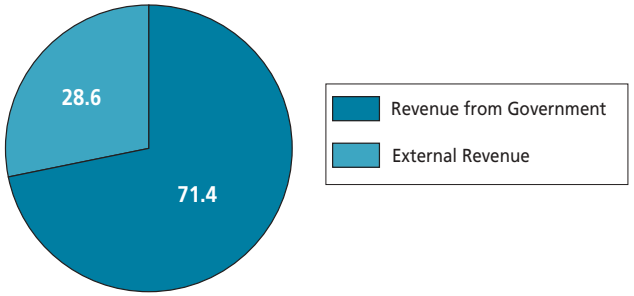
The performance indicator for this objective is the earnings and net contributions from external research and services contracts and from commercial operations (see Table 3).

Table 3: External earnings as a percentage of appropriation outcome 3 ($000's)

	2002-03	2001-02	2000-01
Appropriation revenue from Government, (net of capital usage charge, equity injections and special maintenance supplementation)	93,986	88,877	72,193
External revenue (net of asset disposal proceeds)	37,638	34,401	35,162
Total revenue (outcome 3)	131,624	123,278	107.355
External revenue as a percentage of total	**28.60**	**27.91**	**32.75**

Note: Presentation has been re-stated for previous years to ensure uniformity.

External Earnings as Percentage of Total



Key Performance Indicators

4. Advice to Government

This performance indicator measures ANSTO's performance in terms of the objective to ensure we provide highly regarded advice to Government on nuclear and related matters.

The performance indicator is the level of involvement in international policy developments (see Table 4).

The reporting system does not capture staff seconded to and paid by international activities, and where activities are driven by international nuclear organisations.

Table 4: Effort expended for and on behalf of Government on domestic and international policy-related issues

	2002-03	2001-02	2000-01
Number of projects	15	16	17
Number of person years	26.3	28.6	28.9
Amount expended ($m)	**5.29**	**5.78**	**5.84**

5. Customer satisfaction

This performance indicator measures the performance of our objective to ensure a high level of customer satisfaction. The performance indicator is the level of successfully completed research and service contracts for industry and government (see Table 5).

Table 5: Contract performance

	2002-03	2001-02	2000-01
Number of contracts completed during report period	1311	935	585
Number of contracts due for completion during reporting period	1321	944	591
Proportion of contracts completed against the number of contracts due (%)	99	99	99
Number of continuing contracts at end of period with period milestones met	95	70	47
Number of continuing contracts at end of period with milestones to be met during period	96	81	47
Proportion of continuing contracts that met milestones during period (%)	99	86	100
Proportion of all contracts that were completed or met milestones	**99**	**98**	**99**

Core Business Areas

International Strategic Relevance of Nuclear Science and Technology

Projects in this core business area provide high level technical advice on the nuclear fuel cycle to government and advice on nuclear-related issues to the international and local communities.

ANSTO is taking a leading role in promoting the implementation of appropriate nuclear-related practices, including the application of safeguards to our nuclear material and facilities.

Keeping the government informed

Activity

Providing advice and responses to ministers, Parliament, government departments and agencies about a range of nuclear issues nationally and internationally. ANSTO also contributes advice that assists government decision-making regarding science and technology, health, environment, industry, foreign affairs and trade, as well as responding directly to public inquiries that it receives about its activities, and nuclear science and technology in general.

Output

During the year ANSTO provided submissions to inquiries and reviews that addressed National Research Priorities, higher education, biotechnology, the pharmaceutical industry, clinical research, future workforce skills, science and security, business R&D and Australian adherence to international treaties. We also provided reports to ministers and the Parliamentary Public Works Committee on the replacement research reactor project.

Outcomes

The Government was able to draw on a depth of experience in matters such as nuclear waste management, research, higher education reform and national security. Discussions on topics ranging from salinity to nanotechnology contributed to stronger understanding of these issues by departments and members of parliament.

Future

At the end of the 2002-03 year, ANSTO was contributing to the Mapping of the National Innovation System, and the Review of Closer Collaboration Between Universities and Major Publicly Funded Research Agencies, as well as another 14 reviews and inquiries.

Australia's international nuclear profile

Activity

Continuing ANSTO's specialised overseas representation through Counsellor (Nuclear) posts located in Australian diplomatic missions in Vienna, London and Washington DC, to maintain Australia's nuclear profile internationally.

Output

ANSTO's Counsellors (Nuclear) develop technical contacts with the International Atomic Energy Agency and the Organisation for Economic Cooperation and Development (OECD) Nuclear Energy Agency (NEA) and provide essential links between ANSTO and those geographical regions most active in nuclear science and technology. They also provide advice to the Department of Foreign Affairs and Trade (DFAT) on the development of policy and guidelines for the peaceful application of nuclear science and technology.

Outcomes

The counsellors provided a vital component of ANSTO's services to government by reporting on nuclear developments in the international agencies and elsewhere, and representing Australia in international meetings and negotiations.

Future

The Counsellor (Nuclear) in Vienna will assume Europe-wide responsibilities when the Counsellor (Nuclear) arrangements in London end during the 2003-04 financial year.

Leading the way in nuclear safeguards

Activity

Meeting national and international nuclear safeguards requirements established by the IAEA and the Australian Safeguards and Non-Proliferation Office (ASNO).

Output

Australia has taken a leading role in the implementation of advanced safeguards arrangements. IAEA inspectors carried out verification of ANSTO's nuclear material in an unannounced inspection, including a complementary access visit, in November 2002 and a physical inventory verification visit in April 2003. Results from those inspections were satisfactory, with the opportunity to further tighten the accounting methods for and checking of nuclear material.

Outcomes

ANSTO demonstrated continued compliance by it, and Australia, with the Nuclear Non-proliferation Treaty (NPT) and Australia's bilateral safeguards agreements with the IAEA and others.

Supporting nuclear policy

Activity

Advancing Australia's international nuclear policy objectives through a strong presence in key conferences and meetings.

Output

ANSTO is Australia's principal technical interface with the IAEA. In addition, the Executive Director is a designated Alternate for Australia's Governor on the IAEA Board of Governors and participates in its key policy meetings. Australia is a designated member of the Board. The Executive Director is also a member of the Standing Advisory Group on Nuclear Applications, which reports directly to the Director General of the IAEA.

ANSTO contributes to numerous technical committees and working groups of the IAEA, OECD/NEA and other international fora. We also provide technical and logistic support to the IAEA Technical Cooperation Program.

During the last year, ANSTO hosted IAEA meetings and training events, while staff participated in almost 30 IAEA and OECD/NEA missions. We assessed almost 60 applications from IAEA fellows and scientific visitors for training in Australia and placed some 20 individuals with appropriate organisations. We provided advice to DFAT on technical nuclear issues and international nuclear developments.

ANSTO played a key role in the leadership of the International Conference on the Safe Transport of Radioactive Material and chaired an international meeting to finalise a Code of Conduct on the Safety and Security of Radioactive Sources. Senior personnel have contributed to IAEA programs on the potential for misuse of radioactive material, potential radiation effects and protective measures. An ANSTO staff member is working with the IAEA Iraq Action Team.

Outcomes

ANSTO continues to be asked by the IAEA, NEA and others to provide advice and technical expertise on nuclear issues and participate in technical committees and meetings.

Participation in international meetings enables us to maintain and develop a firm understanding of current and future nuclear related issues, and assist in representing and promoting Australia's interests internationally.

Future

To ensure a strong Australian presence regionally and internationally in the nuclear area, ANSTO will continue to be involved during the coming year in international activities, such as hosting IAEA events, placement of IAEA fellows in Australia, participation in IAEA and NEA technical and advisory committees, which are leading specific safety-related activities, and providing technical expertise for the IAEA Technical Cooperation Program.

In particular, ANSTO will continue to provide specialist input to further strengthen Australia's role in brokering solutions for the safe transportation and shipment of nuclear materials for the benefit of Australian industry and global security.

ANSTO expertise for RCA projects

Activity

Representing Australia on Regional Cooperative Agreement (RCA) matters and providing significant "in kind" contributions to its activities.

Output

Australia is a leading member of the RCA for research, development and training related to nuclear science and technology in the Asia Pacific region. In November, AusAID announced funding of $1.42 million over three years to support an RCA project proposal prepared by ANSTO to improve regional radiological safety capabilities. Managed by ANSTO, a significant number of the project activities will utilise ANSTO's knowledge, experience and expertise.

Outcome

Participation in the RCA is a demonstration of the fulfilment of Australian obligations and commitments under Article IV of the Nuclear Non-proliferation Treaty. It also provides a platform to demonstrate ANSTO's nuclear science and technology capabilities at the regional level.

Future

In fulfilling Australia's commitments under the RCA, ANSTO will continue to be involved during the coming year in a wide range of RCA activities, especially those associated with the extra-budgetary support recently approved by AusAID.

Nuclear powered warship visits

Activity

Monitoring nuclear powered warships (NPWs) within Australia.

Outputs

ANSTO provides operational health physics support and technical advice to the Commonwealth and Australian states for visits by nuclear powered warships to Australian ports. During the last year, there were eight such visits. We also assisted the Department of Defence in updating port plans and answering questions from the public regarding technical aspects of NPW visits.

Outcomes

This service, which uses ANSTO's specialist expertise in nuclear operations and safety, is of strategic value to Australia.

Supporting IAEA safeguards research

Activity

Analysing iodine-129 and uranium-236 by accelerator mass spectrometry (AMS) to identify these key nuclear signatures in environmental samples for the IAEA Safeguards Network of Analytical Laboratories. Undertaking research on the capabilities of radiation detectors. Analysing and providing information to the IAEA.

Output

Our success with the detection of signs of nuclear activity was reported at several international conferences. Demand for our specialised analytical service has exceeded forecast by 60 per cent due to extra requirements from the IAEA this year, as a result of the global security situation. The results of our evaluations have been reported to the IAEA, and will contribute to further international research and development in this area.

As part of an IAEA Coordinated Research Project (CRP), ANSTO has undertaken studies of the capabilities of radiation detectors to find smuggled nuclear material.

Outcomes

The IAEA has adopted ANSTO-developed techniques that are leading to greater confidence in the ability of the nuclear safeguards system to detect undeclared nuclear facilities. The capabilities of commercially available detectors to detect illicit trafficking have been more precisely evaluated.

Future

In cooperation with the IAEA, development of plutonium isotopic analysis by AMS will enhance nuclear safeguards by enabling the detection of this key nuclear signature at even lower levels than are presently possible. The technique can also be applied to nuclear forensics.

International bilateral agreements

Activity

Maintaining bilateral nuclear cooperation agreements with institutes in a number of countries around the world.

Output

The bilateral agreements in the Asia Pacific region are of particular importance, specifically the ANSTO/KAERI (Republic of Korea) agreement and the ANSTO/BATAN (Indonesia) agreement.

During the last year, ANSTO continued implementing ANSTO/KAERI cooperation projects and explored possible expanded cooperation in neutron science and research reactor materials evaluation. We provided expert assistance to BATAN to advise on its future human resource and equipment requirements to improve the reliability of 'in service' inspections conducted on research reactor tank vessels.

Outcomes

Bilateral nuclear cooperation supports and reinforces Australia's bilateral treaty and agreement obligations in science and technology as well as other cooperation and Nuclear Non-proliferation Treaty priorities. ANSTO has 155 memoranda of understanding with other organisations through which its collaborative activities with national and international researchers are progressed.

Future

ANSTO will proceed with the implementation of the agreed ANSTO/KAERI cooperation activities and the application of IAEA and AusAID funding to improve BATAN's 'in service' inspection capabilities for research reactor tank vessels, and to provide BATAN with a quality remaining life assessment and material properties capability.

Nuclear cooperation in Asia

Activity

Representing Australia in both policy and technical Forum for Nuclear Cooperation in Asia (FNCA) meetings, ANSTO leads FNCA activities in the area of nuclear safety culture and participates in activities on small angle neutron scattering and radioactive waste management. The FNCA, which involves nine Asian countries, all NPT signatories, operates outside the IAEA and RCA frameworks. It undertakes a range of nuclear cooperation activities covering aspects of the utilisation of radioisotopes and radiation in agriculture, medicine and industry as well as radioactive waste management, nuclear safety culture and the utilisation of research reactors.

Output

ANSTO organised and supported the sixth Nuclear Safety Culture workshop held in Vietnam in January, at which most participating countries submitted a self-assessment report covering a research reactor. ANSTO also participated in the Radioactive Waste Management workshop held in Korea in November, and hosted a visit by a FNCA naturally occurring radioactive material (NORM) task group in February.

Outcome

Participation in the FNCA reinforces Australia's position as a leader in nuclear science and technology in the Asia Pacific region. It also supports Australia's obligations and commitments under Article IV of the Nuclear Non-proliferation Treaty and provides a window into nuclear developments in the region. FNCA activities also provide an appropriate venue to promote ANSTO's nuclear science and technology capabilities at the regional level and enable strong regional linkages.

Future

ANSTO will continue to lead the nuclear safety culture initiatives in the FNCA during the coming year and will specifically promote and support the nuclear safety culture workshop, to be held in Thailand. ANSTO will also participate in a number of planned workshops in key activities, such as radioactive waste management and small angle neutron scattering scheduled for the coming year.

High quality information for the community and industry

The publication and distribution of high quality information on ANSTO to the community and potential collaborative partners.

Output

During the past year ANSTO participated in the Sydney Royal Easter Show, Science Festival Wollongong, Science Week, Sutherland Home Show and the Gray's Point Festival. A series of media lunches around Australia, hosted by Professor Ben Selinger of the Australian National University, focused on nuclear and radiation issues and applications. We also continued to encourage visits to the ANSTO site. ANSTO issues media releases (45 during the last year) and liaises with journalists about its activities, especially the outcomes of its research and development, and the benefits of its radiopharmaceuticals.

Major publications included a new corporate brochure, *Our Lives Would be Unimaginable Without the Applications of Nuclear Science*, and a Royal Easter Show 2003 brochure, *Celebrating 50 years of Applying Nuclear Science to Daily Life*. In line with the general trend towards electronic publishing, ANSTO aimed to provide all major publications in CD and web formats. External usage of ANSTO's website averages about 1000 visits per day.

Outcome

More members of the community gained first-hand understanding of ANSTO, and nuclear science and technology in general, through visits and the presence at community events. Visitor numbers rose by 40 per cent this past year.

Media coverage presents a myriad of ways in which ANSTO benefits Australian society. Quality publications and our website provide ready access by the public to information about ANSTO's activities and capabilities.

Announced in November 2002, a competition to name the replacement research reactor stimulated interest among school students and teachers around Australia.

ANSTO's Easter Show stand won a gold award for a commercial exhibit of 18-50 square metres in size.

Future

The website will be developed further to enhance navigability and ease of access.

The result of the replacement research reactor naming competition will be announced early in the new financial year. Celebrations of the 50th anniversary of the passing of the Atomic Energy Act will include activities to engage the community.

Site security

Activity

Providing physical protection of the Lucas Heights Science and Technology Centre.

Output

ANSTO provided protective security arrangements covering classified material and information. Security vetting of staff and contractors were satisfactorily managed. In consideration of the national and international security environment, ANSTO provided security awareness training for all staff and long-term contractors.

Outcome

ANSTO has satisfactorily maintained the physical protection of all facilities and materials in accordance with international obligations and guidelines recommended by the IAEA and national requirements set by ASNO.

Core Nuclear Facilities Operation and Development

The Core Nuclear Facilities Operation and Development (CFOD) core business area's role is to operate core facilities in Australia and overseas for the benefit of the Australian research community and industry. Critical to CFOD's success is safety, efficiency and access for scientists to our nuclear infrastructure.

High quality industrial irradiation

Activity

Supplying neutron irradiation services for industrial materials purposes.

Outputs

HIFAR's irradiation service is provided for the production of high quality neutron transmutation doped silicon for electronics metals manufacturers around the world. Ore and material samples for environmental and archaeological studies are irradiated for subsequent neutron activation analysis investigations. Materials are also irradiated for use as tracers in environmental studies and for engineering investigations into wear rates and performance of machine components.

Outcomes

Recognised as a reliable supplier to the NTD silicon markets, HIFAR has acquired new customers over the last financial year. Throughout the year neutron activation analysis business remained steady with additional interest by universities for research projects.

Future

During the next financial year HIFAR will continue to produce high quality NTD silicon for the electronics industry, along with irradiation services for researchers and other clients. Continuing participation in development of irradiation techniques for production of high resistivity material will provide a potential base for new business opportunities.

Shipping ANSTO's fuel safely

Activity

Arranging for the safe storage and transport of spent fuel to reduce the on-site inventory of irradiated fuel.

Output

In accordance with stringent regulatory requirements, ANSTO ensures that the management of new and used nuclear fuel is provided in a safe manner. Using experience obtained over the years, ANSTO implements a comprehensive plan to remove spent HIFAR fuel from the site. We have implemented a detailed plan to enable the sixth spent fuel shipment to proceed. ANSTO's exacting management of the Fuel Facility Licence ensures safe storage and shipment of used fuel.

Outcomes

ANSTO demonstrates commitment to safely managing spent fuel and providing a disposition strategy. Our interest in the management and disposition of research reactor spent fuel is represented in international and national deliberations .

Future

ANSTO will continue to provide the facilities to safely handle, store, inspect and use nuclear fuel into the future.

A reliable source of ion beams

Activity

Managing the operation of the Australian National Tandem Accelerator for Applied Research (ANTARES) and the smaller Van de Graaff particle accelerator facilities.

Outputs

The safe and reliable operation of our accelerator facilities is ensured through a well developed program of preventative maintenance and upgrades. Enhancement of the particle beams that we produce and the control systems are designed to meet the demands of the research projects. We maintain and operate accelerator facilities to world class standards to meet the expectations of the science community.

Outcomes

ANTARES and the smaller Van de Graaff accelerator provide a reliable source of ion beams to support two key research areas – ion beam analysis (IBA) and accelerator mass spectometry – benefiting the Australian research and development community and industry.

Future

To replace the 38-year-old Van de Graaff accelerator, a small tandem accelerator (STAR) is currently being installed and should be operational in 2003. Once commissioned, the STAR facility will provide a new source of ion beams for IBA and AMS.

New state-of-the-art accelerator

Activity

Replacing the small tandem accelerator.

Outputs

ANSTO is commissioning and installing a new particle accelerator that fully meets the current and projected needs of accelerator sciences.

Outcomes

When installed, we will have a state-of-the-art accelerator that will provide enhanced analytical information in accelerator mass spectrometry and ion beam analysis. This facility will be more cost effective and increase the capability to satisfy the needs of accelerator scientists by AINSE and ANSTO strategic projects and commercial contracts.

Future

Becoming operational in 2003, this new facility will be utilised to significantly improve the outputs in scientific programs related to the environment, archaeology, heritage, biology and materials science.

Accelerator mass spectrometry

Activity

Providing access for Australian and overseas researchers to the AMS facility on ANTARES.

Output

Designed for ultra-sensitive multi-isotope analysis with high precision and high throughput, the facility routinely delivers high quality AMS sample processing and target preparation, measurement and interpretation capabilities. ANSTO ensures continuous improvement by developing the capabilities.

Low energy end of the ANTARES accelerator. The object at bottom right with the white cover is the 'injection magnet' which provides the first stage of mass analysis. On the right at bottom is one of three negative ion sources – a high-intensity, multi-sample cesium sputter ion source.

The user community includes researchers at Australian universities, along with other Australian and overseas research organisations and ANSTO scientists. AMS analyses have supported research on global climate change, palaeoenvironment, landscape evolution, Pacific Island and South East Asian archaeology and forensic science.

Outcomes

Radioisotopic analysis of carbon, beryllium and aluminium supports scientific research projects in environmental and earth sciences, archaeology, heritage and forensic studies. Over 1000 samples were measured in the last year, most of which were radiocarbon analyses. Analyses for radioisotopes of beryllium and aluminium have been maintained at around 400 per year. The AMS facility has been improved by commissioning an elemental analyser isotope ratio mass spectrometer (funded through AINSE), which extends our capability to include stable isotope analysis of carbon and nitrogen and will provide a means of automating some aspects of radiocarbon sample processing.

Future

With the commissioning of the new accelerator and routine operation of the elemental analyser isotope ratio mass spectrometer, the AMS facility will improve and increase the capacity for radiocarbon analyses, thus sustaining ANSTO's position as a leading player in AMS analysis.

DAY-TO-DAY OPERATIONS OF HIFAR

Reactor operation

In accordance with the conditions of the ARPANSA operating licence, HIFAR was operated safely throughout the last year and at a nominal power of 10 megawatts for 7832 hours – being 96.4% of its scheduled available operating time.

Nuetron Beams

Usage of neutron scattering facilities increased by 25% this year. The neutron beam instruments were used for ANSTO research projects (445 days), university research supported by AINSE and the ARC (642 days), and national and international collaborative research (153 days).

Reactor maintenance and modifications

Accredited to the ISO9000 requirements for quality systems and all operations and maintenance, HIFAR's activities are undertaken in accordance with procedures. There were 11 scheduled shutdowns for routine maintenance and refuelling totalling 1080 hours (45 days). Modifications included replacement of radiation monitors in the reactor protection system and the installation of a new storage block for neutron transmutation doping silicon production.

Radioisotope production

Demand for the molybdenum continues to grow. The number of targets irradiated increased by 15% during the year and 3 extra irradiation facilities were introduced by early 2003 to cater for the demand. During the year approximately 2180 targets were irradiated to produce medical and industrial isotopes.

Irradiation services

World market demand for NTD silicon has remained strong. HIFAR has continued to attract an increasing share of this business due to the high quality of our product, responsiveness to customer needs and ability to contribute in development of the NTD process for new products and more precise specification.

During the year export revenue in excess of $3 million was produced from irradiation of silicon. Some 16,170 environmental, archaeological and mineral samples were also irradiated for neutron activation analysis.

Brad Difford (left) and John Staraj preparing reactor top plate for a fuel element change.

ON A CLEAR DAY I CAN SEE FOREVER

Emissions of dust particles into the air are of great interest to everyone for health, environmental and aesthetic reasons.

Dust (or particulate matter) occurs in the atmosphere from two sources – either from the surface, such as wind-blown soil, agricultural and open-cut mining activities, or from combustion products, such as from cars or the burning of fossil fuels.

In response to increasing community concerns about the possible impacts of airborne particles, regulatory authorities are increasingly expecting the generators of these emissions to ensure the fallout from their activities have minimal consequences.

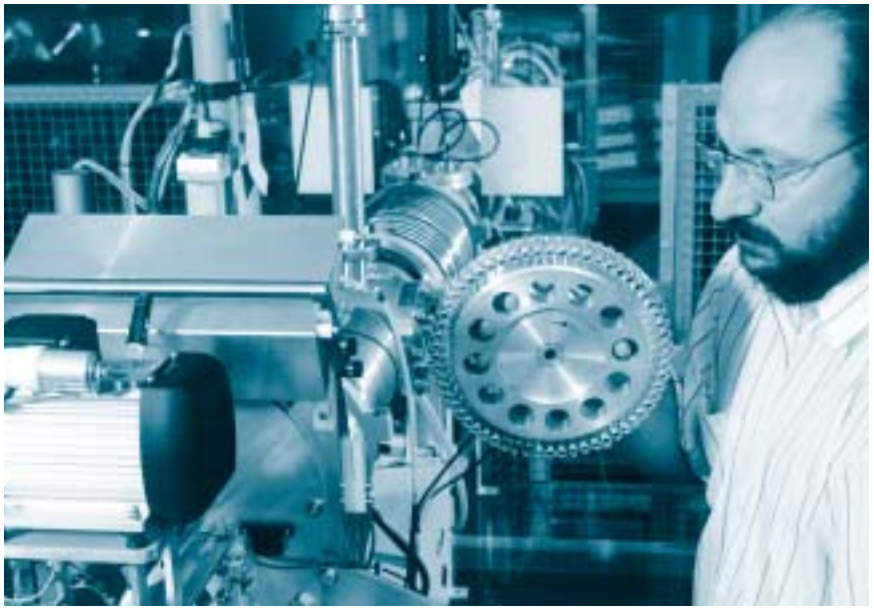
ANSTO is using ion beam analysis techniques to identify the nature and origin of the particulate emissions in the air at selected sites. The high analytical sensitivities afforded by ion beam analysis enables the effects of seasonal climatic changes to be observed and transient events to be tracked, long after they have taken place.

The fast, highly sensitive and non-destructive technique of ion beam analysis rapidly identifies a suite of 21 selected elements in particulates collected on aerosol filters located at strategically positioned sampling stations. Statistical techniques are then used to identify and classify the signatures that identify their origin.

ANSTO has been using these techniques in the Muswellbrook area in a project for the Australian Coal Association Research Program. From the data collected, five main sources of particulate matter in the air have been identified in the area: soil (40%), petrol-fuelled engines (15%), sea spray (11%), diesel-fuelled engines (7%) and sulfur from industrial processes (5%).

The identification of different sources leads to a better understanding of the transport of the particulate matter by wind. The information gained from this research is being used by stakeholders to develop and implement strategies for effective environmental management.

Open cut coal mine in the Hunter Valley where ANSTO has been carrying out research on airborne dust transported from this mine across the township of Muswellbrook and adjacent farms.



Dr Ugo Zoppi holding a carousel in which cathodes, containing processed samples, are located. The carousel can hold up to 58 cathodes, which are loaded with 'unknown' samples (i.e. those which we are trying to measure) plus a number of 'blanks' (samples depleted in the radionuclide of interest) or 'standards' (samples containing a known ratio of radionuclide of interest to stable nuclide). The carousel is placed under vacuum (in the aluminium box to the right of the carousel) and samples are remotely loaded into the active region of the ion source under computer control. *Refer to page 32.*

Identifying pollution with ion beams

Activity

Analysing ion beams to identify pollution.

Output

ANSTO provides on-demand ion beam analyses and expert advice for internal projects and externally driven activities involving universities, CSIRO, local and state government organisations, industry and international organisations, including the International Atomic Energy Agency.

Outcomes

ANSTO maintained its standing as a provider of choice for ion beam analysis by universities, local and state government organisations and industry.

Future

New funding and grants have been obtained to characterise fine particle pollution in capital cities around Australia. This will provide new and valuable information for state and federal Environment Protection Authorities.

REPLACEMENT RESEARCH REACTOR ON ITS WAY

Construction of the research reactor to replace HIFAR, which has been operating since 1958, is now well under way.

When completed in 2005, the replacement reactor will be a low power pool reactor using low enriched uranium fuel, which is cooled by water. The reactor will be a multi-purpose facility for radioisotope production, irradiation services and neutron beam research. Its compact core has been designed to achieve high performance in the production of neutrons.

The reactor building will contain all the nuclear systems as well as the reactor and service pools. It will protect the reactor from external elements, and provide the structural basis for the reactor containment. Constructed from reinforced concrete, it will be seismically robust with a metallic grillage for added protection.

The replacement research reactor under construction.

A modern, more efficient reactor will allow us to expand our 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.

HIFAR's performance limitations, compared with more modern reactors, indicate that it is approaching the end of its useful life. It will be taken out of service, following a successful parallel operation period with the replacement reactor.

Contracted project expenditure remained within budget. Details of expenditure to date are explained in the financial statements that accompany this report.

Progress – Previous years

Phase 1 – environmental assessment, public works review, pre-tender and tender processes.

Phase 2 – selection of the contractor – INVAP S.E., an Argentine company, working with an Australian joint venture subcontractor comprising John Holland Construction and Engineering Pty Ltd and Evans Deakin Industries Limited – was completed by July 2000.

Phase 3 – detailed engineering, construction, commissioning and demonstration of performance is well under way. Delays of two months in February and March 2002, were incurred in issuing the construction licence. ▶

Progress – Current year

Site construction work was suspended due to the discovery of the geological fault in the excavated site in June 2002. Geological investigations were carried out from late June to late October. The project schedule is being expedited as quickly as possible to overcome this and the earlier delay.

While site construction was suspended, detailed design and engineering proceeded. In other countries, the granting of a construction licence would lead directly to manufacturing and procurement of equipment and systems for the facility. However, Regulation 54 of the ARPANS Act requires that separate approval must be obtained from ARPANSA before construction can commence on each and every item of importance to safety. Development of effective systems for making applications to ARPANSA and the ongoing preparation of documentation to obtain the necessary approvals required substantial commitment from INVAP and ANSTO.

Following completion of the geological investigation, go-ahead was received from ARPANSA in late October and building work was resumed. A project award productivity agreement was employed by the contractor to achieve an accelerated rate of building work.

To enable building equipping works in the lower levels prior to completion of the upper levels of the building shell, project re-scheduling was implemented by the contractor in May 2003 in an attempt to accelerate the project schedule.

Work also commenced in early 2003 on preparation of the application to ARPANSA for an operating licence for the new facility.

Seven out of eight neutron beam instruments for the replacement reactor have now been approved, along with the necessary computing infrastructure to operate them in the facility. The conceptual designs are complete, engineering design is proceeding and some major procurements have been placed.

The schedules for the neutron beam instruments project and reactor construction have been aligned. Both schedules will be monitored to ensure alignment of the completion of the two projects.

Future planning

Hot commissioning tests are planned from around mid-2005. Prior to this, ANSTO will request approval from ARPANSA to load fuel.

ANSTO's application for an operating licence will require significant supporting documentation. Preparation of this documentation and subsequent submission of the final application is currently scheduled for September 2004 to allow at least eight months for ARPANSA processing and approval, which will include significant interaction with and input from the public.

Operations and maintenance procedures and associated manuals will need to be finalised by late 2004. Training is also planned for completion by this time.

Exacting environmental management

Activity

Enhancing ANSTO's Environmental Management System towards ISO14001 certification and implementing a current world's best practice environmental monitoring program for ANSTO.

Output

ANSTO is preparing essential components of the ISO14001 environmental management system, such as an environmental aspects database and a legal requirements register. Environmental emissions from ANSTO sites are continuously monitored and results reported to facility operators and the regulator as required. Environmental monitoring systems, such as that used to monitor airborne emissions, are being upgraded and a radiological characterisation of the Lucas Heights Science and Technology Centre and buffer zone using an airborne helicopter radiological survey has been completed.

Heathcote Creek

Outcomes

Effective environmental management shows ANSTO's commitment to protecting the environment and that the organisation complies with Australian Radiation Protection and Nuclear Safety Agency regulations and other requirements.

Future

We are aiming to achieve ANSTO certification to the international ISO14001 standard for environmental management systems in 2003-04.

Keeping assets in good order

Activity

Ensuring capital upgrades to keep building infrastructure operating efficiently.

Output

Many ANSTO infrastructure services and buildings are now around 50 years old. Effective asset management and replacement continues to ensure appropriate functionality.

Outcomes

Key outcomes have included:

- an upgrade of the main electrical substation;
- an upgrade of low voltage distribution supplying switchboards to many buildings;

Michael Jance and Mirela Ribicic applying the basics of welding principles in the Building 3 Development Workshops. This was part of an introductory welding course to develop a greater understanding and appreciation of the technical and practical aspects of the welding process by engineers.

- capital maintenance work for ANSTO Radiopharmaceuticals and Industrials (ARI) production facilities; and
- reconstruction of site roads and parking areas.

Future

Asset maintenance studies indicate that an increasing program of refurbishment will be required over the next 10 years, particularly for building, roofing and ventilation services.

Maintaining Integrity of nuclear plant

Activity

Studying the effects of radiation and the operating conditions within research reactors on the mechanical behaviour of reactor core materials, along with the effects that any changes may have on the structural integrity of the reactor.

Output

The studies undertaken provide information on the ability of the materials used in ANSTO's nuclear plant to withstand changes caused by reactor operation. This will allow ANSTO personnel to ensure that any changes are recognised and taken into account in future operational decisions. It will also contribute to the worldwide body of knowledge of radiation effects on engineering materials.

Outcomes

The key value of the work is to support the continued safe operation of ANSTO's existing and future nuclear plant. For HIFAR, information is gained to ensure that the state of structures and components do not change significantly during the remaining years of operation. For the replacement research reactor, the aim is to ensure that the materials used in construction enable the facility to operate safely and efficiently for its design life. Understanding of the behaviour of Zircaloy-4, an alloy used extensively in the reactor core regions, is particularly important.

Future

Future work is directed towards preparing for testing of active materials as part of the surveillance program for the replacement research reactor. This will have to be performed remotely in hot cells due to the high activity of the samples that will be taken from the reactor.

Ensuring safety of operations

Activity

Providing safety assessments of facilities and assistance and advice on safety issues.

Outputs

This service provides high quality safety assessments of ANSTO's core facilities, along with sound technical advice on hazards, risks, safety reviews and licensing issues.

Outcomes

ANSTO has improved safety and operations of controlled facilities in accordance with our duty of care to the public and staff, along with compliance with licensing requirements of ANSTO facilities, apparatus and materials. The level of risk has also been reduced.

Neutron scattering science

Activity

Undertaking research in materials science, physics, chemistry, biology, the earth sciences and engineering using neutron scattering techniques.

Output

Studies have included the development of superconducting and magnetic materials, soft condensed matter and colloids, ferroelectric materials and structural characterisations of ceramic and small molecular systems.

Outcomes

ANSTO has enhanced the reputation of its neutron scattering effort and established new collaborative research relationships with the aim of expanding our user group for the replacement research reactor. This project enables ANSTO to maintain staff for the replacement reactor's Neutron Beam Instrument Project.

Over the last financial year, outcomes of neutron scattering studies have resulted in:	
Refereed journal publications	41
Invited scientific talks	3
Presentations at domestic and international conferences	31
Scientific web highlights	3
New scientific collaborations developed	16
Awards or prizes	3
Postgraduate students supervised	12

Future

ANSTO aims to maintain excellent scientific output for the next 12 months (more than 50 refereed journal publications in the neutron scattering field) and expects to attract high-profile overseas personnel to Australia as visitors and users. Australia's scientific reputation will also be enhanced, lending credibility to its investment in the replacement reactor, and raising the general scientific standard in Australian research institutions. We intend to use this project to seed future focussed research projects and commercial activities.

UNDERSTANDING REACTOR MATERIAL INTEGRITY

Safe and efficient operation of HIFAR and the replacement research reactor is of utmost importance to ANSTO.

The Nuclear Component Integrity project develops knowledge and expertise on the effect of the plant operations on the materials used in the reactor core region. Such conditions include neutron and gamma radiation, heat and coolant flow.

The project involves a study of the mechanical properties of Zircaloy-4, used in the core of the replacement reactor reflector vessel and in the control rod structures. Of particular importance is the fracture toughness, which determines a material's capability of resisting the growth of pre-existing defects or initiation of new defects under extreme off-normal operating conditions.

Ross Finlay holding a prototype fuel assembly for the replacement research reactor.

Small sample techniques have been used to monitor changes in fracture properties, which are necessary due to space limitations in the replacement reactor core region where the surveillance samples will be located. We have evaluated a number of different tests with the conventional three-point-bend and the short-rod tests proved to be capable of measuring change in fracture properties. We are investigating additional methods, including the small punch test.

Early in its operational life, the replacement reactor will be one of the first research reactors to operate with the newly developed uranium molybdenum fuel. Developed under the Reduced Enrichment for Research and Test Reactors (RERTR) program, it will provide a high density, low enrichment uranium fuel suitable for wide application in research reactors and capable of being conditioned or processed after use.

ANSTO staff have played a leading role in the RERTR project, which has been carried out at Argonne National Laboratories in the United States. During the past year ANSTO has participated in the post-irradiation examination of trial fuel plates that have been irradiated in test reactors in Europe and the United States.

MATERIALS RESEARCH OF THE FUTURE

By scattering neutron beams, ANSTO scientists and engineers are building a future in materials research with a modern high performance facility that probes atomic and molecular structures.

New materials that display exotic and exciting properties – potentially of great benefit to humanity – are discovered in chemistry, physics, materials science and engineering laboratories every day. To exploit this potential, scientists must have a complete understanding of crystalline structure and interactions on an atomic scale.

There is no better way for probing this structure than neutron beam scattering. However, the method requires that neutrons be generated in a nuclear fission reaction and then cooled sufficiently so that their interaction with atoms and molecules can provide information about the way materials are arranged and how neighbouring atoms influence each other.

ANSTO's replacement reactor will provide a more powerful and versatile source for neutron beam research than the ageing HIFAR reactor. The design and construction of the neutron beam instruments is being undertaken in close consultation with the Australian research community. We expect the facility to rank amongst the best in the world.

When completed in 2006, the beam facilities will house a suite of eight world-leading neutron beam instruments that will enable Australian scientists and engineers to compete at the forefront of research into new materials.

Underpinning our research into advances in science and technology, the facility will attract leading international researchers to our shores to collaborate with Australian scientists. It will also have potential for further expansion and modification to meet Australia's evolving research challenges through the first half of the 21st century.

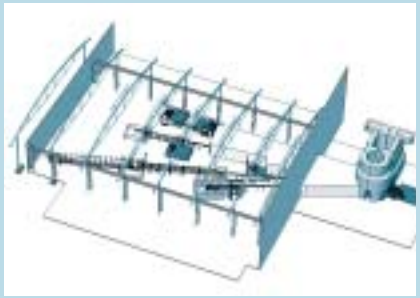


Diagram of the neutron beam facility in the replacement reactor.

WHY COOPERATIVE MAGNETIC BEHAVIOUR OCCURS

A team from the Bragg Institute and three universities have been working together to study the relationships between atomic structure and the physical properties of a new family of oxygen-deficient cobalt oxide compounds.

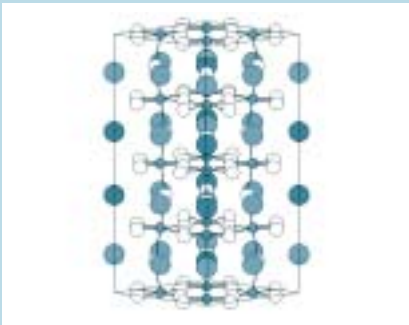
Containing a mixture of rare earth and strontium atoms, these compounds have attracted significant attention over recent years due to their applications in energy storage devices such as solid oxide fuel cells. They also show a wide range of interesting magnetic properties, including glassy behaviour and room temperature ferromagnetism. While these applications have been widely reported, the atomic structure that underpins the materials' technologically exciting physical properties was previously unknown.

The attractive physical properties of these materials depend on the overall oxygen content and location of atoms and vacancies within the structure. Oxygen ionic conductivity, for example, is strongly affected by oxygen vacancy ordering while magnetic behaviour is strongly affected by the ratio and distribution of cobalt ions of differing oxidation state.

Our compositional studies showed that these compounds contained substantial oxygen vacancies along with cobalt ions in 3+ and 4+ oxidation states. Susceptibility measurements revealed ferromagnetic transitions close to room temperature. Electron diffraction, along with the brilliance and high-resolution afforded by the synchrotron powder diffractometer at the Australian National Beamline Facility in Japan, enabled us to correctly determine the structure of these materials for the first time.

We observed a tetragonally-distorted superstructure with ordered oxygen vacancies in the cobalt oxide planes and further ordering between the rare earth and strontium atoms [see image below]. Furthermore, neutron powder diffraction data collected at HIFAR, both above and below the magnetic ordering temperature, enabled us to show that the moments on the cobalt atoms were aligned ferri-magnetically parallel to the crystallographic c-axis.

Our structural studies – carried out with the University of NSW, the Australian National University and the University of Wollongong – have not only clarified why cooperative magnetic behaviour occurs, but also how the ordering of oxygen vacancies and metal atoms contributes to the dramatic stability shown by these materials when used as electrodes in energy storage devices.



The structure of Ho0.33Sr0.67CoO3-d. The general class of materials that have this structure type (determined using diffraction techniques) are called 'perovskites'.

Nuclear Science for Environment and Sustainability

As governments, businesses and communities look to identify strategies for environmental sustainability, they are becoming more aware of the need for a better understanding of natural processes and the impact of human activity on the environment.

The Nuclear Science for Environment and Sustainability (NSES) core business area includes projects where nuclear-based techniques increase this level of understanding.

Our activities in this area have evolved significantly. Where we once only focussed on measuring and monitoring any environmental impacts associated with the operation of ANSTO's facilities and uranium mining, we now address a range of environmental concerns and contribute technical advice on issues of public importance.

Excellence in environmental performance and applying nuclear-based techniques to predicting and solving environmental impacts has become an integral part of our operation.

Quality analytical services

Activity

Providing high quality analytical services relevant to the environmental sector.

Output

ANSTO provides high quality analytical reports to commercial clients, site operations and research projects. In addition, we presented research at the Interact 2002 conference in Sydney on the effects of acidity on the copper and zinc toxicity of algae.

ANSTO also performs analyses and assessments for companies in the mining and manufacturing industries to provide data in areas such as environmental impact, ecotoxicology and mineral processing. Such data are required to monitor operational levels and demonstrate compliance with regulatory limits.

Outcomes

Tactical Environmental Services and Analysis underpins the quality of science on research projects across ANSTO and with external collaborators. Our ongoing commitment to excellence in research has resulted in the generation of revenue from commercial clients and maintained our standing as a "Superior Laboratory", as classified by the National Research Council (Canada) in the 15th Inter-comparison for Marine Biological Tissues and Sediments.

Future

A presentation on the effect of dissolved organic carbon and water hardness on the toxicity of copper and zinc to a tropical freshwater alga will be given at a joint Australasian Society for Ecotoxicology and the Society of Environmental Toxicology & Chemistry Asia Pacific Conference in New Zealand from 28 September to 1 October 2003.

Isotopic microanalysis of surfaces

Activity

Microanalysis of surfaces by secondary ion mass spectrometry (SIMS).

Output

ANSTO provided detailed information on isotopic composition and impurity content at the surfaces of metallic, geological and biological materials to researchers and industrial clients leading to the publication of five collaborative research papers, the improvement of processing parameters and the development of new materials.

Outcome

Improved understanding of isotopic composition and structure at the nano-scale for scientific research and development of new technologies.

Future

ANSTO will continue to identify and improve services to industries.

Migration of radionuclides

Activity

Studying radionuclide pathways with a focus on:

- scientific support for the proposed national waste repository;
- issues associated with the rehabilitation of the Rum Jungle uranium minesite;
- the uptake of nuclides in tropical food plants; and
- the transport of particles and sediments that carry contaminants in terrestrial and marine environments.

Output

Project personnel were finalists in the Sherman Eureka Prize for Environmental Research. Featuring the application of advanced technology, the project included an improved ion microprobe, small angle neutron scattering and synchrotron techniques at major facilities in the USA and Japan. The project undertook sand and sediment tracer studies in the Sydney region, Mumbai (India) and the Philippines through the International Atomic Energy Agency.

Outcomes

The project contributed significantly to an understanding of the migration of radionuclides and other contaminants through the biosphere.

New insights in both tropical and arid environments resulted from the application of advanced technologies to multi-element distribution and mineralogy at the micro-scale. Sediments and particles are major pathways for radionuclide and general contaminant transport and were studied over extended periods using tracer techniques.

Future

This project concluded on 30 June 2003. Some investigations and activities will be taken up in other projects.

What is changing our environment?

Activity

Utilising nuclear techniques to investigate evidence of human activity and climate variability in the Asian and Australasian regions.

Outputs

The Asian Regional Aerosol Characterisation Experiment Project generates official archive data. In collaboration with other participants, ANSTO will prepare papers for an international journal on air characterisation.

A significant scientific contribution will be made to the understanding and characterisation of regional air masses in southern Australia by publishing scientific analysis of measurements, maintaining data quality and guiding the scientific projects at Cape Grim baseline air pollution station, a joint program between The Bureau of Meteorology and CSIRO.

Outcomes

ANSTO has enhanced understanding of what is changing Australia's and the region's environment. The natural archive studies will enable better environmental management and long-term planning strategies. By improving understanding of the role of aerosols in 'climate forcing' in the Asian region, ANSTO is also improving the ability to predict climate change – including long-term changes in the concentrations of trace species in the atmosphere on a regional and a global basis.

Future

The project components will be re-aligned to both the National Research Priorities and internationally driven research into global climate change.

Techniques used for groundwater flows

Activity

Developing novel neutron and gamma analytical techniques to determine groundwater flow parameters.

Output

ANSTO developed a single borehole radiotracer technology using HIFAR-produced bromine-82 to provide high resolution hydraulic conductivity and other aquifer parameters. A novel method using neutron activation of salt water is progressing. Neutrons are used to produce prompt gamma radiation from chloride in the aquifer. The idea has been investigated in an artificial aquifer and two boreholes in sandstone of quite different hydraulic conductivity.

ANSTO AIR POLLUTION STUDIES OFFER CLUES TO CLIMATE CHANGE

Is air pollution in Asia influencing climate change? As part of a program known as the Aerosol Characterisation Experiment (ACE), ANSTO scientists at are at the forefront of an international effort to answer this question.

Like greenhouse gases, aerosols are believed to influence climate. Atmospheric aerosols are very fine particles suspended in air that can come from the dispersal of material at the earth's surface or by reaction of gases in the atmosphere. They include sulphates and nitrates from the burning of fossil fuels, organic materials from the oxidation of volatile organic compounds, soot from fires, and mineral dust blown in the wind. Natural aerosols include sea salt and volcanic dust.

It is known that increased burning of coal and other biomass raises the concentrations of sulfate and soot particles in the air. These particles are thought to scatter more sunlight back into space, influence cloud formations, and alter the amount of atmospheric material deposited into the Pacific Ocean. Scientists have theorised that these factors could cause localised cooling and affect the amount of rainfall and associated agriculture, as well as marine biota and fisheries.

ANSTO scientists are collecting samples from filters at five selected sites to observe the outflow of air pollution from the Asian continent. They are located in Hong Kong, Manila (the Philippines), Hanoi (Vietnam), Sado Island (Japan) and Cheju Island (South Korea).

Using ANSTO's facilities, accelerator-based nuclear techniques of analysis are being applied to obtain over 25 different elemental and chemical species from hydrogen to lead, including the key components of elemental carbon, sulfate and soil.

A radon measuring site at the southern tip of a Hong Kong island.

Outcome

ANSTO's technology provides solutions to aquifer studies such as of tidal flow, river loss to alluvium and estimates of mobility of salt stores. These methods may have great value for predicting the rate of movement of salt in groundwater as current methods of estimating saline flows are very unreliable.

Future

The technique will be developed in aquifers to allow valuable calculations of salt movement to be demonstrated in significant salt-affected agricultural areas.

Understanding salinity

Activity

Encouraging the enhanced use of isotopes in an Australia-wide assessment of groundwater recharge and basin-wide hydrology.

Output

Studies are under way in the Great Artesian Basin and Murray Darling Basin, involving significant collaboration with national institutes, such as The Bureau of Meteorology, and the International Atomic Energy Agency Coordinated Research Project.

Outcomes

The use of isotopes provides a basis for predicting the impact that climate change has on effective groundwater recharge. This knowledge will contribute to the national effort of "drought proofing" Australia.

Future

This work is ongoing under the framework of the IAEA Coordinated Research Project and the Murray Darling Basin Water Budget Project.

Assessment of salinisation processes that lead to urban salinity could have major implications on Australian building codes. Currently ANSTO is using nuclear techniques to investigate these processes in Western Sydney. This work will address a major issue that could cost Australians millions of dollars over the coming years unless understood and addressed.

Reducing the contamination of crops

Activity

Measuring the distribution of contaminants in soils using the highly sensitive synchrotron x-ray fluorescence technique.

Output

This application of synchrotron x-ray fluorescence enabled the relative concentration and exact location of cadmium contamination in soil particles to be determined.

Outcomes

Knowledge of the behaviour of pollutants in soils is important due to the possibility of uptake by vegetables as part of the human diet. The work enables the importance of different sources of cadmium to be assessed, and helps identify the mechanisms leading to accumulation in plants.

MIGRATING SANDS AND SEDIMENTS AT OLYMPIC PARK

ANSTO has been using tracer techniques to study the migration of sands and sediments, due to their potential role in radionuclide and contaminant transport.

There is currently worldwide interest in the migration of cohesive sediments (or muds) in urban areas. A major European study has defined several unanswered questions and is addressing them by using the activatable tracer indium. Activatable tracers are non-radioactive materials added to the environment in small amounts and subsequently measured in collected samples at very low levels after irradation in our HIFAR reactor.

Together with the Sydney Olympic Park Authority, ANSTO is investigating the transport of cohesive sediment in Homebush Bay over a 12-month period. The three-dimensional distribution of the tracer is being used to evaluate and extend numerical models of the transport processes developed by the University of NSW Water Research Laboratories.

The migration of sand off McMasters Beach in NSW, following storm events, has also been studied using iridium-192 labelled glass beads in collaboration with the NSW Department of Land and Water Conservation (DLWC) and Sydney University. Precise measurements of tracer dispersion are now possible and have contributed to theories for the development of megarips and for interaction of beach processes with longshore sand transport.

Future

Following the successful measurements undertaken using the synchrotron, further work will apply other advanced micro-analytical techniques, such as analytical electron microscopy, ion beam analysis and secondary ion mass spectrometry to further elucidate the chemistry of cadmium in soils. The results will enable an assessment of the effectiveness of possible management practices to reduce the contamination of crops.

WHERE IS ALL THE WATER GOING?

ANSTO, together with the NSW Department of Land and Water Conservation, has investigated the loss of up to one-third of the volume of the Macquarie River into alluvial aquifers downstream of Narromine in Central West NSW.

The long-term sustainability of groundwater extraction in the area is also under investigation as part of the NSW Water Sharing Plan process. Narromine is about 460 km from Sydney and 40 km west of Dubbo, the nearest major city. The land is predominantly used for cotton and grain crops, due to irrigation from the river and a large number of high yielding groundwater bores.

DLWC developed a model of how the water was leaking from the river and invited ANSTO to use nuclear expertise to fill in the picture. The project utilised stable and radioactive isotopes to determine the source and ages of groundwater in the vicinity of the irrigation area and assessed the suitability of the electrokinetic sensing technique in alluvial areas as a means for detecting permeable media.

Using nuclear tools such as tritium and carbon-14 dating, ANSTO set about to accurately quantify the amount of water lost from the Macquarie River to the alluvial aquifers in the buried valley adjacent to the river south-west of Narromine. This work was critical in demonstrating that a plume of mainly modern river water was extending up to 20 km west of Narromine at depths from 30 to 100 metres – an enormous amount of water. ▶

Honours student, Meredith Thomas, taking a bore water sample from alluvial flats adjacent to the river.

The source of the water was proven using the stable isotopes of water while the age was determined using naturally occurring radioactive isotopes. We were also able to delineate the main zones of river water leakage through the use of geophysical surveys to reveal where the water flows underground. A picture of the precise shape of the buried valley was produced along a number of key transects across the westerly moving plume of water.

The value of this work is very significant. It provides a sound basis for the sustainable use of groundwater dependant irrigation practice in the region and demonstrates that the loss of water from the river and the extraction for irrigation and other uses has established a new groundwater equilibrium. Additionally, the volume of extractable water resources in the alluvial sediments can now be better determined since the improved understanding of the bedrock topography provides more accurate dimensions of the buried valley.

Taking water quality measurements from the river using a hand-held meter.

Treatment and Management of Man-made and Naturally Occurring Radioactive Substances

Radioactivity is part of our everyday lives. Projects in the Treatment and Management of Man-made and Naturally Occurring Radioactive Substances (TMRS) core business area develop new approaches and processes, and refine existing ones, for the management of man-made and naturally occurring radioactive substances.

Removal of naturally occurring radionuclides from ore products and minerals is important to maintain Australia's competitive edge internationally in the mining industry.

ANSTO places a high priority on the safe management of radioactive wastes, including conditioning of waste for safe storage and disposal. This will continue to be an important focus for TMRS.

Fire testing of charcoal filters

Activity

Providing in situ testing and fire protection of charcoal air extract filters, along with the redesign of filling machinery.

Output

This project involves enhancing the operational reliability of ventilation systems that extract radionuclides from laboratories and process facilities, and verifying them by routine in situ testing of charcoal filters.

Outcomes

In line with best practice, routine in situ testing of charcoal filters ensures the filter systems operate at consistent levels before the filter medium requires replacement, thus ensuring maximum retention levels of radionuclides.

Future

All development and installation outcomes for the project are scheduled for completion over the next 12 months.

Solving global waste problems

Activity

Providing outstanding scientific research and development capabilities to promote commercial exploitation of ANSTO's innovative "designer ceramics", and contribute to solving the global problem of radioactive waste immobilisation.

Outputs

Our work has led to the development of wasteform formulations and technology for immobilising intermediate-level wastes produced during our radioisotope production activities. Contract work was undertaken with British Nuclear Fuels plc (BNFL) on a research-scale demonstration plant for immobilising actinide bearing wastes at Sellafield, United Kingdom.

Outcomes

Our innovative use of ceramics for the immobilisation of radioactive waste has provided ANSTO with international recognition, through the development of a patent portfolio and numerous research papers embodying both scientific and engineering aspects of the work. By providing radioactive waste management solutions to close the nuclear fuel cycle, the project has enhanced Australia's reputation as a responsible member of the international nuclear community and uranium exporter.

Future

Collaborative work continues with BNFL, Cogema (France) and ANSTO Radiopharmaceuticals in the area of radioactive waste immobilisation. Planning is in progress for a pilot plant overseas that would exploit our immobilisation technologies for high-level nuclear wastes. There will also be increased involvement with BNFL and European agencies at the back end of advanced fuel cycles to reduce hazards of high-level radioactive wastes.

Treating liquid and solidified waste

Activity

Developing and designing an immobilisation process plant to treat existing liquid and solidified waste from molybdenum-99 production using leach-resistant titanate-based ceramic. Molybdenum-99 is used to produce the medical isotope technetium-99m.

Output

ANSTO has identified and assessed a potential wasteform which conforms to international best practice guidelines. We have identified a suitable processing route for the immobilisation process and completed a preliminary conceptual design of the immobilisation plant. A spin-off of this work has been an improved process for microwave heating.

Outcomes / future

The major outcome will be design of a process plant to effectively immobilise wastes arising from molybdenum-99 production in a form suitable for indefinite storage or disposal in a geological repository. This will also demonstrate ANSTO's use of its own technologies for waste treatment which could open up the possibility of its application to similar and related waste streams around the world.

EFFECTS OF IRRADIATION ON WASTEFORMS

Zirconolite has been proposed as a major constituent of titanate wasteforms for radioactive wastes rich in actinides, such as plutonium.

These wasteforms will be of importance if partitioning and transmutation are pursued as part of advanced reprocessing strategies overseas. Collaboration with overseas reprocessors of spent fuel has a substantial inherent value to ANSTO.

A memorandum of understanding between ANSTO and two French organisations, Commissariat a' l'Energie Atomique (CEA) and Cogema covers, collaborative studies between the three organisations on zirconolite for actinide immobilisation.

Recent collaborative and parallel studies at CEA and ANSTO have focused on the consequences of radiation damage from incorporated actinides on the structure and chemical durability of zirconolite. Damage was simulated using heavy ion bombardment using facilities at CEA, the Australian National University and Pacific Northwest National Laboratories (USA), and durability studies carried out using a Soxhlet rig. Regardless of the type or intensity of irradiation applied it was found that chemical durability was not affected and there was no evidence of secondary phases on the leached surface.

These current investigations show that radiation damage alone does not increase zirconolite leach rates.

Commercial opportunities with CEA and Cogema have arisen from these collaborative studies and the potential exists for continuing contractual work.

Chemical analyst Terry McLeod using Soxhlet apparatus to assess nuclear wasteform durability

Selective inorganic sorbents for liquid waste

Activity

Developing selective inorganic sorbent materials to extract radioactive isotopes from liquid process streams.

Output

ANSTO has developed selective inorganic sorbent materials that show high selectivity for ions of interest (caesium-137 and strontium-90). After extensive experimentation with simulant solutions, testing with ANSTO's liquid waste from its medical isotope production has recently commenced. Initial results indicate an ability to extract essentially all the caesium-137 and strontium-90 from the liquid waste and concentrate it in a solid sorbent, leading to a 10,000-fold reduction in waste volume.

Outcomes

Ion-selective microporous materials have a range of potential applications, some of which have been demonstrated in laboratory tests. The application and commercial potential of these materials to industry is being explored. The sorbent materials will be used to separate medical isotopes, control radioactivity in liquid waste originating from isotope production at ANSTO, and in various industrial mineral extraction processes.

Future

ANSTO liquid waste remediation could be just around the corner – possibly applying this technology to liquid waste remediation operations at other international sites. Our efforts are ongoing to explore commercial avenues for this technology, develop other new materials for valuable medical isotope separations, and solve a range of environmental problems.

Radioactivity of ores and environmental solutions

Activity

Developing innovative changes in radioactive ore processing and associated hydrometallurgical flowsheets that will contribute to the sustainability of industry.

Output

Three provisional patent applications related to process development innovations (and jointly owned with a key customer) are in progress. ANSTO has been accepted as a core participant in the Cooperative Research Centre for Sustainable Resource Processing, which has similar objectives to this project and is expected to enhance opportunities for interaction with industry.

Outcomes

Industries within Australia and worldwide that are most affected by radioactivity are uranium, copper, mineral sands, rare earths, phosphates, niobium/tantalum, aluminium and steel.

Commercial arrangements for the use of one new process are in progress. A major mining company has also undertaken to assess the applicability of a second new process. Patent applications were filed last year for both these processes.

Expertise and knowledge developed as part of the research program has been responsible for our associated industry project which obtained several major commercial contracts. Australian industry has gained an increased awareness of issues relating to radioactivity in minerals processing circuits at a time when State and Federal governments are introducing new regulatory codes of practice.

Five papers were published during the last year. As part of ANSTO's contribution to IAEA committees that are developing criteria for sustainable development of uranium mining and milling operations, two reports were prepared, along with guidelines for the management of naturally occurring radioactivity in non-uranium industries.

Future

Several promising process developments in radioactivity control are expected to be proven in the coming year.

Radioactivity uptake in plants

Activity

Contributing to the assessment of the impact of any release of radioactivity in the tropical environment.

Output

The results of the study were reported to the International Atomic Energy Agency for use in a database to evaluate the parameters controlling the uptake of radionuclides into crops grown on a variety of soil types. The data were also incorporated in the RADCON model, used for predicting doses from environmental exposures to radioactivity.

Outcomes

On an international level, the work enables data from tropical regions to be adequately considered when assessing the impacts of nuclear activities. It also enhances ANSTO's radiological dose assessment capability for northern Australia and similar regions within the tropics. This is important in assessing the environmental aspects of facilities, including uranium mines and nuclear power stations overseas. In addition, understanding the uptake of both beneficial and detrimental elements in crops is important for farming practices and this aspect of the work has received favourable local media attention.

Future

The combined findings of all studies and data obtained will be made accessible to all the international research participants, and will be presented at the final project meeting to be held in Greece in September. This will also help to maintain ANSTO's well-regarded international profile in radioecology.

Predicting radionuclide migration in the environment

Activity

Developing mathematical ("surface complexation") models to describe the uptake of contaminants on mineral surfaces.

Output

The modelling outcomes have been reported to the OECD Nuclear Energy Agency, which is undertaking a comparison and evaluation of the modelling approaches used internationally to describe the movement of radionuclides in sub-surface waters.

Outcomes

ANSTO is recognised as having world-class expertise in this field and contributes to both the modelling and scientific co-ordination of this international project.

The improvement of these modelling approaches contributes to increased accuracy in predicting the performance of radioactive waste repositories.

Future

The project strengthens the scientific basis for improving the prediction of radionuclide migration in the environment, using models based on chemical thermodynamic principles. More generally, the results are applicable to migration of heavy metals and other contaminants in ground waters.

RADIOECOLOGY STUDY TO BENEFIT TROPICAL NATIONS

A Northern Territory radioecology study recently completed by ANSTO scientists will substantially improve environmental risk assessments in tropical nations across the world.

The research is part of an international collaborative research program initiated by the International Atomic Energy Agency and the United Nations Food and Agriculture Organisation in a wide range of areas such as Russia, USA, Greece, Syria, Vietnam, China, Pakistan and Bangladesh.

Some countries in the tropics are expected to utilise nuclear energy in the next few decades, so key information to improve environmental risk assessments is vital.

ANSTO chose Douglas Daly Research Farm, about 250 kilometres south of Darwin, to carry out the experiment. Because similar soils predominate right across the tropics, other countries will be able to use the Australian data to help predict the impacts of any potential environmental releases.

Trace amounts of radioactive elements were injected into Blain and Tippera soils, where sorghum and mung bean crops were grown. The research monitored the uptake of the radioactive materials over several growing seasons to determine how the plants accumulated radioactivity from the soil.

This study showed that most radioisotopes in this tropical environment behave in a similar fashion to those studied in temperate regions, although some showed relatively higher bioaccumulation. The work also related the transfer factors of radionuclides from soil to plants to the chemistry of the radionuclides and the properties of the soils.

Until this study was undertaken, there was virtually no relevant information on the behaviour of radionuclides in tropical Australian soils and crops, as research has been restricted largely to the temperate regions.

SORBENTS HELP DEAL SAFELY WITH WASTES

The treatment of highly acidic Intermediate Level Liquid Waste (ILLW) is a technological challenge that can benefit organisations worldwide.

ANSTO has recently developed novel selective inorganic sorbent materials that are unique in being able to extract essentially all of the caesium-137 and strontium-90 from its ILLW inventory and concentrate it into a volume of less than one litre. The treated liquid would then have very little radioactivity remaining. Further processing of this waste into a form suitable for safe long-term storage, is then much simpler and safer.

Once the small volume of sorbent is saturated with caesium-137 and strontium-90, it can be heated in air to temperatures between 800 and 1300ºC to produce a highly leach-resistant ceramic material that is suitable for long-term storage in a waste repository.

The novel sorbent technology represents an effective and simple technique to enable ANSTO to deal safely with the wastes arising from medical isotope production. It also has potential application to similar waste streams produced by isotope manufacturers overseas.

The ion-selective sorbent materials are also extremely effective in extracting troublesome trace radioactivity arising from lead and polonium in minerals processing circuits in the mining industry. Another potential application is in the separation and concentration of valuable medical radioisotopes.

Chemist, Chris Griffith, measuring the efficiency of sorbents at extracting radioactive species from solution.

REDUCING THE ENVIRONMENTAL IMPACT ON WASTE STREAMS

Many mineral processing operations, including those that treat radioactive ores, produce waste liquor streams that typically require treatment prior to final disposal or storage. Treatment will often produce a sludge stream, containing solids, and a water stream that may be reused in the process. Key aspects of sustainability in these operations include:

- maximising water recovery from the waste streams to minimise fresh water requirements; and
- minimising the final volume of waste sludge produced and cost of disposal.

With these aims, ANSTO has been investigating treatment processes that have the potential to minimise the environmental impact of the waste streams. One such example is the treatment of acidic waste liquors which is often carried out in a conventional neutralisation circuit where lime or limestone is added as a reagent to neutralise acidic waste liquor. This process produces a waste sludge stream and a neutral effluent liquor stream. A disadvantage of the conventional neutralisation process is the voluminous sludge produced which is often relatively low in solids and high in water.

ANSTO is investigating the high-density sludge processes to gain an understanding of how dense sludges can be produced. These processes differ from conventional treatment in that part of the waste sludge is recycled back to the start of the treatment process. By investigating the fundamentals of sludge recycling, a better understanding of particulate formation and interaction in precipitation systems is being achieved. This allows these mechanisms to be manipulated to achieve the desired results of minimising waste solids volume and maximising water recovery.

ANSTO has considerable expertise in the application of sludge recycle systems to process environments. Application of this technology has recently been demonstrated in small scale pilot trials and will be incorporated in ERA's waste water treatment plant for the Ranger uranium minesite, which is in the final design stages and due to be commissioned during 2004.

CLAYS REDUCE THE MOBILITY OF RADIOACTIVE ELEMENTS

The ability of a radioactive waste repository to prevent the release of radionuclides into the environment is increased by locating it in a suitable geological formation. For many radionuclides, the presence of abundant clays will reduce their environmental mobility.

In a recent research paper, contributed by ANSTO and CSIRO scientists, the importance of specific types of clay minerals was investigated.

Using the quantitative x-ray diffraction technique, the scientists estimated the quantities of different clay minerals in complex sub-surface materials from the central region of Australia.

The results proved to be an extremely useful indicator of the retention properties of the materials, demonstrating the role of specific clay minerals in retaining radionuclides in the sub-surface environment.

Woomera in central South Australia, where a site has been selected for the Australian low-level radioactive waste repository.

PREDICTING MOVEMENT OF RADIOACTIVITY

ANSTO scientists are contributing to an international project that aims to develop improved models of the movement of radioactive elements in the environment.

The Nuclear Energy Agency of the OECD has coordinated the project in which teams from several countries have developed models for the uptake of radioactive elements on mineral surfaces.

Known as 'adsorption', this uptake process is important in understanding the environmental mobility of radioactive elements from a variety of sources. When necessary, mobility can then be minimised to reduce the possibility of radioactivity entering the biosphere.

In conjunction with modelling teams from several other countries, ANSTO scientists have developed models to address this issue. Comparison of the models has indicated the strengths and drawbacks of the various modelling approaches, and the most appropriate directions for further experimental and modelling studies of environmental reactions.

Sustainability and International Competitiveness of Industry

ANSTO recognises the important link between science and business in building Australia's economic strength.

Through the activities in this core business area, ANSTO continues to develop a strong research base for Australia, extend opportunities for further collaboration with the world's best scientific organisation, enhance our local expertise and skills and underpin and progress business opportunities.

One commercial activity is the manufacture and distribution of radioisotopes, for medical applications in diagnosing and treating life-threatening diseases and for environmental and industrial applications. These provide a significant community benefit.

Engineering work for customers

Activity

Carrying out commercial work for a range of customers across Australia and overseas.

Output

Engineering Services commercial work principally covers the pressure certification of pipework, pipe fittings, aerosol cans, etc. using our testing laboratory accredited by the National Association of Testing Authorities. The Engineering Development Workshop provides commercial clients with high precision engineering components in a range of conventional and exotic materials. The majority of work undertaken is unique and unable to be provided by alternative sources within Australia.

Outcomes

ANSTO obtains a commercial return while maintaining staff expertise and high level precision equipment for use within existing laboratory facilities at Lucas Heights.

Future

Requests for commercial work to be undertaken using the research support engineering facilities available at ANSTO are expected to increase.

Fabricating anti-reflection coatings

Activity

Deposition of anti-reflective and scratch resistant ceramic coatings on polymeric substrates using atomic layer chemical vapour deposition (ALCVD) and sol-gel processing.

BURST TESTING ON GAS PIPELINES

In early 2003, ANSTO completed a two-year project in conjunction with the Cooperative Research Centre for Welded Structures and the Australian Pipeline Industry Association (APIA).

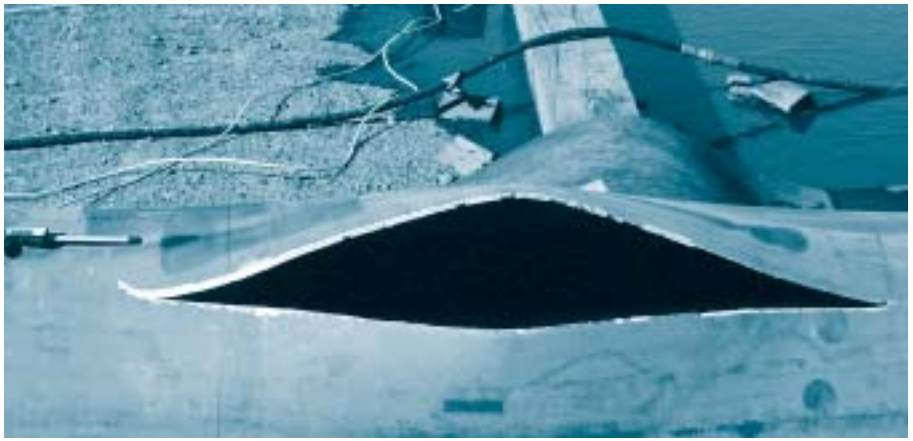
Designed to improve understanding of gas pipeline strength and safety, the research applied finite element modelling techniques to predict pipeline behaviour during hydrostatic testing carried out during installation as well as during normal operation.

The aim has been to enable the use of higher operating pressures or thinner walled pipe, whilst remaining within safe operational limits. These options have the scope to increase pipeline throughput or reduce installation costs respectively.

APIA estimates the potential savings from this project to be $110 million over the next seven years.

As well as computer modelling, burst testing on full size pipeline has been used to validate the computer models, which entailed pressurising a section of pipeline with water and monitoring the deformation of the pipe up to the point at which it burst. This capability will be jointly marketed with capabilities in materials assessment and reliability to address problems in Australia's manufacturing and engineering sectors.

This work has generated considerable interest in the pipeline industry and prospects for funding for future research work are promising. The likely focus will be to apply the technology developed in this project to the design of new pipelines, and also to look at existing pipelines with a view to safely upgrading their operating pressure.



The burst pipe after hydrostatic testing

Output

Multilayer stacks with alternating layers of alumina and titania were successfully synthesised using ALCVD. The stacks had precisely controlled thickness (20±1 nm), abrupt chemical interfaces and excellent uniformity.

ANSTO introduced organically modified silicates (ORMOSOLS) into the sol-gel process to enable us to tailor the mechanical properties of the hybrid thin films, significantly increasing adhesion to polymeric substrates. Plasma treatment of these substrates also increased film adhesion. Finally, a nano-scale building block approach led to closer control over their assembly and higher density in the final film.

Outcomes

ANSTO's ability to deposit multilayer stacks of alternating materials, combined with thin oxide films on polymeric substrates at temperatures as low as 50°C, makes ALCVD a serious candidate for the industrial fabrication of anti-reflection coatings. Close collaboration in this area is ongoing with a number of Australian companies.

The development of expertise and tools for the characterisation of mechanical properties of nano-hybrid coatings generated several international collaborations (Centre National de la Recherche Scientifique-Grenoble, France; CEA-Le Ripault, France; and University of Padova, Italy) as well as with some local manufacturers.

Future

When this project concludes in the current financial year, ANSTO will capitalise on this research with two follow-on projects:

- the practical implementation of the ALCVD technology for the production of anti-reflection coatings on optical lenses; and
- the development of technology to produce nano-structured films for applications such as medical diagnostics, sensors and other nano-technology devices.

Sol-gel technology

Activity

Developing sol-gel technology for entrapping organic molecules, such as pharmaceuticals, in metal oxide nanoparticles, and subsequently releasing the encapsulated molecules at controlled rates. This technology has been patented.

Output

Particle size control enables the passive targeting of key organs and the drug release rates. Encapsulation of larger functional biological species, including micro-organisms, has also been demonstrated in bulk sol-gel matrices.

Patent protection for the technology has entered the national phase in Australia and overseas. Further activity in this area involved:

- biodistribution studies of radio-labelled nanoparticles in rodents, confirming low blood clearance rates (i.e. nanoparticles were not recognised by the body's immune system); and
- developing improved synthetic routes for producing silica nanoparticles with controlled nanostructures and diameters of 50 to 500 nm, together with in situ techniques for investigating factors controlling the structural evolution.

Outcomes

Commercial exploitation of ANSTO's intellectual property is being pursued in conjunction with appropriate R&D partners. Presentations of the technology to venture capitalists generated significant interest.

The promising biodistribution results obtained in tumour-free rodents have been extended to tumour-bearing animals. This work has the potential to significantly improve clinical protocols and procedures for the treatment of cancer. Apart from its applications in oncology, the work has potential applications for producing bio-implantable controlled delivery systems for a range of pharmaceuticals.

Controlled delivery systems could also enable localised delivery of small quantities of potent bioactive agents such as food flavours, biocides, pesticides and cosmetics.

Future

ANSTO is currently seeking partners for sponsored R&D projects for the use of this controlled release technology in a range of areas. These include drug delivery, active paints that slowly release pesticides or biocides, cosmetics which release UV-protection agents, and foods that protect encapsulated molecules inside innocuous micro-capsules until release.

UPGRADE OF BUILDING 54 TO REDUCE NOBLE GASES

ANSTO's Building 54 Isotope Handling Plant has undergone a major upgrade. Part of the Radiopharmaceutical Production Facility, the building contains four handling cells used principally for the production of molybdenum-99. This is used to manufacture technetium-99m generators, the workhorse of nuclear medicine.

The project involved a total review of the air supply and active and non active exhaust systems to bring them up to the latest standard. In addition, new radiation monitoring equipment and real time gas discharge were installed. A computer control system has been developed using industrial control software to monitor and control the performance of the building systems in real time.

All relevant ANSTO safety directives were adhered to during this project, leading to approval by our ANSTO Safety Assessment Committee and ARPANSA.

No production was lost and, importantly, no accident occurred during the upgrade. ARI will be able to significantly increase production while staying below environmental emission levels of 1997.

Safety in our community

Activity

Specialist radiation protection consultancy services.

Output

ANSTO provides radiation protection services to the government, industry and community sectors. It involves analysis and advice on the radiological hazards associated with the use of ionising radiation and naturally occurring radioactive material in industry and the environment.

One example of the work completed by ANSTO during the year was the Illawarra Radionuclide Investigation into radiological consequences on the Illawarra community from the presence of material containing NORM in industrial processes.

The investigation provided radiological advice for the remediation of contaminated land, storage of radioactive materials, application of processes using radioactive materials and site clearances.

The overall finding of the study is that public dose from industrial sources is under one twentieth of the annual public dose limit. This small contribution is far less than the natural background dose and much smaller than the natural variability in radiation dose measured worldwide.

ANSTO also provided advice to Wambo Coal on plant process and disposal options of plant equipment containing NORM.

Outcomes

Assurance of radiological safety for industry and the community supports the continued operation of industry.

Table: Summary of commercial radiation protection training

TYPE OF COURSE	NUMBER	PARTICIPANTS
General radiation safety officer	3	38
Advanced radiation safety officer	2	17
Industrial radiation safety officer	2	26
Safe use of nuclear type soil moisture & density gauges	3	23
Safe use of industrial radiation gauges	3	29
Radiation safety for x-ray analysis operators	3	25
Radiation safety with x-ray imaging operators in industry	1	4
Safe use of x-ray devices	1	4
Radiation safety with Brachy Therapy Units	1	1

Radiation protection training

Activity

Providing radiation protection training.

Outputs

ANSTO provided 19 commercial radiation protection training courses for external organisations in sectors such as local government, mining, engineering, healthcare, education and research and development. A total of 171 personnel from 43 organisations were trained at either ANSTO or in the workplace.

Outcomes

This training, which utilises specialist ANSTO expertise, earned revenue for ANSTO and provided a necessary service to Australian industry.

Quality calibration services

Activity

Calibrating radiation protection instruments.

Outputs

During the year the radiation protection instrument calibration facility calibrated 180 instruments for commercial clients, which represents almost 20% of all calibrations for the year. The remaining 80% of all calibrations completed during the year were for ANSTO instruments. The instruments included gamma dose rate meters, neutron dose rate meters, contamination monitors and electronic personal dosimeters. The facility also provided support for nuclear powered warship visits by calibrating instruments for the monitoring kits used in these visits.

Outcomes

The facility provided quality calibration services for the external community in sectors such as mining, engineering, emergency services, education, hospitals and research organisations ensuring that equipment used is accurate.

Future

The service is moving into new premises providing state-of-the-art facilities and will continue to provide specialist services to Australian industry.

Digital coincidence counting

Activities

Developing a computer-based method for accurately determining the radioactivity of nuclides that simultaneously emit beta and gamma radiation – called Digital Coincidence Counting (DCC).

Outputs

ANSTO, in collaboration with the National Physical Laboratory UK, has continued to work at commercialising the DCC system and to expand the potential application of the technology. In particular ANSTO has designed a new version of the data capture and compression hardware to provide for four channels of input data, instead of two, as used in the current version. This design is now complete and ready to be embodied in electronic hardware. ▶

LOOKING AT THE WORLD ON A MOLECULAR SCALE

The description of our world on the molecular (or nano) scale can provide Australian industry with solutions to problems and competitive edge with new products and improved processes.

We are focussing our specialist knowledge and skills in molecular structure and dynamics on industry needs. Based on x-ray, neutron and electron scattering, this knowledge and skill set extends into enabling areas of advanced materials science, physics and chemistry.

We have worked with research and industry partners in the CRC for Polymers to determine the shape of polymer molecules in injection moulded polypropylene products and to understand the influence that the shape has on the mechanical properties of the product. This has a major impact on the design of the moulded product, the types of polymers and fillers that can be used and the overall cost. The new knowledge gained from these investigations is being incorporated into sophisticated computer software that is used for the design of injection moulds.

The growing demand for lighter, stronger materials for the automotive and aeronautical industries, for example, is driving the development of nanocomposite materials. We have investigated the molecular architecture of nanocomposites fabricated from clay platelets and a range of polymers in routine commercial use. A detailed description of the molecular interactions between the completely exfoliated clay platelets and the polymer matrix, will enable the design of novel nanocomposite materials with defined properties.

Australia is one of the top bauxite and alumina producers in the world. The raw bauxite contains alumina and impurities such as silicates and organic matter (oxalates and humics). ANSTO is exploring the formation of micelles of the organic matter and how these molecular aggregates reduce the efficiency of the alumina recovery. The goal is to provide an industry partner with information that will reduce the concentration of the organic matter in a critical step in the alumina refining cycle (the Bayer Cycle).

The efficiency of oil exploration and recovery is critically dependent on the porosity of the reservoir rock. We are investigating the interaction of drilling muds (complex fluids containing polymers, clays and solvents) with oil-bearing rock to understand the molecular interactions of the mud with the pores, particularly those interactions that can lead to pore blockage. A better understanding of drilling mud interaction with reservoir rock will lead to drilling muds with improved properties, and ultimately to more efficient oil recovery.

Outcomes

DCC has not yet achieved commercial success and at this stage no further research will be undertaken. ANSTO believes that this technology is valuable intellectual property, and its business value, along with the alternative means to exploit it, are now being re-evaluated.

Future

We are continuing our efforts to sell the package internationally and are currently negotiating a sale to a national European laboratory. DCC is ideally suited to enabling a range of novel new software-based radiation standardisation and counting techniques.

Measuring radioactivity

Activity

Maintaining the Australian primary and secondary standard for measuring radioactivity as well as a secondary standard for measuring the absorbed dose.

Output

ANSTO, through our Radiation Metrology Laboratories for neutron flux validation, developed a new gold-198 activity standard.

To validate the neutron fluence of the HIFAR reactor, gold foil activation is performed at a designated position of the reactor geometry. Once activated, the gold is measured in the secondary standard ionisation chamber. A measure of absolute activity is obtained from which neutron fluence can then be calculated.
To maintain the secondary standard, a primary standard has to be developed – carried out once every 10 years. Our results produced a measurement of gold-198 activity with an accuracy of 0.71% (this is an expanded uncertainty with a coverage factor of 2 at a 95% confidence interval).

ANSTO has measurements of gold-198 activation for the validation of the neutron fluence of the HIFAR reactor.

We also support commercial neutron transmutation doped silicon production through the continuing supply of the silicon resistivity measurement service.

Outcomes

ANSTO's activity and dosimetry standards ensure that radioactivity quantities can be accurately measured within Australia.

International linkages with the Bureau International des Poids et Mesures (BIPM) and the Asia Pacific Metrology Program keep ANSTO and the radiopharmaceutical industry abreast of developments in international metrology, with associated implications on international trade.

Through our international partnerships, ANSTO participated in two inter-comparisons on activity and dosimetry measurements: activity of thallium-204 (coordinated by BIPM); and dose from cobalt-60 using thermo luminescent dosimetry (coordinated by the IAEA Secondary Standard Dosimetry Laboratory Network).

Future

The Australian community benefits through the reliable delivery of diagnostic, therapeutic and palliative treatment modalities within the nuclear medicine and radiation therapy centres of Australia's hospitals.

Irradiation in medicine, agriculture and manufacturing

Activity

Providing radiation technology services in radiation processing and high-dose dosimetry to industry, agriculture, government and universities.

Output

Irradiation is used to process such materials as medical devices, human tissue grafts, microbiological test kits, tropical fruit, polymers and Queensland fruit fly pupae for the sterile insect technique. The Queensland fruit fly is the most serious insect pest for fruit and vegetable crops in Australia. Up to 15 million of its pupae were irradiated per week with a total of 415 million for the year.

We also provided our traceable high-dose dosimeter supply, measurement and calibration service to customers in Australia, New Zealand, Malaysia and Sri Lanka.

Outcomes

Australian horticultural, agricultural and manufacturing industries and the medical

HIPING OF PROSTHETIC IMPLANTS

Manufacturing hip and knee joints may not be what the community expects from ANSTO.

We have, however, begun a commercial partnership with Australian Surgical Design and Manufacture (ASDM), a manufacturer of prosthetic devices.

While initially sourcing much of its technology overseas, ASDM intends to bring much of the manufacturing cycle back to Australia, and ANSTO is helping it meet that goal.

Complex shaped knee and hip joints are formed by casting, which can result in pores and other undesirable microstructural defects. Hot isostatic pressing (HIPing) applies heat and high pressures at the same time and in all directions. When castings are HIPed, the defects are removed, producing a fully dense component – improving the strength, flexibility and fatigue life of the component.

ASDM processed around 1500 knee joints during 2002 to 2003 using ANSTO's HIP technology. This number is expected to increase greatly over coming years.

ANSTO's certified laboratory status, along with its ability to provide mechanical testing and characterisation of these components, has enabled the HIP technique to meet the United States Food and Drug Administration standards.

The manufacture of artificial body parts is an unusual spin-off of ANSTO know-how that was originally developed for making radioactive wasteform ceramics. ANSTO is also providing sterilisation services to ASDM.

HIPed knee implant.

community continued to benefit through ANSTO's unique capability within Australia to irradiate material to precise doses at a range of temperatures and dose rates.

Commercial radiation processing in Australia and the Asia Pacific region was supported through ANSTO's dosimetry service.

Routine production of radiopharmaceuticals, industrial isotope products and R&D for new products

Activity

Production and supply of radiopharmaceuticals and radioisotopes for use in medical, industrial and environmental applications in both the domestic and international medical, manufacturing and services industries. These are provided under the trading name ANSTO Radiopharmaceuticals and Industrials.

Output

A large range of radiopharmaceuticals for diagnostic and therapeutic uses was provided to hospitals, nuclear medicine practices and central radiopharmacies in Australia and the Asia Pacific region. Radioisotopes were supplied for industrial use for non-destructive testing.

In addition, radioisotopes were provided for research purposes to a number of centres around Australia.

Outcome

The supply of these radioisotope products has generated revenue in excess of $21 million for the 2002-03 financial year. Many Australians will benefit from nuclear medicine in the diagnosis and treatment of various forms of cancer, heart disease and neurological disorders.

Treating malignant melanoma

Activity

Melanoma is a highly prevalent concern in Australia. ANSTO is conducting a clinical trial in 20 patients of a radio-labelled benzamide as an effective marker of malignant melanoma. Clinical trials are required to prove safety and efficacy of new diagnostic and therapeutic pharmaceutical products. We are also modifying the benzamide molecule to test its potential as a radiotherapeutic.

Output

So far, we have studied 13 patients, comparing the benzamide with the "Gold Standard" tumour marker fluorine-18 deoxyglucose (FDG). The results are encouraging.

Outcome

ANSTO developed a diagnostic and therapeutic agent for malignant melanoma.

MASTERPLAN TO REDEVELOP BUILDING 23

As Australia's national nuclear research and development organisation, ANSTO produces radioisotopes for use in medicine, industry and research.

The manufacture of radioisotope products is largely conducted in Building 23 at the Lucas Heights Science and Technology Centre. Originally planned as a research facility, Building 23 has evolved into a full production facility.

As Building 23's current production facilities are not capable of meeting projected needs, there has been a pressing need to streamline production flow and materials handling, and improve production capacity based on expected growth in demand.

During the last year, ANSTO developed a strategic master plan study to build an extension to the north and east of Building 23 on three levels. When completed, the complex will comprise modern quality controlled chemistry laboratories, service and instrumentation rooms, production clean room facilities, packaging and dispatch facilities, stores and component wash bays. It will also include modified microbiological and clean rooms, intermediates solutions preparation clean rooms and a sterilisation room. Amenities and support facilities, as well as roadwork extensions, additional parking bays, landscaping, engineering and communication services will be provided.

The development will satisfy all relevant Australian codes and standards and be built according to best practice principles in the pharmaceutical industry.

The project is currently being designed and first stage approval from ARPANSA has been received.

An artist's impression of Building 23

Future

After 20 patients, we plan to review the trial. If the research is successful, we will move to the next phase aiming to produce novel diagnostic and therapeutic radiopharmaceuticals for treating malignant melanoma.

Producing quality radiopharmaceuticals with molybdenum-99

Activity

Development of a new molybdenum-99 process to meet the needs of nuclear medicine, with the goal to use low enriched uranium in the most effective way for isotope production.

Output

New process for producing molybdenum-99 which achieves best practice.

Outcomes

The improved molybdenum-99 production process includes state-of-the-art methods for managing liquid and gaseous by-products. The process will initially be used in HIFAR and transferred to the replacement reactor. This will ensure an uninterrupted and guaranteed supply of molybdenum-99 to the Australian medical community.

Future

In the long-term, the Asia Pacific region will benefit from ANSTO's ability to produce quality radiopharmaceuticals.

Why aren't rock dump covers working?

Activity

Finding out why the performance of the earthen covers placed on the Rum Jungle waste rock dumps in 1984-85 to control water infiltration rates has declined.

Output

Funded by the Australian Centre for Mining and Environmental Research, this project was carried out in collaboration with CSIRO Land and Water. The study found that the cover materials had deteriorated over the 18 years since replacement and hence no longer meet the original specifications. In particular, the permeability has increased, which explains the increase in rainfall infiltration into the waste rock. This increased permeability is largely due to biological activities – galleries formed by termites and ants, as well as root growth from the pasture grasses and the few trees that grow on the waste rock dumps.

Outcomes

Recommendations have been made for the improved design and construction of future earthen covers for waste rock dumps.

Future

Better cover designs of waste rock dumps will also enhance the ecological sustainability of the mining industry.

Hydrometallurgical know-how

Activity

Capturing ANSTO hydrometallurgical know-how and making it available to industry.

Output

Ores, radioactivity and environmental solutions (ORES) is an exciting new concept that draws on our experience of developing uranium and rare earth processing circuits, the behaviour of radionuclides in processing plants, and the management of liquid and solid waste streams.

We are providing consulting services to the minerals processing and metallurgical industry. Over the past year, 12 major jobs were undertaken. These made use of our extensive experience as well as the excellent laboratory and pilot-scale experimental facilities at ANSTO. In addition, as a service to the industry, many smaller tasks were carried out that required our specialised chemical and radio-chemical analysis.

Outcomes

There is an increasing awareness in the industry that radioactivity is not limited to uranium ores. The drivers for this are:

- a progressive tightening of the radionuclide limit in product specification;
- occupational health and safety issues; and
- improved waste management.

In terms of waste management, there is a general move towards near zero or zero release of water from industrial sites to reduce the environmental impact, aid water conservation and minimise cost by reuse. This trend is providing opportunities for ANSTO to use its expertise to assist the minerals industry in addressing these issues.

All the work done in this area is of a commercial nature and funded by industry clients. This ensures that the findings will be implemented by industry whenever this is economically attractive.

Future

The pattern of work is expected to be similar in the year ahead. However, the emphasis will be shifted to expanding our engagement with the global minerals industry, under the ANSTO Minerals umbrella.

Characterisation of biomolecules

Activity

Applying neutron and x-ray based techniques for analysing the relationship between structure and function of large molecules of biological origin. This is the key to understanding biological processes at the cellular and sub-cellular level.

Ouput

Research partnerships have been formed with the University of NSW, University of Technology, Sydney and Macquarie University to investigate biomaterials such as bacterial polymers, naturally occurring

biomineralised structures (diatom shells) and enzyme-based biocatalysts. Properties characterised included porosity and surface area, association between cell components and structural changes in biocatalyst components after assembly. Neutron technology enabled these measurements to be done at a scale of hundredths of a micrometre.

Outcomes

This project strengthens ANSTO's expertise in the preparation of biomaterials and deuteration of biomolecules for neutron-based analyses to meet demand from the bioscience user community in the South-East Asian and Pacific region. The biomaterials investigated have potential application in the production of biomedical prostheses, drug-delivery systems, environmentally-friendly biodegradable polymers and communication infrastructure.

Future

The development of a showcase of biological applications of neutrons will further stimulate external demand from the tertiary and industrial sectors for use of neutron instrumentation under construction for the replacement research reactor. This technology will not only assist scientists developing biotechnological and nanotechnological products but those investigating the fundamentals of biological processes.

Green Trends for our environment

Activity

Combining the various environmental services from ANSTO Environment to make a coordinated service available to external clients.

Outputs

Backed by ANSTO's unique nuclear facilities and the skilled personnel who operate those facilities, a core group of ANSTO scientists provided expert advice to industry, local councils, water corporations and government environment organisations.

ANSTO Green Trends is using knowledge gained from earlier strategic research carried out in the core business area of Nuclear Science for Environment and Sustainability. It applies this fundamental scientific knowledge to practical environmental problems, such as catchment pollution and the effects on the environment of urban sprawl.

Outcomes

ANSTO Green Trends customers receive high quality reports from a business that adheres to ANSTO's service charter. This business expands ANSTO's potential commercial revenues. In addition, the community will benefit from the application of ANSTO facilities and expertise.

Future

A business plan has been developed and we anticipate that ANSTO Green Trends will need a lead-in period of up to two years to reach its full potential. Initially a small team worked on the business plan, marketing and liaison with clients. Services are delivered in custom made packages.

The scope of this consultancy business is to attract work that is challenging to the team and will lead to increased visibility of ANSTO. It will also lead to increased revenue by delivering high quality environmental work to customers at the right price.

New Business Lab

Activity

Providing a total learning environment for the evaluation, management and commercialisation of intellectual properties and technologies.

Output

ANSTO is building a portfolio of opportunities and a future track record of success in the framework of the ANSTO Business Lab.

Outcomes

The Business Lab will improve the transfer of technology, and enhance ANSTO's and Australia's reputation in commercialisation of public sector R&D.

Patenting our intellectual property

Activity

Managing the evaluation, filing, prosecution and commercialisation of ANSTO's patent portfolio, in accordance with ANSTO's intellectual property management process.

Lynne Blackbourn facilitating a workshop on how to conduct effective assessments in ANSTO's objective setting and review process.

Organisational Development and Support

Projects in the Organisational Development and Support (ORDS) core business area ensure ANSTO's business processes, safety systems, information services and human resources management are best practice.

Financial support

Activity

Support to all ANSTO projects through the provision of an effective and efficient financial accounting, planning and budgetary support service.

Output

The Finance unit provides a sitewide service to support financial accounting, planning and budgetary processes. In July 2002 our services were enhanced by the introduction of a sitewide planning and budgeting process based on the SAP Enterprise Resource Planning System.

Outcome

ANSTO achieved value from having one sitewide system to manage its operational and financial resources, through improved reporting on project progress, including milestones and objectives. Our operating income for the year was $137.209 million comprising $38.144 million from external services in research and sales of radioisotopes and $99.065 million from Government appropriations. During 2002-03 ANSTO also received appropriations of $14.171 million for the disposition of spent fuel in terms of an agreed program and equity injection of $137.833 million towards the construction costs of the replacement reactor. This sum includes an undrawn amount of $33.658 million from the 2002 year, which has been accrued in 2003 year accounts.

Future

For the 2004 year we expect to generate $39.3 million from external services, research and sales of radioisotopes and $106.109 million from Government appropriations. In 2004, there will be a further equity injection for construction costs of the replacement reactor of $84.69 million.

ANSTO training during 2002-03

	NUMBER OF COURSES	ATTENDANCE
Learning environments for new strategies project	44	627
Health and safety courses	168	2,988
Nuclear science and engineering courses and seminars (including HIFAR-specific training)	16	257
All other management, operational and competency based courses	85	642

Enhanced learning systems and training

Activity

Providing strategic learning and development.

Outputs

The number of training courses ANSTO provided to staff are listed above.

Outcomes

The courses have improved skills across the organisation in the management of people, projects and resources, and enhanced personal and operational effectiveness.

Future

Existing programs will continue to be supported in an ongoing effort to improve our operational performance. A review of the learning and development strategy will be undertaken during 2003-04, which may lead to program enhancements.

Competency framework

Activity

Implementing the objective setting and review process based on a competency framework.

Output

An enhanced objective setting and review process was successfully implemented following the introduction of the 2002 Enterprise Agreement. All staff (approximately 830) were provided with training in the process. In addition, supervisors, project leaders and managers were provided with intensive training at the beginning and end of the review year, to strengthen the performance management skills of our line managers and demonstrate the links between performance and learning objectives, and ANSTO's competency framework.

Outcomes

Improved understanding of the objective setting and review process amongst managers and employees, and improved skills in conducting it.

Future

Lessons learned from this inaugural year will be addressed in the operation of the process in 2003-04.

Business systems improvement

Activity

Developing a business management system that incorporates continuous improvement with a strong customer focus, based on the quality standard AS/NZS ISO 9001-2000.

Output

ANSTO developed a framework for the implementation of our business management system and completed a review of policies and began documentation of processes for approval by senior managers.

Outcomes

From this project, ANSTO achieved a greater understanding of process and interrelations with process owners, as well as the practical application of the quality standard, resulting in simplified documents, reduced duplication and improved efficiencies.

Future

The ANSTO business management system will be subjected to an independent external audit in the next financial year which will provide verification that it represents international best practice and can be certified in accordance with the quality standard.

Providing information through our library

Activity

Contributing Australian publications to the International Nuclear Information System (INIS) of the IAEA and providing access to scientific and technical nuclear information for Australian users.

Output

Library staff indexed and contributed to the INIS database with 932 new Australian scientific and technical publications on the peaceful applications of nuclear science and technology. They also facilitated access to the INIS database on the Internet. Twelve Australian universities and academic institutions have been granted free access to INIS.

Outcomes

This project supports ANSTO core business activities, promotes Australian scientific and technical developments in nuclear science and technology worldwide and contributes to the preservation of knowledge as a result of current and past investment in nuclear research for the use of future generations.

Future

More efforts will be directed towards harvesting and disseminating print and electronic resources and enhancing nationwide accessibility to nuclear information. In the coming financial year, ANSTO staff will gain access to the valuable information contained in the Nuclear Sciences Abstract (USA) and receive monthly updates of the INIS on CD-ROM.

Moving from paper to electronic literature and access to electronic data

Activity

Providing electronic delivery of literature and reference databases.

ANSTO's file appraisal, indexing, keyword development and storage are important components of our overall knowledge management strategy.

Output

ANSTO's library continued to move from paper to electronic delivery of journal literature, a process facilitated by its networking arrangements with the CSIRO Library Network. Subscription agreements with Academic Press, American Institute of Physics, American Physical Society, Elsevier (chemistry backsets), Emerald, Nature Publishing Group and others were established during the year, resulting in an additional 640 e-journal titles.

We introduced subscription agreements, several in collaboration with the CSIRO Library Network, for access to several new literature and reference databases. They included Building Code of Australia, Business Who's Who of Australia, Current Protocols, Emerald Management Reviews, MIMS Pharmaceutical Database and Zoological Record.

In addition, close to 400 keywords were added to the ANSTO intranet records file creation index.

Library staff looking at updated material on new online system

Outcomes

ANSTO staff now have desktop access to 116 literature and reference databases and over 4270 electronic journal titles covering areas of science, technology, business, human resources and management, thus further supporting internal and external organisational activities.

The adding of 400 keywords to the intranet index enabled demands for additional space to be resolved. It significantly reduced file appraisal which improved the currency of our record keeping practice. File appraisal resulted in a significant reduction of unsentenced ANSTO records.

ANSTO now has more efficient file titling, facilitated by quicker retrieval of information and assigning of disposal authorities.

Future

The library will continue to seek ways to move from print to electronic delivery of journal literature and will implement this where cost-effective. It is expected *Nucleonics Week* and *Nuclear Fuel* will change to electronic delivery early in 2003-04.

Negotiations between CSIRO Library Network, ANSTO and the Institute for Scientific Information (ISI) are continuing and we expect access to the Current Contents Database will move from the Structured Information Manager to the ISI's Web of Knowledge platform during 2003-04.

Our more efficient filing system has laid the basis to enable ANSTO to select an archive service provider that meets the requirements of both ANSTO and the National Archives of Australia next year.

Enterprise bargaining for our people

Activity

Negotiating a replacement enterprise agreement for ANSTO employees.

Outputs

A comprehensive Enterprise Agreement was negotiated and agreed.

Outcomes

The Agreement operates for three years from 10 January 2003 to 10 January 2006 and provides a stable platform for ANSTO's employment relations, conditions and remuneration.

Future

The Agreement allows ANSTO to concentrate on its strategic direction and allows for an appropriate period in which further employment based reforms will be able to be developed for implementation in 2006.

ANSTO Technology Park

Activity

Developing and leasing land for any commercial purpose.

Output

The ANSTO Technology Park continues to benefit science, industry and the community through its long standing and diverse group of tenants providing services in fields such as:

- radiocommunications and telecommunications;
- scientific instruments;
- neutron activation analysis;
- aviation support technologies;
- raw materials manufacture;
- financial services;
- research and development on energy fuels;
- development of laser isotope separation technology;
- nuclear medicine; and
- waste disposal technologies.

Outcomes

The Technology Park's existing tenant portfolio and planned development will increase ANSTO's interaction with compatible organisations, support scientific and technological research advancement, and provide ANSTO with knowledge sharing and a greater return on its investment in Technology Park facilities.

Future

The ANSTO Technology Park will continue to attract a wider range of scientific, industrial, government and commercial entities as tenants which will benefit from proximity to ANSTO, along with our expertise and infrastructure.

In preparation for this development, we are extending our fibre optic communications network to provide advanced communication services to our tenants.

ANSTO is also negotiating with a number of organisations with regard to the development of Technology Park land. As a result of these negotiations we anticipate that formal arrangements will be realised in the 2003-04 financial year, benefiting ANSTO, its business partners and the community.

Data and telecommunications network

Activity

Implementation of stages 1 & 2 of the site PABX system upgrade covering most buildings outside the HIFAR protected area, and a wide area network (WAN) upgrade of the link between ANSTO at Lucas Heights and the National Medical Cyclotron at Camperdown.

Output

ANSTO redesigned the topology of the PABX system from a centralised to a distributed network. Making use of fibre optic trunk cabling, we eliminated the reliance on 40-year-old lead-sheathed, paper-insulated copper cable which was common when the site was first established.

The WAN link required the installation of optical fibre cable from the NMC to Sydney University via the Royal Prince Alfred Hospital, then a link from Sydney University to AARNET's regional network office at the University of Technology, Sydney (UTS). The installation of a shared 155Mbit microwave link with CSIRO allowed data to be routed from UTS to Lucas Heights.

Outcomes

Now in line with modern business practices, the new PABX system provides a greater range of features as well as a significant improvement in reliability. The previous system suffered repeated failures, particularly in bad weather when old copper cabling becomes vulnerable.

The new WAN link has increased the bandwidth from 128 K bit over an ISDN link to 100Mbit Ethernet over optical fibre and shared microwave. The increased bandwidth will accommodate growth in requirements, particularly with the implementation of phase 2 of the SAP business system into production operations.

Future

Stage 3 is scheduled for completion in the coming financial year and will integrate the Technology Park with the enhanced PABX system and ANSTO fibre optic backbone. This will complete the site upgrade. Stage 4 will support the replacement reactor project.

The WAN link's increased bandwidth will enable the direct linking of ANSTO's Lucas Heights and NMC telephone systems via voice over Internet Protocol technology. This will lead to reduced ongoing communication costs, allow for the implementation of video conferencing between sites and complete integration of telecommunications features for all ANSTO staff.

Always getting the best value

Activity

Support to all ANSTO projects by negotiating a number of strategic supply arrangements.

Output

The procurement project covers a wide range of tasks associated with the review of the ANSTO supply chain across the site, including an appropriate selection process, contract negotiation and registration of preferred supplier status. To support the process, a specialist team has been formed to review and evaluate outputs.

Outcome

The value to ANSTO will include cost savings, productivity and technology improvements, increased service levels, and safety and security enhancements. Our suppliers will also benefit from the partnership through the use of new technology and consistency of business opportunities.

Future

This project will be ongoing in an environment of continuous improvement where supply relationships will be monitored against key performance indicators. And when appropriate, outcomes and value will be tested against the market. We will stay abreast of developments in technology to ensure that ANSTO obtains maximum value from its supply chain.

Risk management

As a cross-organisational function involving all ANSTO staff, the risk management structure is embedded in ANSTO's day-to-day operational processes, ranging from good occupational health and safety practices to financial checking processes.

An independent internal auditor reviews these processes, maintaining close communication with senior management, and reports formally each quarter to the ANSTO Board Audit Committee.

The Australian National Audit Office (ANAO) conducts an annual audit of financial results and reports directly to the Audit Committee in that regard. The ANAO also conducts periodic reviews of specific functions of ANSTO and those, too, are reviewed by management and the Audit Committee.

Overview of financial performance

Particulars	Actual $000's	Budget $000's	Variance $000's
1. Revenue			
Appropriations	168,252	182,087	(13,835)
External earnings	38,144	36,713	1,431
Total	206,396	218,800	(12,404)
2. Expenditure			
Operating	108,644	105,766	(2,878)
Depreciation	28,368	29.451	1,083
Spent fuel	326	14,709	14,383
Capital use charge	68,851	68,874	23
Total	206,189	218,800	12,611
Net operating result	207		207
3. Capital expenditure	30,784	37,479	6,695
4. Replacement Reactor	77,167	86,893	9,726

Comments on variances from Budget

Appropriations

The variance of $13.8 million is due to deferment of the scheduled shipment for spent fuel and a change in the accounting treatment for amounts not expended. In this year $13.8 million was booked to unearned revenue and will be drawn as required in a future period.

External earnings

Industrial irradiation of silicon exceeded budget by $1.3 million, due to strong demand for ANSTO's quality services in final half of year.

Expenditure

After allowing for the impact of the deferred shipment of spent fuel operating expenditure overall is $1.2 million above budget principally due to increased security costs.

Net operating result

Favourable variance of $0.2 million.

Capital expenditure

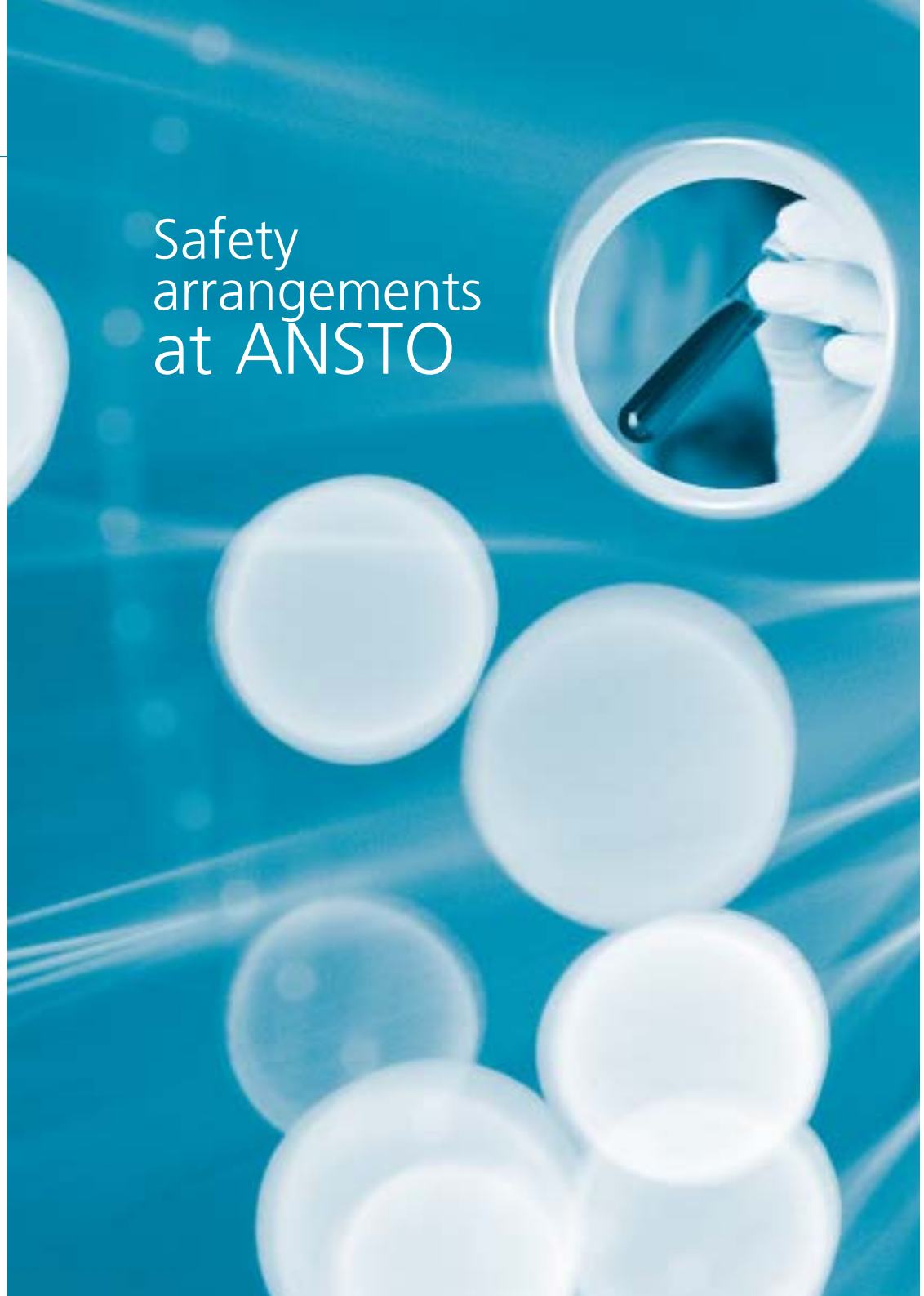
Under budget by $6.6 million due to delays in completion of major buildings and road works due to inclement weather.

Replacement Reactor

Under budget by $9.7 million due to delays which have occurred as a consequence of the seismic investigations. This has now been satisfactorily addressed.

Enquiries and complaints

Customer feedback is fundamental to improving customer service and is an integral part of all service charters. During the financial year, ANSTO recorded 260 customer queries, pertaining mainly to the supply and delivery of radiopharmaceuticals. Most of the non-technical issues were resolved within 24 hours.



Safety arrangements at ANSTO

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

Our objectives

To ensure our activities do not adversely impact on the community, our objectives are to:

1. provide protection of human health and safety as the organisation's highest priority;
2. provide and maintain safety systems and assessment procedures that are in accordance with national and international standards;
3. promote a positive safety culture; and
4. strive for continual improvement in safe work practices so that the risk to staff and the public from ANSTO's operations is as low as reasonably achievable.

Outcomes during the year

- Improved ownership of safety at the individual level through implementation of behavioural observation and accident investigation activities.
- Control of radiation exposure for employees again ensured that the highest dose to any employee was 9.7 mSv which is less than the occupational dose limit of 20 mSv.
- Annual radiation doses to the public from ANSTO discharges remained less than 0.01 mSv which is only 1% of the recommended annual limit of radiation recommended by the Radiation Health Committee for any person to receive over and above normal environmental and medical doses.
- Contributed to ANSTO's operational and research outcomes by providing safety systems and maintaining an emergency response capability to protect employees and the public.

Activities and Outputs

ARPANSA licensing and regulation

Licences have now been issued from ARPANSA for all of ANSTO's major facilities, for which quarterly reports continue to be produced on time.

Having the licence approvals, regulatory attention is now turning to continued compliance with the licence conditions. To this end, ARPANSA has instituted a program of planned inspections of ANSTO's controlled facilities and sources. The planned inspections carried out to date have shown ANSTO to be compliant with the licence conditions.

Safety management

The ANSTO Health, Safety and Environment Policy sets out safety and environmental principles, values and commitments. Under this policy is a framework of documents, including safety directives, that together provide the safety management system.

ANSTO's safety goals are:

- continual improvement of the efficiency and effectiveness of safety systems;
- regular promotion of safety initiatives and safety awareness programs;
- continually improving radiation protection;
- ensuring that staff are appropriately trained for all potentially hazardous activities; and
- complying with the requirements of the regulators Comcare and ARPANSA.

These goals are implemented by project activities involving staff from Safety and Radiation Science working in collaboration with the other divisions.

Monitoring of safety performance is a key element of the safety management system. The ANSTO Health, Safety and Environment Committee (AHSEC) has a membership that includes external members, ANSTO directors and senior staff. The role of this committee is to monitor health, safety and environmental performance and advise the Executive Director on these matters. AHSEC met four times during the year.

At the operational level, the Safety Assessment Committee, which also has external membership, provides internal review of all potentially hazardous activities involving ANSTO staff. They assessed and endorsed 126 submissions during the year.

Radiation protection

Radiation protection services are provided to ANSTO sites by the operational health physics group and the radiation monitoring group within Safety and Radiation Science. The operational health physics group monitors radiological conditions and provides specialist assistance in developing procedures for work in controlled areas. The group's work includes routine health physics monitoring of work areas to ensure that radiological hazards are controlled and safe working conditions are maintained. The radiation monitoring group provides dosimetry services, facilitates the measurement of airborne discharges and provides radiation instrument calibration services.

The dosimetry service involves monitoring any radiation doses that may be received externally or internally by workers. This is part of assuring safety at work for all personnel. The service monitored 859 workers during the year, 83% of whom received less than 1 mSv and no person received more than 9.7 mSv. The highest dose is well below the relevant regulatory annual dose limit of 20 mSv (averaged over five years) for radiation workers. 18 of the 23 workers with doses between 5 and 10 mSv had been involved with radiopharmaceutical production at the Lucas Heights site or at the National Medical Cyclotron.

Safety arrangements at ANSTO

Dose is the physical quantity involved with assessing the effects of ionizing radiation on living cells. The unit of measurement of dose is joules per kilogram, termed the sievert (Sv). Typical doses are expressed in units of millisievert (mSv), which is one thousandth of a sievert. Dose estimates take into account the susceptibility of different body organs to radiation.

Everyone in the world receives ionizing radiation from natural sources.

In Australia the average dose received from natural background radiation (excluding medical exposures) is 1.5 mSv per year.

Table1 shows the maximum, average and collective effective doses for the past four years. The distribution of individual effective doses over that period is given in Table 2. To enable comparison, the maximum and average effective doses for the period are graphed in Figure1.

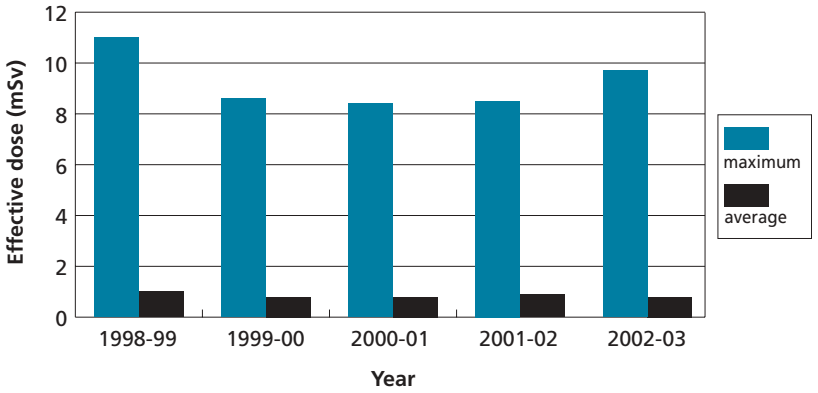
Table 1: Effective dose

		1998 -1999	1999 -2000	2000 -2001	2001 -2002	2002 -2003
Maximum effective dose	mSv	11.3	8.9	8.6	8.7	9.7
Average effective dose	mSv	1.0	0.8	0.8	0.9	0.8
Collective effective dose	person mSv	772	617	630	749	684

Table 2: Distribution of individual effective dose

Individual effective dose ranges (mSv)	1998 -1999	1999 -2000	2000 -2001	2001 -2002	2002 -2003
≤ 2	665	669	700	726	756
> 2 to 5	81	67	65	77	80
> 5 to 10	25	26	23	25	23
> 10 to 15	1	0	0	0	0
> 15	0	0	0	0	0

Figure 1: Comparison of the maximum and average effective doses (mSv)



The highest shallow dose (skin dose) for the year to any individual was 17.74 mSv, which is a small fraction of the national and international annual dose limit of 500mSv.

Staff who handle radioisotopes may receive doses to their hands and fingers that are significantly different to their whole body average and consequently these extremity doses are monitored separately. The highest extremity dose to any individual for the year was 239 mSv, which is less than the annual dose limit of 500mSv.

Annual dose limits

Whole body	20 mSv
Shallow (skin)	500 mSv
Extremities	500 mSv

There is routine monitoring for possible internal exposures of staff working with unsealed sources. The methods used include bioassay and whole body and thyroid counting. Any such doses are added to those from external radiation in the effective doses reported above.

Occupational health and safety

Accidents and incidents

An important element of the safety management system involves capturing information on all safety-related events including accidents and 'near misses'. This system ensures appropriate investigation and follow-up of events and provides data for monitoring of safety performance. Significant incidents are reportable to Comcare and are recorded using its classification system.

Seven notifications to Comcare of reportable incidents were made during the year.

Safety arrangements at ANSTO

One "serious personal injury" report was made, which involved a crush injury to the nail of a staff member's finger caused by the clamp of a guillotine. The guarding of the guillotine was immediately improved and all health and safety representatives and workshop supervisors were issued Comcare's 'Identifying Plant Hazards Checklist' to review guarding on all plant.

One 'incapacity' was reported as a result of a person losing more than 30 consecutive working days. This resulted from a fracture to the wrist following a fall while cleaning.

EMERGENCY PREPAREDNESS AND EFFECTIVE RESPONSES

A high safety priority this year has been raising awareness of and training staff in the hazards of confined space entry. An important part of this is the emergency response to any incident that may occur.

A hypothetical emergency involving a confined space rescue from the tandem accelerator was simulated to exercise the response capability.

Kevin Thorpe acts out a suspected diabetic coma during a confined space rescue exercise that took place in the tandem accelerator.

The hypothetical scenario

The tandem accelerator is open for routine maintenance. Confined space entry clearance has been given and workers are inside performing maintenance. One worker is discovered collapsed on the floor in what is suspected to be a diabetic coma.

The rescue

An emergency call is made to the Site Alarm Centre and the Site Operations Safety Supervisor responds to the scene.

The vessel is entered, first aid given and the patient made stable. The patient is then recovered from the vessel to waiting ambulance staff.

Lessons learnt

Changes to the work environment were identified that would assist a 'real' rescue, should it be required. Also some improvements to response procedures were identified.

The remaining five reports were classified as 'dangerous occurrences' and were unrelated:

1. Pieces of concrete debris fell from a building onto a pathway due to concrete ageing. A structural engineer inspected the site, loose material was removed and the area made safe before repairs were instigated.
2. A mobile elevated work platform (snorkel) was setting up in a workshop to carry out upgrade work on an overhead travelling crane. The placement was over a services valley covered in plate metal which buckled under the weight of the equipment. The snorkel was undamaged. The damaged plates were taken for repair and all floor plates were reviewed for modification to take loads required for future maintenance.
3. A process in one of the research laboratories uses hydrofluoric acid solution (which is corrosive and toxic) to dissolve quartz. During a regular check of the process the chemist observed that a sealed bottle had spilt and leaked acid. The emergency response procedures were initiated and HAZMAT was called to make the area safe. During the subsequent recovery a safe work method statement was developed for safe clean-up of the laboratory. Changes to the equipment and procedures have been instigated following the investigation.
4. In another research laboratory process, grit is digested by a small quantity of a mixture containing nitric acid, hydrochloric acid and hydrofluoric acid. The digestion takes place in a microwave oven. After a digestion run the operator received a whiff of gases when the oven door was opened. This incident was unrelated to the previous incident. Changes to procedures have been made following the investigation.
5. A building contractor was cutting through an internal wall and severed an electrical cable inside the wall. The wall had been checked the previous day by an electrician and cleared for the work to go ahead. Improved scanning equipment has been purchased.

Safety training

In addition to filling requirements for induction and role specific safety training, the focus has been directed towards:

- providing accredited competency-based training for staff required to enter confined spaces (75 staff);
- training supervisors in safety behaviour observation (105 staff);
- training staff in the application of new safety directives and safe systems of work (322 staff); and
- accident investigation training for supervisors in preparation for the revised event reporting system (152).

Safety arrangements at ANSTO

Overall 900 contractors completed contractor site induction and 1956 staff participated in 173 courses covering 50 different safety topics.

Emergency preparedness and effective responses

ANSTO, together with State emergency services organisations, maintains a 24-hour emergency response capability to deal with incidents on-site and off-site at the Lucas Heights Science and Technology Centre.

The Response Plan for Accidents and Incidents at the ANSTO LHSTC identifies responsibilities and provides arrangements to coordinate the response. Details of how ANSTO and the emergency services organisations respond are contained in standing operating procedures owned by the individual organisations.

Emergencies with off-site consequences are covered by escalating arrangements consisting of the Sutherland Shire Local Disaster Plan, the Georges River District Disaster Plan and the NSW State Disaster Plan. The ANSTO Response Plan provides for ANSTO staff giving technical and practical support to the emergency services organisations for incidents with off-site consequences.

A close working relationship is maintained between ANSTO and the State emergency services organisations through the Local Liaison Working Party (LLWP). Membership of this working party includes ANSTO specialists, the emergency services organisations, local government and support organisations including NSW Health. ARPANSA is an observer.

In July 2002 a combined exercise was held with the local NSW Ambulance Rescue, the purpose of which was to exercise coordination between ANSTO first response personnel and outside agencies. An internal exercise was held in October 2002 (see page 92) to exercise confined space training and instigate a rescue from a confined space.

A program of familiarisation visits through the year by all the local NSW Fire Brigades has been highly successful and will be maintained. ANSTO and ARPANSA are working together to develop ideas and draft material to augment the familiarisation visits of the emergency services organisations.

Environmental Protection

Environmental Protection

Environmental management

ANSTO is committed to undertaking its activities in a manner that protects the environment and is consistent with national and international standards. ANSTO reports the results and findings of its environmental monitoring in the annual *Environmental and Effluent Monitoring at ANSTO Sites* report which is available to the public.

An aerial survey using a helicopter carrying radiation detectors was used to determine the radiological characterisation of the Lucas Heights Science and Technology Centre and the buffer zone. The gamma spectrometry data indicated no measurable impact of long-lived, man-made radioactivity in the buffer zone beyond the LHSTC boundary. The results of this survey provide a baseline for assessing radiological trends over time.

ISO14001 Certification

As part of its strategic plan, ANSTO is implementing an environmental management system that will be certified to the international standard ISO14001. ANSTO has committed to have this certification standard prior to commissioning of the replacement research reactor, scheduled for 2005.

A register of environmental aspects for ANSTO activities has been developed as required for ISO14001 certification. The ISO14001 environmental management system will demonstrate ANSTO's commitment to the environment.

Safe gaseous emissions

In the course of normal operations, some ANSTO facilities produce small gaseous radioactive emissions which are minimised by treatment and filtration before discharge. They are all constantly monitored.

The effect on local residents of the airborne emissions is too small to detect directly, so an atmospheric dispersion model is used to estimate doses to public in the surrounding region. The maximum potential public dose determined by the atmospheric dispersion model, PC-CREAM, was 0.005 mSv for the 2002-03 financial year. Details of the dose calculation and quarterly dose results are provided in the report, *Environmental and Effluent Monitoring at ANSTO Sites.*

The doses from airborne emissions are a very small fraction of the average dose of 1.5 mSv per year that Australians receive from natural background radiation and less than 1% of the 1 mSv annual limit recommended by the National Health and Medical Research Council for any added dose (i.e. above background) to a member of the public. For comparison, 0.01 mSv corresponds to the dose a passenger receives on a return commercial airline flight between Sydney and Melbourne.

Liquid effluent discharges within limits

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

Good quality storm and groundwater

ANSTO regularly monitors the storm water leaving the site and the groundwater collected from an array of groundwater monitoring bores. The tritium concentrations measured in stormwater are well below the Australian Drinking Water Guidelines and gross alpha/beta measurements were also below the levels required of Class C waters designated by the NSWEPA.

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

The groundwater response to heavy rainfall has been assessed using continuous water level measurements over a year. The response is consistent with a groundwater flow regime consisting of a near surface permeable aquifer, which drains within a few weeks, and deeper, less permeable material.

Transportable high volume air sampler which samples air at the rate of 70 cubic metres of air per hour, is deployed at the Little Forest Burial Ground to monitor the air for particulates.

Stormwater and groundwater drain into the MDP + 60m site, situated at the south-east corner of ANSTO. Creek water is sampled from this site weekly and measured for tritium, gross alpha/beta activity and the presence of gamma-emitting nuclides.

Corporate Governance

Corporate Governance

Compliance

ANSTO is subject to the provisions of the following key Commonwealth Acts and Awards:

- *Australian Nuclear Science and Technology Organisation Act* 1987 *(ANSTO Act)*
- *Auditor-General Act* 1997
- *Commonwealth Authorities and Companies Act* 1997 *(CAC Act)*
- *Workplace Relations Act* 1996
- *Public Service Act* 1999
- *Long Service Leave (Commonwealth Employees) Act* 1976
- *Superannuation Act* 1976
- *Superannuation Act* 1990
- *Superannuation (Productivity Benefit) Act* 1988
- *Superannuation Guarantee (Administration) Act* 1992
- *Maternity Leave (Commonwealth Employees) Act* 1987
- *Nuclear Non-proliferation (Safeguards) Act* 1987
- *Australian Radiation Protection and Nuclear Safety Act* 1998
- *Australian Radiation Protection and Nuclear Safety (Licence Charges) Act* 1998
- *Freedom of Information Act* 1982
- *Environment Protection and Biodiversity Conservation Act* 1999
- *Occupational Health and Safety (Commonwealth Employment) Act* 1991
- *Australian Nuclear Science and Technology Organisation (General) Award* 1990
- *Australian Government Statutory Authorities Redeployment and Retirement (Redundancy) Award* 1988
- *A New Tax System (Goods and Services Tax) Act* 1999.

ANSTO has put in place policies and procedures to deliver compliance with the above Acts and Awards.

The provisions of the Australian Government Statutory Authorities Redeployment and Retirement (Redundancy) Award 1988 are only operative to the extent that they deal with an allowable matter in terms of Section 89A of the *Workplace Relations Act* 1996.

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 9 of the *ANSTO Act* are to:

- ensure the proper and efficient performance of the functions of the organisation; and
- 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; and
- ensuring that the significant risks facing the organisation have been identified and that appropriate control, monitoring and reporting mechanisms are in place.

The CAC 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; and
- 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 and performance assessment of the Board and its committees.

The Board has established an Audit Committee. All matters considered by that 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.

Board membership

During the 2002-03 financial year, the Board comprised 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 2002-03 financial year had experience in areas that included public service, industry, mining, scientific research, medicine and the commercialisation of research.

Corporate Governance

Member	Meetings Held	Meetings Attended
Dr I D Blackburne (Chair)	6	6
J M Craker (term concluded 31 December 2002)	3	2
Dr C J Hillyard	6	5
G Cook	6	6
M A Eager	6	6
Dr A A van der Schaaf (term commenced 25 July 2002)	6	6
Dr K H Schindhelm (term commenced 20 March 2003)	2	2
Professor H M Garnett (Executive Director)	6	6

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.

Six Board meetings were held during the 2002-03 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 above.

Remuneration and allowances

Non-executive members of the Board and the Executive Director's remuneration and allowances are determined by government policy .

Remuneration of Board members is disclosed in the Financial Statements.

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 member on such 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.

Report of operations

Section 9, Schedule 1 of the CAC Act requires that this Annual Report include a report of operations. *The Commonwealth Authorities and Companies (Report of Operations) Orders* 2002 set out the requirements. The format and content of the 2002-03 Annual Report, including the financial statements, addresses these requirements in general and Appendix 9 sets out compliance with the particular requirements of these Orders. The Board reports that:

- ANSTO's mission and strategic plan has not changed from that reported for the previous financial year and continues to be managed through six core business areas;
- each core business area is reported against in terms of its outputs, strategies for achieving and contribution to outcomes and future performance;
- 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; and
- ANSTO has continued to manage both the risks and opportunities it faces.

In the opinion of 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 sets out clearly the Organisation's commitment to verifiable implementation of best practices in safety and environmental protection.

The Board continued to attach priority to the recommendations on safety made by the Australian Radiation Protection and Nuclear Safety Agency. Under the ARPANS Regulations 1999, ANSTO has submitted licence applications and received licences for all ANSTO facilities and radioactive sources. Procedures are in place to ensure compliance with all licence conditions.

ANSTO has the ANSTO Health, Safety and 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 a further two years to 2003 and now to 2005. The audit program for 2002-03 was successfully completed. Comcare conducted its own audit of ANSTO's self audit activities with positive results reported to the Executive Director, Board Audit Committee and the Board.

Audit Committee

The Audit Committee, a formal sub-committee of the Board, comprised during the year Mr M A Eager (Chairman), Dr C J Hillyard, Mr J M Craker (until 31 December 2002) and a member external to ANSTO,

Corporate Governance

Mr W Wilton. Mr Wilton is a chartered accountant. The ANSTO Chairman is an ex officio member of the Committee. The Executive Director, the Director, Corporate Services, the Chief Financial Officer and the Chief Internal Auditor attend all meetings or relevant parts of all meetings by invitation. Others, including representatives of the Australian National Audit Office, attend meetings, as appropriate, at the invitation of the Committee. In accordance with better 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 including the financial reporting process, legislative and regulatory conformance, including 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 has received a signed recommendation from the Chief Financial Officer, through the Director Corporate Services and the Executive Director, as to the veracity of the financial statements signed by the Board.

Four 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.

Member	Meetings Held	Meetings Attended
M A Eager (Chairman)	4	4
J M Craker (term concluded 31 December 2002)	2	2
W Wilton (external member)	4	4
Dr C J Hillyard	2	2

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

Technical Advisory Committee

The Technical Advisory Committee, formally established in accordance with a Board decision, comprises four members, all of whom are external to ANSTO. Members are chosen on the basis of internationally recognised scientific expertise and experience. The current members (as at 30 June 2003) of the Committee are Dr Roy Green (Australia), Professor Alan Leadbetter (United Kingdom) and Dr Dan Shochat (United States), with the term of Professor Joan Dawes (Australia) having been completed on 26 March 2003.

This Committee operates under a written terms of reference and was established by the Board to advise on:

- whether projects are nationally or internationally important;
- the quality of the science and whether it is appropriately focussed and achievable;
- the quality of the networks and/or collaborations with other relevant research leaders and industry, and whether other contacts and networks could add value; and
- whether the research is being presented at the most appropriate fora, and other ways whereby ANSTO research can be fully recognised and the value captured.

The Committee was formally constituted in October 1996 and is required to meet at least once per year. It met during the 2002-03 financial year and presented a formal report to the Board.

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. 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 – 4360/1999. The Audit Committee and the ANAO receive summaries of all risk assessment reports.

ANSTO has a risk management policy setting out that it is the responsibility of the operational management of ANSTO to develop and implement risk mitigation strategies. The 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 replacement research reactor, business information system, particular capital works and information technology outsourcing projects.

Corporate Governance

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

The Board, supported by the Audit Committee, oversights 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.

Fraud control

The organisation has an established fraud control policy and plan, in line with the *Fraud Control Policy of the Commonwealth* and 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 reviews 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.

Information technology services market testing

Pursuant to a whole of government policy, the Board and the ANSTO Executive Director have a responsibility to ensure that ANSTO conducts a market testing exercise on the provision of relevant information technology services.

A project to undertake this market testing exercise was commenced in 2001 and was completed in July 2003 in accordance with a defined plan.

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 and adheres closely to the Customer Service Charter Principles developed by the Department of Finance and Administration.

External scrutiny

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

Ministerial directions

There were no ministerial directions to ANSTO made under either the ANSTO Act or the CAC Act during the reporting year.

Under the relevant provisions of the CAC Act, the Minister for Education, Science and Training consulted the ANSTO Board during the year in relation to the adoption of the amended *Fraud Control Policy of the Commonwealth*. The Board responded to the Minister that it would comply with this policy, as it had done with the previous policy. The Minister, using CAC Act provisions, consulted the Board during the year in relation to the adoption of Government policy on foreign exchange risk management and a response was provided.

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 the insurer, Comcover.

Associated Organisations and Programs

Associated Organisations and Programs

Northern Territory University doctoral student and AINSE Postgraduate Research Award Scholar, Tony Jong, using the SIMS facility as part of his doctoral research.

Australian Institute of Nuclear Science and Engineering

Located next to ANSTO at the Lucas Heights Science and Technology Centre, the Australian Institute of Nuclear Science and Engineering (AINSE) Incorporated is a consortium of 36 Australian universities and the University of Auckland in partnership with ANSTO. It has four full-time staff.

AINSE is a non-profit-making institute incorporated under the *NSW Associations Incorporation Act* 1984 and was established by the Commonwealth Government in 1958 to conduct research into nuclear energy and to provide training in the nuclear field.

AINSE's mission is to advance research, education and training in nuclear science and engineering and their applications within Australia by being, in particular, the key link between universities, ANSTO, and major nuclear science, engineering and associated facilities.

AINSE's governing council comprises a representative of each member university, the executive director of ANSTO and five directors of ANSTO's scientific and technical divisions.

AINSE's objectives are to:

- ensure users in member organisations of AINSE have access to major nuclear science, engineering and associated facilities for research purposes;
- facilitate graduate and undergraduate education and training experience utilising major nuclear science and technology facilities;
- encourage collaboration and cooperation between member organisations of AINSE in areas primarily related to nuclear science and engineering and their applications; and
- sustain and support the development of major nuclear science and technology facilities in Australia for shared use by AINSE's member organisations.

AINSE operates on a calendar-year basis and this report covers 1 January to 31 December 2002. Income of $2,765,717 comprised $1,351,577 from ANSTO, $705,526 from university subscriptions, $494,090 from external grants, and $209,664 from interest on investments and $4,860 from other sources – mainly conference registrations.

Core business

AINSE uses the funds it receives primarily to provide access to the nuclear and other facilities at ANSTO and AINSE-supported facilities. During 2002, 283 university projects were supported, including 204 new and 79 carried over from previously, along with 34 postgraduate research student supplements, representing $2,090,619 in total. Some 20% of these researchers had not previously had access to ANSTO's facilities, and for 12 of the postgraduates, the award was the first they had received from AINSE.

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

AINSE supported two neutron scattering workshops, two national conferences and one international conference during the year by subsidising the travel to and accommodation at the conferences for researchers and students from member universities.

The Fifth AINSE Winter School was held in July 2002. A scholarship was offered to every member university to enable a nominated third-year student to participate, and 37 attended. Judged to be an outstanding success from feedback, the program will be held again in 2003.

AINSE is very grateful to the staff at ANSTO who give their time and expertise to this important program. It significantly contributes to AINSE's and ANSTO's public profile, and is especially effective as an 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 to the Australian Research Council (ARC) Research Infrastructure and Equipment Fund was successful. The grant of $255,000 for access to the UK facility ISIS, the world's most powerful pulsed neutron source, is supplemented by $90,000 from universities, $25,000 from ANSTO and $30,000 from AINSE. Twenty-four experiments were accepted and they used a total of 75 days. There were ten publications notified during the year.

A new accelerator was purchased with the assistance of a 2000 ARC Linkage-Infrastructure Grant, 27 universities and ANSTO. Ordered in December 1999 and delivered in October 2002, it is expected to perform routine accelerator mass spectrometry and ion beam analyses from December 2003.

To free the bottleneck with AMS sample preparation, AINSE presented ANSTO with an elemental analyser/isotope ratio mass spectrometer. Worth about $264,000, this facility will facilitate both automatic

preparation of graphite targets for AMS analysis as well as determine the carbon-13/carbon-12 isotope ratio which provides critical quality control as well as calibration information. This facility was delivered in January 2003 and will be operational before the end of 2003.

AINSE member organisations as at 30 June 2003

ANSTO, Australian Catholic University, University of Adelaide, University of Auckland, Australian National University, University of Ballarat, University of Canberra, Central Queensland University, Charles Sturt University, Curtin University of Technology, Deakin University, Edith Cowan University, Flinders University of South Australia, Griffith University, James Cook University of North Queensland, La Trobe University, Macquarie University, University of Melbourne, Monash University, Murdoch University, University of New England, University of New South Wales, University of Newcastle, Northern Territory University, University of Queensland, Queensland University of Technology, Royal Melbourne Institute of Technology, Southern Cross University, University of South Australia, University of Southern Queensland, Swinburne University of Technology, University of Sydney, University of Tasmania, University of Technology, Sydney, Victoria University of Technology, University of Western Australia, University of Western Sydney and University of Wollongong.

For further information on AINSE, visit its website at http://www.ainse.edu.au.

Access to Major Research Facilities Program

Acting on the recommendation of its International Science and Technology Advisory Committee, the Department of Industry and Technology set up the Access to Major Research Facilities Program (AMFRP) in 1990. ANSTO has operated AMFRP since its inception.

It is currently funded under the Innovation Access Program and administered by the Department of Education, Science and Training. Initially $150,000 per year, its funding has increased steadily and currently stands at $621,500 including GST and a management fee.

The cost of constructing large research facilities, which now dominate many aspects of scientific activities, can exceed several billion dollars. Furthermore as science has become more and more sophisticated, the range and scope of such facilities has also increased.

For Australian science to participate in current activities and for the country to benefit from developments in technology, it has been recognised that mechanisms must be developed that allow Australian scientists to gain access to these overseas facilities.

The objectives of the program are to provide support for Australian researchers from industry, private or public research organisations and universities to travel to:

1. access major international research facilities not available in Australia; and
2. attend strategic planning meetings where this can be clearly demonstrated to be essential to Australia's participation in projects using major international research facilities not available in Australia.

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

- Access to such facilities is competitive and subject to heavy worldwide demand. Scientists who apply for access to the facilities are often given only short notice that they have been successful in their application. Hence a program with a very short turnaround time is vital to enable the scientist to make use of the access time granted.
- In many cases the use of these facilities is complex and requires more than one person to operate the equipment. Postgraduate students and technicians are therefore often involved in the running of the experiment. This program provides for multiple personnel to visit the facilities.

During 2002-03, the AMFRP funded 83 experimental teams that performed experiments on facilities in USA, Europe and Asia. Fifteen ANSTO teams were funded to overseas neutron scattering, synchrotron and accelerator facilities.

Australian Synchrotron Research Program

ANSTO manages the Australian Synchrotron Research Program (ASRP), which provides access to a comprehensive range of synchrotron x-ray research capabilities for Australian science in the fields of physics, chemistry, materials science, structural biology, polymer research, environmental science and geophysics.

ASRP's member organisations are ANSTO, the Australian National University, Curtin University of Technology, the University of Sydney, the University of Canberra, the University of NSW, the University of Melbourne, Monash University, the University of Newcastle, the University of Queensland, the University of South Australia, the University of Western Australia, the CRC for Microtechnology, CSIRO and the State Governments of NSW, Queensland and Victoria.

The ASRP was established to operate synchrotron radiation research facilities at two overseas laboratories – the Photon Factory in Japan and the Advanced Photon Source in the United States. Any research scientist affiliated with an Australian academic, government or industry research organisation can obtain access to these facilities via a peer reviewed research proposal. ANSTO maintains specialist scientific staff at these facilities to assist visiting Australian research teams.

The Australian synchrotron user community has grown steadily since the ASRP was established in 1996. The ASRP currently

Associated Organisations and Programs

supports visits to the 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 CSIRO, and five CRCs have used ASRP beamlines in the past six years.

During the last financial year, ANSTO continued to be a significant user of ASRP facilities, with funding and beamtime awarded to nine teams from ANSTO Environment, Materials and Engineering Science, and the Bragg Institute.

The ASRP was initially funded for a five-year period by the Major National Research Facilities (MNRF) program in 1996. A proposal for funding for an additional five years was submitted to the 2001 MNRF program with ANSTO again acting as the principal proponent and managing agent. This proposal was successful, with the ASRP being awarded $14.8 million to operate until mid-2007.

Included in the current ASRP grant are new funds to expand access to soft x-ray beamline facilities, an area that was under-resourced in the original ASRP operation. Accordingly in 2002 the ASRP negotiated a new collaborative agreement with the National Synchrotron Radiation Research Center (NSRRC), which operates a 1.5 GeV synchrotron facility in Hsinchu, Taiwan. Under this agreement ASRP users have access to all beamlines at the NSRRC, including nine state-of-the-art soft x-ray beamlines, an infra-red beamline and a deep x-ray lithography beamline for manufacturing micro-structure devices. The ASRP has begun the acquisition of a specialised soft x-ray end station which will be based at NSRRC and available to Australian users.

The ASRP administers a post-doctoral fellowship program, using membership subscriptions from the 16 member organisations. In July 2002 the ASRP awarded five fellowships, to be taken up at ANSTO, CSIRO, Monash University, the University of Melbourne and the University of New England (under the NSW State membership). An additional fellowship round closed in May 2003, and it is expected that a further six fellowships will be awarded.

Dr Richard Garrett, ASRP Facility Director, and Dr King-Long Tsang, Head, Beamline Division at the Taiwan synchrotron, taken during a visit in July 2002 to negotiate access to that facility for ASRP users.

Financial Statements

Australian Nuclear Science & Technology Organisation

STATEMENT BY DIRECTORS

In our opinion, the attached financial statements for the year ended 30 June 2003 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

19th August 2003
Sydney

Helen M Garnett
Executive Director

19th August 2003
Sydney

Australian National Audit Office

INDEPENDENT AUDIT REPORT

To the Minister for Science

Scope

I have audited the financial statements of the Australian Nuclear Science and Technology Organisation for the year ended 30 June 2003. The financial statements comprise:

- Statement by Directors;
- Statements of Financial Performance, Financial Position and Cash Flows;
- Schedules of Commitments, Contingencies and Administered Items; and
- Notes to and forming part of the Financial Statements.

The members of the Board are responsible for the preparation and presentation of the financial statements and the information they contain. I have conducted an independent audit of the financial statements in order to express an opinion on them to you.

The audit has been conducted in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards, to provide reasonable assurance as to whether the financial statements are free of material misstatement. Audit procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial statements and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion as to whether, in all material respects, the financial statements are presented fairly in accordance with Accounting Standards and other mandatory professional reporting requirements in Australia and statutory requirements so as to present a view which is consistent with my understanding of the Organisation's financial position, its financial performance and its cash flows.

The audit opinion expressed in this report has been formed on the above basis.

Audit Opinion

In my opinion the financial statements:

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

(ii) give a true and fair view, in accordance with applicable Accounting Standards and other mandatory professional reporting requirements in Australia and the Finance Minister's Orders, of the financial position of the Australian Nuclear Science and Technology Organisation as at 30 June 2003, and its financial performance and cash flows for the year then ended.

Australian National Audit Office

P Hinchey
Senior Director
Delegate of the Auditor-General

Sydney
19 August 2003

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

STATEMENT OF FINANCIAL PERFORMANCE FOR THE YEAR ENDED 30 JUNE 2003

	Note	2003 $'000	2002 $'000
REVENUE			
Revenues from ordinary activities			
Revenues from Government	2(p), 4A	**168,252**	152,364
Goods and services	4B	**33,645**	32,251
Grants	4B	**624**	738
Interest	4B	**3,356**	1,255
Revenue from sale of assets	4C, (c)	**507**	862
Net foreign exchange gains – non speculative	4D	**12**	6
Other	4E	**–**	151
Revenues from ordinary activities		**206,396**	187,627
EXPENSES			
Expenses from ordinary activities (excluding borrowing costs expenses)			
Employees	5A	**49,738**	53,948
Suppliers	5B	**55,904**	46,939
Depreciation and amortisation	5C	**28,368**	24,672
Write down of assets	5D	**585**	1,143
Grants	5E	**2,278**	1,964
Value of assets sold	5F, (c)	**333**	324
Expenses from ordinary activities (excluding borrowing costs expenses)		**137,206**	128,990
Borrowing costs expense	5G, (b)	**132**	124
Operating surplus from ordinary activities	(a)	**69,058**	58,513
Net surplus	9	**69,058**	58,513
Net credit to asset revaluation reserve	9	**24,320**	–
Total revenues, expenses and valuation adjustments recognised directly in equity		**24,320**	–
Total changes in equity other than those resulting from transactions with owners as owners		**93,378**	58,513

STATEMENT OF FINANCIAL PERFORMANCE FOR THE YEAR ENDED 30 JUNE 2003

Notes:

(a) The net surplus, after allowance for payment of the capital use charge to Government of $68.8 million (2002: $57.7 million) represents an operating surplus from ordinary activities of $0.207 million (2002: operating surplus $0.840 million).

(b) This amount relates to interest attributable to prepaid revenue under a lease of property (refer Note 8A).

(c) Last year amounts have been adjusted for comparative purposes.

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

STATEMENT OF FINANCIAL POSITION AS AT 30 JUNE 2003

	Note	2003 $'000	2002 $'000
ASSETS			
Financial assets			
Cash	6A	**5,426**	34,523
Receivables	6B	**85,181**	9,811
Investments	6C	**53,083**	17,953
Total financial assets		**143,690**	62,287
Non-financial assets			
Land and buildings	7A	**167,627**	138,533
Infrastructure, plant and equipment and major facilities	7B	**389,765**	314,639
Inventories	7C	**8,114**	5,189
Intangibles	7D	**2,906**	4,473
Other	7E	**380**	5,502
Total non-financial assets		**568,792**	468,336
Total assets		**712,482**	530,623
LIABILITIES	8		
Interest bearing liabilities			
Other	8A	**2,326**	2,194
Total interest bearing liabilities		**2,326**	2,194
Provisions			
Capital use charge	8B	**–**	1,355
Employees	8C	**20,433**	21,788
Other	8D	**8,949**	7,364
Total provision		**29,382**	30,507
Payables			
Suppliers	8E	**14,707**	8,178
Grants	8F	**57**	76
Other	8G	**14,210**	228
Total payables		**28,974**	8,482
Total liabilities		**60,682**	41,183
NET ASSETS		**651,800**	489,440

STATEMENT OF FINANCIAL POSITION AS AT 30 JUNE 2003

	Note	2003 $'000	2002 $'000
EQUITY	9		
Contributed equity		**265,889**	128,056
Reserves		**319,579**	284,259
Accumulated surpluses		**66,332**	77,125
Total equity		**651,800**	489,440
Current assets		**146,898**	64,765
Non-current assets		**565,584**	465,858
Current liabilities		**50,334**	29,844
Non-current liabilities		**10,348**	11,339

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

STATEMENT OF CASH FLOWS FOR THE YEAR ENDED 30 JUNE 2003

	Note	2003 $'000 Inflows (Outflows)	2002 $'000 Inflows (Outflows)
OPERATING ACTIVITIES			
Cash received			
Goods and services		**38,490**	28,598
Interest		**3,248**	1,306
GST received from ATO		**13,147**	7,569
Appropriations		**168,252**	152,364
Total cash received		**223,137**	189,837
Cash used			
Employees		**(50,666)**	(52,138)
Suppliers		**(62,618)**	(53,642)
Grants		**(2,278)**	(735)
Total cash used		**(115,562)**	(106,515)
Net cash from operating activities	10	**107,575**	83,322
INVESTING ACTIVITIES			
Cash received			
Proceeds from sales of property, plant and equipment		**507**	861
Proceeds from sales/maturity of investments		**18,000**	13,831
Proceeds from foreign currency disposals		**87**	55,523
Total cash received		**18,594**	70,215
Cash used			
Purchase of property, plant and equipment	*	**(107,034)**	(77,099)
Purchase of investments		**(53,130)**	(31,784)
Purchase of foreign currency for future construction progress payments		**–**	(52,750)
Purchase of foreign currency for future supplier payments		**(319)**	(29,744)
Total cash used		**(160,483)**	(191,377)
Net cash used by investing activities		**(141,889)**	(121,162)
FINANCING ACTIVITIES			
Cash received			
Appropriation – contributed equity		**73,836**	64,039
Total cash received		**73,836**	64,039

STATEMENT OF CASH FLOWS FOR THE YEAR ENDED 30 JUNE 2003

	Note	2003 $'000 Inflows (Outflows)	2002 $'000 Inflows (Outflows)
Cash used			
Capital use charge paid		**(68,851)**	(57,655)
Total cash used		**(68,851)**	(57,655)
Net cash from financing activities		**4,985**	6,384
Net decrease in cash held		**(29,329)**	(31,456)
Cash at 1 July		**34,523**	39,008
Cash at 30 June		**5,194**	7,552
Cash per statement of financial position	6A	**5,426**	34,523
Less cash not used in the daily cash management function			
Foreign currency held as forward cover for future construction progress payments	6A	**–**	(24,267)
Foreign currency held as forward cover for future supplier payments	6A	**(232)**	(2,704)
		5,194	7,552

* The major portion of the figure in 2003 relates to the cash flow impact of the Replacement Research Reactor of $79.2 million (in 2002: $52.8 million).

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

SCHEDULE OF COMMITMENTS NOT RECOGNISED AS LIABILITIES AS AT 30 JUNE 2003

	Note	2003 $'000	2002 $'000
CAPITAL COMMITMENTS			
Infrastructure, plant and equipment		1,900	5,335
Waste treatment and disposal project		–	4,730
Fuel elements purchase		3,718	4,340
Total capital commitments		5,618	14,405
By maturity			
Capital commitments payable			
One year or less		4,738	9,675
From one to five years		880	4,730
Over five years		–	–
		5,618	14,405
OTHER COMMITMENTS			
Replacement Research Reactor Project	(b)	207,324	257,500
Disposition of spent fuel	(a)	60,646	59,916
Operating lease	(c)	2,543	2,661
Total other commitments		270,513	320,077
Total commitments payable		276,131	334,482
Commitments receivable			
Replacement Research Reactor Project	(b)	207,324	257,500
Disposition of spent fuel	(a)	46,811	59,916
GST recoverable from Australian Taxation Office		511	1,310
Total commitments receivable		254,646	318,726
Net commitments		15,867	1,351
By maturity – operating lease – minimum payments			
One year or less		118	118
From one to five years		591	591
Over five years		1,834	1,952

SCHEDULE OF COMMITMENTS NOT RECOGNISED AS LIABILITIES AS AT 30 JUNE 2003

(a) In 1997-1998 the Government determined to provide $98.56 million in 2003 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 $37.914 million has been spent to date. The amount of $60.646 million is not included in the commitment by maturity figures as the commitment payable is fully offset by the commitment receivable and $13.835 million recognised as other receivable, refer Note 6B(b).

(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 $207.324 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 of $118,142. The annual rental is subject to review each three years.

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

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 2003

1 Economic dependency

Australian Nuclear Science & Technology Organisation (ANSTO) 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 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 2003) Orders);*
- Australian Accounting Standards and Accounting Interpretations issued by the Australian Accounting Standards Board;
- Consensus views of the Urgent Issues Group (UIG).

Schedule 1 requires statements to be prepared having regards to:

- The explanatory Notes to; and
- Finance Briefs, Finance Circulars and other Guidance Notes issued by Finance.

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 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 liablities 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.

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.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

(b) Changes in accounting policies

The accounting policies used in the preparation of these financial statements are consistent with those used in 2001-02, except in respect of:

- Measurement of certain employee benefits at nominal amounts (refer to Note 2e)
- The initial revaluation of land on a fair value basis (refer to Note 2k)
- In accordance with the Finance Minister's Order appropriations made by Goverment but not drawn at balance date are now recorded as a receivable, whereas in the previous years no accounting recognition was made. Refer to Note 6B(b).

(c) Reporting by outcomes

A comparison of budget and actual figures by outcome specified in the Appropriation Acts relevant to ANSTO is presented in Note 3.

(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 4 and 9).

Revenue from Government – Output Appropriations
Revenues from Government are revenues of the core activities of ANSTO and are recognised in accordance with policy 2A.5 of the Finance Ministers Orders 2002-2003.

Equity injections
Appropriations for capital items are recognised directly into equity in full amount as appropriated by the Parliament (refer Note 9).

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.

Revenue received in advance
Revenue received in advance is initially brought to account as other payables 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.

Interest revenue
Interest revenue is recognised as the interest is received or is entitled to be received by the end of the year.

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 4.

(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 to be measured at their nominal amounts.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability. This is a change in accounting policy from last year required by initial application of new Accounting Standard AASB 1028 from 1 July 2002. The current enterprise bargaining agreement pay rates applicable on 1 June each year are considered in the calculation. The financial effect of this change was an accrual of $0.549 million.

The provisions for employee entitlements encompass annual leave and long service leave that ANSTO has a present obligation to pay resulting from employee services provided up to balance date.

General leave
The Organisation's 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.

Annual leave
The provision for annual leave reflects the value of total annual leave entitlements of all employees at balance date and is recognised at its nominal value.

Long service leave
The provision for long service leave is recognised and measured at the present value of estimated future cash outflows to be made by ANSTO in respect of employee entitlements at 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.

(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 2003 were 9.6% of salary (CSS) and 11.7% of salary (PSS). 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 5A.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.

(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 21.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

(j) Bad and doubtful debts

Bad debts are written off during the period in which they are identified. A provision is made for any doubtful debts based on a review of all outstanding accounts at year end.

(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 2002-2003) Orders and AASB 1041 requires that from 1 July 2002, entities must revalue every class of assets that includes land, building, infrastructure, plant and equipment.

The clause 3c.1 of the FMO allows entities to utilise the transitional arrangements as stated in Section of AASB 1041. Entities that are progressively revaluing a class of assets 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 this year in accordance with the fair value method of valuation and will be valued in successive five 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 2002-2003) Orders are being implemented as follows:

- Freehold land was revalued as at 30 June 2003
- Buildings on freehold land were revalued at 30 June 2001
- Plant and equipment were revalued at 30 June 2001
- Infrastructure was revalued at 30 June 2001
- The major national facility, HIFAR reactor including instrumentation was revalued at 30 June 2001
- Other national and major facilities were revalued at 30 June 2001.

Land was revalued in 2003 and the next revaluation cycle will commence in 2004 for each of the following class of assets: buildings, infrastructure, plant and equipment including national and other major facilities as part of three year progressive revaluation cycle. Assets acquired during the same financial year of revaluation are reported at cost.

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 was conducted by an independent qualified valuer, Mr John Starr (registered Valuer No. 2388) of the Australian Valuation Office on 8 May 2003. The valuation of buildings, infrastructure, plant and equipment including national and other major facilities was last performed by independent quantity surveyors, Currie & Brown (Australia) Pty Ltd in November 2000 and the revaluations were adopted by the Directors.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

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:

	2003	2002
Buildings on freehold land	30 years	30 years
Plant and equipment	2 – 30 years	2 – 30 years
Infrastructure	20 years	20 years
National and major facilities	5 – 30 years	5 – 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 5C.

Recoverable amount test

Those assets carried at cost 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.

(l) Inventories

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

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. In previous years software was included in plant and equipment and was revalued with other plant and equipment.

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 were revalued in 1999.

Amortisation

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

Amortisation rates applying to intangibles are as follows:

	2003	2002
Purchased software	2 – 7 years	2 – 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 5C.

Recoverable amount test

Those assets carried at cost 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.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

(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 2003 there were 159 patents, trademarks, design and applications (153 at 30 June 2002) registered to ANSTO and no associated costs are recognised as an asset (nil at 30 June 2002).

(o) Foreign currency

Transactions denominated in a foreign currency are converted at a rate of exchange prevailing at the date of the transaction. At balance date, amounts receivable and payable in foreign 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) Capital use charge

Included in revenues from Government is an appropriation to cover the capital use charge of 11% on budgeted estimate of net assets of ANSTO for the 2002/2003 financial year (Note 4A). Any adjustment based on the calculation of actual net assets, excluding asset revaluation during the financial year is recognised as an asset or liability as appropriate in the balance sheet (refer Note 8B). Capital use charge is to be discontinued from 1 July 2003.

(q) Taxation

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

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

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

(r) 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.

(s) Principles of consolidation

ANSTO's sole subsidiary company Ansto Inc., a company incorporated in Delaware, USA, is unlikely to trade in the foreseeable future. Any amounts owing to the parent have been foregiven and the financial statements reported are that of ANSTO as a single entity. The financial effect of the debt foregiven was a cost of $0.204 million in this years results, refer Note 5D.

(t) Comparatives

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

(u) 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

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

3 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			
	2003 $'000	2002 $'000	**2003 $'000**	2002 $'000	**2003 $'000**	2002 $'000	**2003 $'000**	2002 $'000
Operating revenues								
Revenue from Government			**336**	778	**99,065**	93,931	**99,401**	94,709
Sale of goods and services					**33,645**	32,251	**33,645**	32,251
Interest					**3,356**	1,255	**3,356**	1,255
Revenue from sale of assets					**507**	862	**507**	862
Other					**636**	895	**636**	895
Total operating revenues	–	–	**336**	778	**137,209**	129,194	**137,545**	129,972
Operating expenses								
Employees			**95**	107	**49,643**	53,456	**49,738**	53,563
Suppliers			**231**	104	**55,673**	47,239	**55,904**	47,343
Depreciation and amortisation					**28,368**	24,671	**28,368**	24,671
Other					**3,328**	3,555	**3,328**	3,555
Total operating expenses	–	–	**326**	211	**137,012**	128,921	**137,338**	129,132

Notes:

The net cost shown include intra – government costs that would be eliminated in calculating the actual Budget outcome.

The Capital use charge is not included in any of the net cost/(contribution) of outcomes as it is not an operating expense.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

4 Revenue

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
4A. Revenues from Government			
Appropriation for outputs		**168,252**	152,364
4B. Goods and services			
Radioisotope sales		**21,203**	19,578
Services and contract research		**4,117**	4,529
Silicon irradiation		**3,290**	2,688
CSIRO site support		**695**	936
Training courses		**109**	122
Land management		**2,606**	2,295
Synchrotron project		**813**	774
AINSE interactions		**812**	1,329
Total sales of goods and services		**33,645**	32,251
Grants		**624**	738
Interest on deposit		**3,356**	1,255
4C. Net gain from sales of assets			
Infrastructure, plant and equipment:			
Revenue from sale of assets		**507**	862
Value of assets disposed		**(333)**	(324)
Net gain from disposal of infrastructure, plant and equipment		**174**	538
4D. Net foreign exchange gains – non speculative	21	**12**	6
4E. Other revenue:			
Sundry materials		**–**	151
4F. Sales of goods and services	4B		
Goods		**21,203**	19,578
Services		**12,442**	12,673
Total sales of goods and services		**33,645**	32,251
Provision of goods and services to:			
Related entities		**695**	936
External entities		**32,950**	31,315
Total sales of goods and services		**33,645**	32,251
Cost of sales of goods		**20,547**	19,090

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

5 Operating expenses

The breakdown of operating expenses is:

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
5A. Employee expenses:			
Salaries		**39,593**	42,584
Superannuation		**5,083**	5,332
Annual leave		**4,100**	2,804
Long service leave		**388**	2,742
Separation and redundancy		**236**	90
Total employee benefits expenses		**49,400**	53,552
Workers compensation premiums		**338**	396
Total employee expenses		**49,738**	53,948
5B. Supplier expenses:			
Goods from external entities		**14,125**	11,360
Services from related entities		**10,408**	9,500
Services from external entities		**31,280**	26,048
Operating lease rentals		**91**	31
Total supplier expenses		**55,904**	46,939
Operating expenses		**11,847**	17,401
Stores		**6,882**	5,517
Maintenance and external services		**28,079**	16,408
Power and water		**1,762**	1,725
Reactor supplies		**2,554**	834
Disposition of spent fuel rods		**–**	14
Variable production costs		**4,689**	5,009
Operating lease rentals		**91**	31
Total supplier expenses		**55,904**	46,939
5C. Depreciation and amortisation: (See footnote (a) below)			
Depreciation of property, plant and equipment (a)	7B	**26,659**	24,229
Amortisation of intangible assets – licence	7D	**345**	191
Amortisation of intangible assets – software	7D	**1,364**	252
Total depreciation and amortisation		**28,368**	24,672

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

5 Operating expenses (continued)

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
5D. Writedown of assets (See footnote (b) below)			
Financial assets:			
Receivables for goods and services		**–**	75
Unrealised foreign exchange loss	21	**66**	10
Other (b)		**204**	–
Non financial assets:			
Materials – Write off obsolete Stock		**–**	297
Nuclear material stock devaluation		**315**	761
Total other expenses		**585**	1,143
5E. Grants		**2,278**	1,964
5F. Value of asset sold		**333**	324
Total operating expenses		**137,206**	128,990
5G. Borrowing costs expense	8A	**132**	124
(a) 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		**4,854**	4,575
Plant and equipment		**11,543**	12,996
Infrastructure		**2,137**	2,055
National and major facilities		**8,125**	4,603
Total allocated		**26,659**	24,229

(b) ANSTO Inc. accumulated losses of A$0.204 million were foregiven in the 2002/03 year as ANSTO Inc. is unlikely to trade in the foreseeable future.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

6 Financial assets

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
6A. Cash			
Cash at bank for operating needs		**5,194**	7,552
Foreign currency held as forward cover for future construction progress payments (a)		**–**	24,267
Foreign currency held as forward cover for future supplier payments		**232**	2,704
Total cash		**5,426**	34,523
6B. Receivables			
Goods and services (a)		**4,866**	5,355
Less provision for doubtful debts		**376**	376
		4,490	4,979
Advance held by Dept of Education, Science and Tourism		**–**	20
Interest accrued		**178**	69
Reimburseable foreign exchange loss		**86**	1,451
Other (b)		**77,909**	77
GST receivable		**2,518**	3,215
Total receivables (net)		**85,181**	9,811
(a) Goods and services (trade debtors)			
Age analysis of trade debtors			
Current		**3,079**	3,037
Overdue:			
Less than 30 days		**1,059**	1,418
30 to 60 days; and		**467**	471
60 to 90 days		**128**	268
More than 90 days		**133**	161
		4,866	5,355

(a) In 2002 the Department of Finance and Administration introduced a new policy whereby programs were no longer required to hedge foreign currency positions. Consequently the foreign exchange exposure related to the Replacement Research Reactor is no longer hedged.

(b) Of the total amount, $77.832 million represents appproriations receivable from Government for undrawn equity injection ($63.997 million) and spent fuel appropriation ($13.835 million), (2002, Nil).

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

6 Financial assets (continued)

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
6C. Investments			
Fixed term investments (a)		**53,083**	17,953

(a) The majority of the value held is to meet contracted future payments including construction of the Replacement Research Reactor.

6D. Investment in subsidiary

ANSTO Inc. was incorporated in Delaware, USA on 27 October 1999. At 30 June 2003, US$100 (2002, US$100) of capital has been invested in this wholly owned subsidiary.

ANSTO Inc. accumulated losses of A$0.204 million were forgiven in the 2002/03 year as ANSTO Inc. is unlikely to trade in the foreseeable future. The investment is carried forward at nil value.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

7 Non-financial assets

FINANCIAL YEAR

	Note	2003 $'000	2002 $'000
7A. Land and buildings			
Land – at independent valuation – 30 June 2003 (fair value)	(b), (d)	76,500	52,180
Buildings – at cost		9,676	280
Less accumulated depreciation		420	–
		9,256	280
Buildings – at Directors valuation – 30 June 2001 (deprival)	(a)	109,865	109,634
Less accumulated depreciation	(c)	27,994	23,561
		81,871	86,073
Total buildings		91,127	86,353
Total land and buildings		167,627	138,533
7B. Infrastructure, plant, equipment and major facilities			
7B(i).Plant and equipment			
Plant and equipment – at cost		13,010	7,262
Less accumulated depreciation		2,417	1,226
		10,593	6,036
Current years additions – at cost		6,013	5,748
Less accumulated depreciation		2,178	1,191
		3,835	4,557
Plant and equipment – at Directors valuation – 30 June 2001 (deprival)	(a)	203,064	204,056
Less accumulated depreciation	(c)	116,318	107,841
		86,746	96,215
Plant and equipment under construction		29,679	18,381
Total plant and equipment		130,853	125,189
7B(ii). Infrastructure			
Electrical/site services			
Electrical/site services facilities – at cost		151	12
Less accumulated depreciation		9	1
		142	11
Electrical/site services facilities at Directors valuation – 30 June 2001 (deprival)	(a)	50,807	50,807
Less accumulated depreciation	(c)	22,980	20,851
		27,827	29,956
Total infrastructure		27,969	29,967

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

7 Non-financial assets (continued)

FINANCIAL YEAR

	Note	2003 $'000	2002 $'000
7B(iii). Major national and major research facilities			
Major national research facilities – at cost		487	302
Less accumulated depreciation		77	36
		410	266
Major national research facilities at Directors Valuation – 30 June 2001 * (deprival)	(a)	111,052	110,900
less accumulated depreciation	(c)	79,721	73,467
		31,331	37,433
Major research facilities at Directors Valuation – 30 June 2001 (deprival)	(a)	23,203	23,203
Less accumulated depreciation	(c)	9,498	7,720
		13,705	15,483
* includes $17,133 (2001 $17,133) buildings on leasehold land.			
Research facility under construction at Directors Valuation – 30 June 2001 (deprival)	(a)	–	–
Replacement Research Reactor Project capitalised cost		185,497	106,301
Total major national and major research facilities		230,943	159,483
Total infrastructure, plant, equipment and major facilities		389,765	314,639
Total land, buildings, infrastructure, plant, equipment and major facilities		557,392	453,172

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

7 Non-financial assets (continued)

Movement summary 2002-2003 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 2002	52,180	109,914	162,094	526,971	689,065
Additions – new assets		9,627	9,627	97,265	106,892
Additions – replacements					
Transfer/Reclassification					
Revaluations		24,320	24,320		24,320
Disposals				(1,272)	(1,272)
Write-offs					
Gross value as at 30 June 2003	**76,500**	**119,541**	**196,041**	**622,964**	**819,005**
Accumulated depreciation/ amortisation 1 July 2002		23,561	23,561	212,332	235,893
Depreciation/amortisation		4,853	4,853	21,806	26,659
Transfer/Reclassifications					
Revaluations					
Adjustment for disposals				(939)	(939)
Write-offs					
Accumulated depreciation/ amortisation 30 June 2003		28,414	28,414	233,199	261,613
Net book value as at 30 June 2003	**76,500**	**91,127**	**167,627**	**389,765**	**557,392**
Net book value as at 30 June 2002	52,180	86,353	138,533	314,639	453,172

Notes:

(a) The 2001 Directors valuation of buildings, plant and equipment including national and major facilities and intangibles reflects the valuation performed by Currie and Brown (Australia) Pty Ltd (quantity surveyors) in November 2000 Note 2(k).

(b) The 2003 independent valuation of land was performed by Mr. John Starr (registered valuer No. 2388) of the Australian Valuation Office Note 2(k), May 2003.

(c) In accordance with the requirements of Schedule 1 of the Commonwealth Authorities and Companies Act 1997 (Financial Statements 2002-2003) Orders, all revalued assets are shown on a gross basis: asset values are at deprival value (except for land which is valued at fair value) and accumulated depreciation has been calculated based on this value. The resulting adjustment has been transferred directly to the asset revaluation reserve.

(d) The value of land in 2003 was increased by $24.32 million due to revaluation in May 2003.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

7 Non-financial assets (continued)

Movement summary 2002-2003 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 2003					
Gross value	76,500	119,541	196,041	388,126	**584,167**
Accumulated depreciation /amortisation		(28,414)	(28,414)	(229,783)	**(258,197)**
Net value	**76,500**	**91,127**	**167,627**	**158,343**	**325,970**
As at 30 June 2002					
Gross value	52,180	109,915	162,095	388,966	**551,061**
Accumulated depreciation /amortisation		(23,561)	(23,561)	(209,879)	**(233,440)**
Net value	**52,180**	**86,354**	**138,534**	**179,087**	**317,621**

Summary of all assets under construction as at 30 June 2003

Item	Land	Buildings	Total Land and Buildings	Infrastructure, plant, equipment national and major facilities	Total
	$'000	$'000	$'000	$'000	$'000
As at 30 June 2003					
Gross value				215,176	**215,176**
Accumulated depreciation /amortisation					
Net value as at 30 June 2003				215,176	**215,176**
Net value as at 30 June 2002				124,681	**124,681**

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

7 Non-financial assets (continued)

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
7C. Inventories			
Raw materials and stores-not held for resale			
Stores – at cost		2,027	1,288
Cobalt-60 sources – at net realisable value		246	280
Reactor fuel and heavy water – at average purchase price		5,832	3,678
Nuclear materials – at net realisable value		73	7
Provision for stock dimunition		(64)	(64)
Total inventories		**8,114**	5,189
7D. Intangibles			
Licences – at cost		1,033	1,056
Less accumulated amortisation		720	411
		313	645
Design fees – at cost		76	45
Less accumulated amortisation		45	9
		31	36
Software at cost		4,138	4,004
Less accumulated amortisation		1,611	248
		2,527	3,756
Software at deemed cost		458	458
Less accumulated amortisation		423	422
		35	36
Total intangibles		2,906	4,473

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

7 Non-financial assets (continued)

Movement summary 2002-2003 for all intangibles irrespective of valuation basis

	Licenses $'000	Software $'000	Total $'000
Gross value as at 1 July 2002	1,101	4,462	5,563
Additions – new assets	8	134	142
Revaluations			
Disposals			
Gross value as at 30 June 2003	**1,109**	**4,596**	**5,705**
Accumulated depreciation/amortisation 1 July 2002	**420**	670	1,090
Depreciation/amortisation	345	1,364	1,709
Additions – New Assets			
Additions – replacements/upgrades			
Revaluations			
Adjustment for disposals			
Writeback of accumulated depreciation			
Accumulated depreciation/amortisation 30 June 2003	765	2,034	2,799
Net book value as at 30 June 2003	**344**	**2,562**	**2,906**
Net book value as at 30 June 2002	**682**	**3,791**	**4,473**

	FINANCIAL YEAR 2003 $'000	2002 $'000
7E. Other		
Prepayments	380	5,502
	380	5,502
Total non-financial assets	568,792	468,336

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

8 Liabilities

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
8A. Interest bearing liabilities			
Other (a)		2,326	2,194
Total interest bearing liabilities		2,326	2,194
Provision and payables			
8B. Capital use charge			
Capital use charge (e)		–	1,355
Balance owing 1 July		1,355	1,355
Capital use charge provided for during the period		68,851	57,655
Capital use charge paid		(70,206)	(57,655)
Balance owing 30 June		–	1,355
8C. Employees			
Accrued salaries and wages		1,427	1,660
Annual leave		7,416	7,428
Long service leave		11,590	12,700
		20,433	21,788
8D Other			
HIFAR spent fuel rods (b)		1,000	1,000
Provision for HIFAR license review (c)		4,749	3,166
Superannuation fluctuation (d)		1,692	1,692
Common law and other claims		1,508	1,506
		8,949	7,364
8E Suppliers			
Trade creditors		14,707	8,178
		14,707	8,178
8F Grants			
Non-profit entities		57	76
		57	76
8G Other			
Revenue received in advance		375	228
Unearned revenue (f)		13,835	–
		14,210	228
Total provisions and payables		58,356	38,989
Total liabilities		60,682	41,183

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

Notes:

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

(b) Provision for HIFAR spent fuel rods.

In 1995 ANSTO created a provision of $6.6 million, for the overseas transport and reprocessing of HIFAR spent fuel rods. No expenses were incurred against the provision during 2002-2003 and following review, 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 created for the cost of disruption to business arising from a scheduled routine maintenance program to meet ongoing ARPANSA operating license conditions. This provision is reviewed annually.

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

(e) Amount has been repaid to Department of Finance and Administration.

(f) Revenue recognised to cover costs of spent fuel shipment scheduled for year ended 30 June 2003, deferred to 2004 year. Refer to Note 6B(b).

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

9 Equity

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
Capital			
Capital 1 July		**128,056**	64,017
Equity injections from Government – Appropriation Act Nos. 2 & 4, (d)		**137,833**	64,039
Balance 30 June		**265,889**	128,056
Reserves, including movements			
Asset revaluation reserve			
Balance 1 July		**269,859**	269,859
Net revaluation increases		**24,320**	–
Balance 30 June		**294,179**	269,859
Fuel elements reserve			
Balance 1 July		**5,600**	5,600
Transferred from accumulated surpluses (a)		**6,800**	–
Balance 30 June		**12,400**	5,600
Instrumentation reserve			
Balance 1 July		**4,500**	4,500
Transferred from accumulated surpluses (b)		**1,700**	–
Balance 30 June		**6,200**	4,500
Waste treatment reserve			
Balance 1 July		**4,300**	4,300
Transferred to accumulated surpluses (c)		**(4,300)**	–
Balance 30 June		**–**	4,300
RRRP training and business initiatives reserve			
Balance 1 July		**–**	–
Transferred from accumulated surpluses (e)		**6,800**	–
Balance 30 June		**6,800**	–
Total reserves		**319,579**	284,259

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

9 Equity (continued)

	Note	FINANCIAL YEAR 2003 $'000	2002 $'000
Accumulated surpluses			
Accumulated surpluses 1 July		**77,125**	76,267
Transfer to fuel elements reserve		**(6,800)**	–
Transfer to instrumentation reserve		**(1,700)**	–
Transfer from waste treatment reserve		**4,300**	–
Transfer to RRRP training and business iniatives reserve		**(6,800)**	–
Operating surplus		**69,058**	58,513
Capital use charge		**(68,851)**	(57,655)
Accumulated surpluses 30 June		**66,332**	77,125
Total equity		**651,800**	489,440

(a) Fuel elements reserve

A transfer has been made to this reserve in 2003 to identify separately the amount anticipated to be required for the purchase of fuel elements.

(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. The sum was increased by $1.7 million in 2003.

(c) Waste treatment reserve

During the 2001 financial year, a $5.0 million equity injection was received from the Government to upgrade low level liquid effluent treatment facilities. This amount has now been spent.

(d) Equity injection

The total drawdown of $73.836 million (2002, $51.432 million) is for expenditure on capital projects.

Total equity injection for $137.833 million includes undrawn amount of $63.997 million which is to 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.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

10 Cash flow reconciliation

	FINANCIAL YEAR 2003 $'000	2002 $'000
Reconciliation of Operating Surplus to Net Cash from Operating Activities:		
Operating surplus before extraordinary items	69,058	58,513
Non-cash items		
Depreciation/amortisation	28,368	24,672
Gain on disposal of assets	(174)	(575)
Write off obsolete stock	–	258
Nuclear materials (devaluation)	(315)	(610)
Changes in assets and liabilities		
(Increase)/decrease in receivables	489	(554)
(Increase) in other receivables	(76,446)	(1,515)
(Increase) in receivable from DOFA	77,832	–
Decrease/(increase) in GST receivables	697	(1,898)
Decrease(increase) in prepayments	5,122	(4,453)
(Increase)/decrease in inventories	(2,610)	1,749
(Decrease)/increase in creditors	(7,306)	2,207
(Decrease)/increase in employee entitlements	(1,355)	1,854
(Decrease)/increase in other creditors	(1,228)	3,467
Increase in unearned revenue	13,835	–
(Increase)/decrease in accrued interest	(109)	50
Increase in other provision	1,585	33
Increase in revenue in advance	132	124
Net cash from operating activities	107,575	83,322

10A Cash flows presented on a net basis

Cash flows arising from profits and losses on foreign exchange activities are presented on a net basis in the Statement of Cash Flows and the cash flow reconciliation.

11 Extraordinary items

There were no extraordinary items for the year ended 30 June 2003 ($NIL 2002).

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

12 Remuneration of members of the Board

	FINANCIAL YEAR 2003 $	2002 $
Board members are paid in accordance with government policy.		
Included in operating expenses (Note 5) are:		
Aggregate amounts of superannuation payments in connection with the retirement of members of the Board	31,880	24,087
Other remuneration received, or due and receivable by members of the Board	439,035	366,365
	470,915	390,452
The number of members included in these figures is shown below in each relevant remuneration band:		
Remuneration between	Number	Number
$Nil and $9,999	2	1
$10,000 and $19,999	2	2
$20,000 and $29,999	1	2
$40,000 and $49,999	2	1
$260,000 and $269,999*	–	1
$320,000 and $329,999*	1	–
	8	7

* Includes payment of special allowances

13 Remuneration of executives

Executive remuneration is determined by the ANSTO Enterprise Agreement 2002 which is underpinned by the ANSTO Award. Included in operating expenses (Note 5) is total remuneration received or due and receivable, by executives (excluding the Executive Director who is included in Note 12) who earn $100,000 or more in connection with the management of ANSTO.	1,434,608	1,839,653
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	2	–
$110,000 and $119,999	3	5
$120,000 and $129,999	2	2
$130,000 and $139,999	–	3
$140,000 and $149,999	–	2
$150,000 and $159,999	3	1
$170,000 and $179,999	1	–
$180,000 and $189,999	–	1
	11	14

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

14 Replacement Research Reactor Project 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.

15 Insurances

Insurance risks, including professional indemnity, general liability, industrial special risk for a 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.

16 Remuneration of auditors

	FINANCIAL YEAR 2003 $	2002 $
Remuneration to the Auditor-General for auditing the financial statements for the reporting period	**90,000**	90,000

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

17 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 Concluded	Term Concludes
H M Garnett	11 May 2000		10 May 2005
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
J M Craker	2 June 1998	31 December 2002	
C Hillyard	21 July 1999		20 July 2004
G Cook	13 June 2001		4 April 2006
M Eager	1 January 2002		31 December 2006

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

For the 2002-2003 financial year the aggregate remuneration paid to members of the Board is disclosed in Note 12.

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 $31,880 (2002, $24,087).

18 Related party disclosures

Several members of the ANSTO Board were also members of Boards of entities with whom ANSTO had commercial transactions. None of these members were in a position to exercise significant influence on the relevant Boards. All such transactions were in accordance with commercial practice and on normal terms and conditions.

19 Average staffing levels

	FINANCIAL YEAR 2003	2002
The average staffing levels for ANSTO during the year were:	**824**	837

20 Trust money

Monies received by ANSTO for specific purposes are placed in special bank accounts and are expended for these specified purposes only. These monies are not recognised in the ANSTO financial statements.

Total		
Balance 1 July	**4,156**	3,306
Add: receipts	**1,708**	3,218
interest received	**140**	88
Deduct: payments	**(3,121)**	(2,456)
Balance 30 June	**2,883**	4,156
Represented by the following:		
Trust account		
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	**5**	5
Add: receipts	**14**	–
interest received	**–**	–
Deduct: payments	**(13)**	–
Balance 30 June	**6**	5

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

20 Trust money (continued)

	FINANCIAL YEAR 2003	2002
MNRF Synchrotron		
The Australian Synchrotron Research Program Incorporated was established under the Major National Research (MNRF) Program.		
Balance 1 July	**4,103**	3,283
Add: receipts	**1,693**	3,190
interest received	**139**	86
Deduct: payments	**(3,108)**	(2,456)
Balance 30 June	**2,827**	4,103
ISRC – 2003		
ANSTO received this trust money to facilitate assistance to the attendance of students to the ISRC – 2003.		
Balance 1 July	**29**	–
Add: receipts	**1**	28
interest received	**–**	1
Deduct: payments	**–**	–
Balance 30 June	**30**	29
Welfare fund		
A Welfare fund trust account is maintained to receive and manage donations to the fund and expenditure on specific welfare items for ANSTO employees.		
Balance 1 July	**19**	18
Add: receipts	**–**	–
interest received	**1**	1
Deduct: payments	**–**	–
Balance 30 June	**20**	19

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

21 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	6A	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 3.50%pa (2002 3.50%pa), calculated daily
Fixed term investment	6C	The deposits are recognised at cost. Interest is accrued as it is earned.	The deposits are with the Commonwealth Bank of Australia, and earn an effective rate of interest of 4.30% for 90 days (2002 4.75%pa for 90 day terms) payable on maturity.
Foreign exchange holdings	6A, 6B	Transactions denominated in a foreign currency are converted at a rate of exchange prevailing at the date of each transaction. Balances at year end are converted at end of year exchange rates.	The foreign currency deposits are with the Commonwealth Bank of Australia, and earn an effective rate of interest of 2.25%pa (2002 2.25% pa) payable monthly.
Receivables for goods & services	6B	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 (2002 30 days).
Other debtors	6B	Receivables are recognised at the nominal amounts due less any provision for bad and doubtful debts.	Majority of the amount ($77.832 million) is receivable from Department of Finance and Administration for undrawn equity injection $63.997 million and appropriation of $13.835 million for spent fuel disposition.
Financial Liabilities		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	8E	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	8F, 8A, 8G	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.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

21 Financial Instruments (cont.)

(b) Interest rate risk – consolidated

Financial Instruments	Notes	Floating Interest Rate		Fixed Interest Rate 1 year or less		Fixed Interest Rate 2-5 years		Non-Interest Bearing		Total		Weighted Average Effective Interest Rate	
		2003 $'000	2002 $'000	2003 $'000	2002 $'000	2003 $'000	2002 $'000	2003 $'000	2002 $'000	2003 $'000	2002 $'000	2003 $'000	2002 $'000
Financial assets (recognised)										5,192	7,547	3.50%	3.50%
Cash at bank	6A	5,192	7,547										
Cash on hand	6A							2	5	2	5	n/a	n/a
Fixed term investment	6C	53,083	17,953							53,083	17,953	4.30%	4.72%
Foreign exchange holdings	6A	232	26,971							232	26,971	2.25%	2.25%
Receivables for goods and services	6B							7,094	9,645	7,094	9,645	n/a	n/a
Loans	6B								20		20	n/a	n/a
Interest accrued	6B							178	69	178	69	n/a	n/a
Unrealised foreign exchange gain	6B											n/a	n/a
Other	6B							77,909	77	77,909	77	n/a	n/a
Total financial assets (recognised)		58,507	52,471					85,183	9,816	143,690	62,287		
Total assets										712,482	530,623		
Total financial liabilities (recognised)													
Trade creditors	8E							14,707	8,178	14,707	8,178	n/a	n/a
Grant received in advance	8F					57	76			57	76	n/a	n/a
Interest bearing liabilities	8A					2,326	2,194			2,326	2,194	6.00%	6.00%
Other	8G							14,210	228	14,210	228	n/a	n/a
Total financial liabilities (recognised)						2,383	2,270	28,917	8,406	31,300	10,676		
Total liabilities										60,682	41,183		

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2003

21 Financial Instruments (cont.)

(c) Net fair values of financial assets and liabilities

	Note	FINANCIAL YEAR 2003 Total carrying amount $'000	2003 Aggregate net fair value $'000	2002 Total carrying amount $'000	2002 Aggregate net fair value $'000
Financial assets (recognised)					
Cash at bank	6A	**5,192**	**5,192**	7,547	7,547
Cash on hand	6A	**2**	**2**	5	5
Fixed term investments	6C	**53,083**	**53,083**	17,953	17,953
Foreign exchange holdings	6A	**232**	**232**	26,971	26,971
Receivables for goods and services	6B	**7,094**	**7,094**	9,665	9,665
Interest accrued	6B	**178**	**178**	69	69
Other	6B	**77,909**	**77,909**	77	77
Total financial assets		**143,690**	**143,690**	62,287	62,287
Financial liabilities (recognised)					
Trade creditors	8E	**14,707**	**14,707**	8,178	8,178
Grant received in advance	8F	**57**	**57**	76	76
Interest bearing liabilities	8A	**2,326**	**2,326**	2,194	2,194
Other	8G	**14,210**	**14,210**	228	228
Total financial liabilities		**31,300**	**31,300**	10,676	10,676

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.

ANSTO has no significant exposure to any concentrations of credit risk other than those disclosed in Note 6.

Appendices

Appendix 1
Equal Employment Opportunity

ANSTO actively seeks to implement Equal Employment Opportunity (EEO) and diversity principles in its management practices. All new employees are introduced to the principles of EEO as part of their induction program.

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

ANSTO has sought to accommodate employees seeking part-time employment wherever feasible, and it is noted that 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.

	Number employed		% of total staff		Average salary	
	2003	2002	2003	2002	2003	2002
Female	195	208	23%	24%	$49,316	$46,688
Male	641	643	77%	76%	$59,671	$57,317

Staff in specific employment categories

This information is based on data obtained from 836 staff.

Note: Staff had the option of choosing not to provide information when answering questions.

	Number employed		% of total staff		Average salary	
	2003	2002	2003	2002	2003	2002
People with disabilities	18	20	2.2%	2.3%	$53,979	$51,281
Aboriginal and Torres Strait Islanders	15	16	1.8%	1.9%	$53,453	$51,412
Non-English speaking background	21	13	2.5%	1.5%	$49,605	$53,632

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 Australia and overseas.

The Local Liaison Working Party, established in 1967, comprises representatives from the NSW Police, Ambulance, Fire Brigades, Rural Fire Service, Environment Protection Authority and Department of Health, the Australian Protective Service, the St George-Sutherland District Emergency Management Officer, Sutherland Shire Council and ANSTO, as well as observers from the State Emergency Management Committee, the State Emergency Service and 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 the compliance with the ARPANS 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 experience who is also Chairman of 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 and 37 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

Appendix 2

Freedom of Information

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 International Nuclear Information System documents are available for purchase. Single copies of the annual report, the *Lucas Heights News*, the program of research, 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 tapes and printouts; 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 systems for 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 smi@ansto.gov.au).

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

The Director, Government and Public Affairs, and the Director, Corporate Services, have been appointed as authorised officers 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 general powers of the organisation under the *Australian Nuclear Science and Technology Organisation Act* 1987 (the ANSTO Act). In the text below, "Organisation" means the Australian Nuclear Science and Technology Organisation.

Functions of the Organisation under the ANSTO Act

Section 5 of the ANSTO Act provides that:

(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:

(i) nuclear science and nuclear technology;

(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;

(ii) selling or leasing equipment;

(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

(l) 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.

Appendix 3

Functions and powers of the Organisation under the ANSTO Act

(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.

Subsection 4 (2) of the *Australian Nuclear Science and Technology Organisation Amendment Act* 1992 (the ANSTO Amendment Act) provides that subject to subsection 4 (3), for the purposes of paragraph 5 (1) (ba) of the ANSTO Act, any radioactive material or radioactive waste that is stored on the Organisation's premises is taken to be radioactive material and radioactive waste arising from the Organisation's activities.

General powers of the Organisation under the ANSTO Act

Section 6 of the ANSTO Act provides that:

(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

Status report on the implementation of the conditions arising from the Environmental Impact Assessment of the Replacement Research Reactor

Sixth 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 2003

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 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 sixth 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.

As previously reported, the Chief Executive Officer of ARPANSA issued ANSTO with a licence to construct the replacement research reactor on 4 April 2002. In mid-June 2002, excavations disclosed the existence of a geological fault crossing the site. On 12 September, ANSTO provided to ARPANSA information confirming that the geological and seismological basis of the design described in the Preliminary Safety Analysis Report submitted in May 2001 for the Replacement Research Reactor remained valid. ARPANSA subjected the results to an independent review by Geoscience Australia and by an international expert in seismic analysis nominated by the International Atomic Energy Agency. After considering the information provided by ANSTO and the reports of those experts, the Chief Executive Officer of ARPANSA concluded that the faulting on the site of the RRR is not capable of resulting in surface displacement, and that it therefore does not alter the seismic design basis on which the construction licence was issued. Construction at the site recommenced in October 2002, and concrete was first poured in December 2002.

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 provided a direct reference between the EIS commitments and the actions that will be taken during construction to ensure compliance.

The contractor prepares Specific Inspection and Test Plans for each environmental control activity, and compliance with those plans is reported on. The contractor also prepares and submits to ANSTO quarterly Environmental Performance Reports, which detail compliance with the requirements of the CEMP and related documents. The reports summarise performance with respect to Storm and Surface Water, Noise and Vibration, Erosion Control, Soils and Groundwater, Traffic Impact, Fire Prevention, Air Quality, Waste, and Visual and Landscape.

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;

Appendix 4

Status report on the implementation of the conditions arising from the Environmental Impact Assessment of the Replacement Research Reactor

– 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 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.

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.

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

Appendix 4

Status report on the implementation of the conditions arising from the Environmental Impact Assessment of the Replacement Research Reactor

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.

In June 2001, ARPANSA issued an airborne radioactive discharge authorisation for ANSTO's operations, which sets out a range of Notification Levels relating to emissions from stacks. The discharge authorisation directly refers to this condition, and states that the values which have been used to demonstrate compliance are the levels foreshadowed in the EIS.

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.

ANSTO has an ongoing program to characterise airborne emissions from the LHSTC. As indicated in previous reports, the work on timing of process steps in Building 54 resulted in a reduction in emissions of almost an order of magnitude. As part of the ISO14001 process, ANSTO is continuing to characterise other emission sources.

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.

Since the last report, the project team has briefed ARPANSA (October 2002) on the scope of the proposed new method of Mo-99 production. In brief, the new Mo-99 process will keep the same chemical separation process, however changes will be made in target enrichment and design, plant design and gaseous and liquid waste management systems. The project includes a new fission gas trapping system, detail design of which will commence in the near future. The design basis for that trapping system is for up to four times the current production level, and will therefore result in reduced emissions. The project team is also considering possible improvements to the management of liquid wastes containing uranium which arise from Mo-99 production. The Stage 1 concept submission for the proposed modifications in the Mo-99 production facility will be submitted to ARPANSA in the coming months.

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.

ANSTO's Trade Waste Agreement requires that, by the time discharges from Lucas Heights reach the Sewage Treatment Plant at Cronulla, the levels of radioactivity in the sewage arriving at the plant comply with the World Health Organisation's derived concentration limits for drinking water. The Trade Waste Agreement is reviewed periodically to ensure that it takes into account any changes in operations, both within the LHSTC and within the sewage handling system.

In March 2002, ANSTO submitted a study of the radiological health risk associated with ANSTO effluent release, including the reuse of tertiary treated sewer water and sludge and the impact of effluent entering local waterways with sewer surcharge, to ARPANSA. The general conclusion of the study was that there are no radiological health effects associated with ANSTO operations, overflows from sewer surcharges or with recycling of sewage water or sludge.

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.

The collection of baseline groundwater commenced during the year 2000. A report on 12 months' monitoring was submitted to ARPANSA in February 2002. This report was independently reviewed by PPK, and the PPK review provided to ARPANSA in March 2002. Additional groundwater monitoring boreholes were drilled in March/April 2002, as recommended by PPK.

Groundwater monitoring using these boreholes is now part of the ANSTO routine monitoring program.

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.

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An airborne gamma radiation survey was undertaken in July 2002 to provide a radiological characterisation of the site and the buffer zone. The survey was undertaken using a helicopter to carry the detector system at a height of 60 metres, with flight line spacing of 40 metres. Local residents and other stakeholders were advised of the low-flying helicopter before the survey was undertaken.

Data from the airborne survey detected man-made radioactivity in some facilities at LHSTC but no man-made radioactivity in the buffer zone beyond the LHSTC boundary fence. The data provides a radiological characterisation of the buffer zone and the reactor site. A report on the results of the airborne survey will be submitted to ARPANSA and Environment Australia in the near future.

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 noted in the fourth report, the then Minister for the Environment advised ANSTO in August 2001 that 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.

The PSAR demonstrated that the assumptions used in deriving the Reference Accident were incorporated in the final design. The accident analysis in the PSAR was accepted by ARPANSA as suitable for the issue of a construction licence.

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.

This matter was specifically addressed in the PSAR and was examined by ARPANSA as part of its consideration of the PSAR and the application for a construction licence. As noted in the introduction to this report, after considering the information provided by ANSTO and the reports of those experts, the Chief Executive Officer of ARPANSA concluded that the faulting on the site of the RRR is not capable of resulting in surface displacement, and that it therefore does not alter the seismic design basis on which the construction licence was issued.

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.

This matter was addressed in the PSAR. ARPANSA considered this issue as part of consideration of the PSAR and the application for a construction licence.

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.

This matter was addressed in the PSAR. ARPANSA considered this issue as part of its consideration of the PSAR and the application for a construction licence.

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.

An analysis and design of the fire suppression system was undertaken during the detailed design phase. The proposed systems were described in the PSAR. ARPANSA considered this issue as part of its consideration of the PSAR and the application for a construction licence.

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.

This matter was addressed in the PSAR. ARPANSA considered this issue as part of its consideration of the PSAR and the application for a construction licence.

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. However, the requirement for any such extension is unlikely to be apparent before 2005.

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 will be further analysed in the Final Safety Analysis Report and at regular

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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.

The contract for the replacement reactor has made review by the Local Liaison Working Party (which incorporates representatives of all State emergency service organisations and the local Council), and approval by ARPANSA, of emergency plans a contractual condition. The proposed emergency arrangements were described in the PSAR. The ARPANSA review of these proposed emergency arrangements found them to be adequate. At an appropriate time before any licence to operate is sought, the emergency plans and arrangements will be updated, and, consistent with previous commitments, an independent review by Emergency Management Australia will be undertaken in accordance with this condition.

Subsequently, periodic review of emergency management plans will continue throughout the life of the replacement reactor.

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.

ANSTO distributes information to the local community on credible hazards and emergency planning arrangements. This information is available in local libraries. The Local Emergency Management Committee, which has the responsibility for communication on the emergency plans, has recently completed a new public information pamphlet on hazards and risks from the existing HIFAR reactor. This information will be reviewed when the application is made for an operating licence during 2004.

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.

As previously reported, in July 2001 the then Minister for the Environment and Heritage advised that he was satisfied with the community information program. As a result of the program's implementation, particularly with regard to the significant promotion of tours through the ANSTO site, visitor numbers through the site have increased by 40%.

Away from site, information has been disseminated to the public by ANSTO's participation in the Sydney Royal Easter Show (winning First Prize in the exhibitors' awards for 2002), the Export Awards, the Science Festival Wollongong, Science Week Canberra, Sutherland Home Show and the Gray's Point Festival, as well as technical and trade shows and conference exhibitions. Before shows such as the Easter Show, ANSTO provides training to its staff in the communication skills required to effectively communicate issues that are often complex and involve community concerns. Feedback from visitors and attendees is encouraged.

As previously reported, ANSTO developed and launched an innovative series of Media Lunches, hosted by the respected author and journalist Professor Ben Selinger of the Australian National University. The first three sessions attracted around 35 working journalists, with the presentation focusing on nuclear and radiation issues in general, applications of the technology and some practical demonstrations.

A contract has been signed for continuous filming of RRR construction progress.

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.

On 3 September 2001, the then Minister for the Environment wrote to ANSTO's Executive Director and to the Mayor of Sutherland Shire advising of his decision on the one issue outstanding from the negotiations on the Charter. The Minister went on to:

> "...urge both ANSTO and representatives of the community in the vicinity of the reactor to enter into negotiations to finalise the text of the Community Right to Know Charter, in the light of the terms already agreed upon ... and my determination."

Later that same month, the Executive Director of ANSTO wrote to the then

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Status report on the implementation of the conditions arising from the Environmental Impact Assessment of the Replacement Research Reactor

Mayor of Sutherland Shire requesting an indication of Council's availability for a discussion to finalise the text of the Charter. ANSTO has received no reply to that letter. ANSTO wrote to Council again in March 2002, reiterating our availability for such a discussion. Again, no reply has been received.

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.

This matter formed part of the Application for a Construction Licence submitted to ARPANSA (see condition 13), and was addressed in the decision of the Chief Executive Officer of ARPANSA. As indicated in the previous report, the Minister for the Environment and Heritage advised in April 2002 that he was satisfied with the spent fuel management strategy that was appended to ANSTO's application for a construction licence.

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, as noted in previous reports the Minister for Industry, Science and Resources announced on 8 February 2001 that the Federal Government will establish a safe purpose built facility on Commonwealth land for the storage of national intermediate-level radioactive waste produced by Commonwealth agencies. On 16 July 2001, a discussion paper entitled "Safe Storage of Radioactive Waste – The National Store Project: Methods for Choosing the Right Site", prepared by the National Store Advisory Committee and the then Department of Industry, Science and Resources, was released for public comment. The paper looks at the range of criteria that could be used to decide a site for the store. The release of the document is a significant step in the process to select a site for the facility. A paper responding to public comment was released in April 2002. The suitability of Commonwealth land for the national store will be assessed against the selection criteria, and we are advised that shortlisting of potential sites is proceeding.

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.

The process of achieving certification to ISO 14001 prior to commissioning continues. A process for determining environmental aspects of operational activities and services is being implemented for all facilities within ANSTO. The process, which utilises a custom-made computer-based data entry and analysis system, allows staff to analyse the potential impacts of those activities and services. All ANSTO activities have been reviewed and a draft list of environmental aspects of potential significance without controls is being reviewed. The next stage is to prepare environmental management plans for the different environmental categories. An accredited independent body will certify the EMS prior to commissioning of the replacement reactor.

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 sixth 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

ANSTO Technology Park Tenants

Australian Communications Authority
ABN: 78 334 953 951

The Australian Communications Authority (ACA) is responsible for regulating telecommunications and radio-communications. This includes radio-communications and telecommunications licensing, spectrum management, compliance with codes and standards, performance monitoring and consumer safeguards. The ACA also administers legislative provisions relating to powers and immunities of carriers in installing communications facilities.

The ACA site at Lucas Heights is used for remote monitoring of the radio spectrum. Lucas Heights was chosen for its relatively quiet radio environment.

ATA Scientific Pty Limited
ABN: 85 003 951 737

ATA Scientific Pty Ltd supplies and services analytical instruments. The product range covers the following application areas:

- particle size and powder technology;
- spectroscopy – ultraviolet, Fourier transform infra red (FTIR), Raman FTIR, and near infra red; and
- polarimetry – digital and CD spectropolarimetry.

Australian Institute of Nuclear Science and Engineering
ABN: 42 975 449 183

AINSE provides a mechanism through which universities can access the special facilities at Lucas Heights. It also provides a focus for cooperative research in the nuclear scientific and engineering fields. For more information on AINSE please refer to page 110 or go to http://www.ansto.gov.au/ainse/index.html.

Becquerel Laboratories Pty Ltd
ABN: 28 003 271 832

Becquerel Laboratories is a specialist in neutron activation analysis, providing multi-element analysis of samples, particularly for Australian and overseas researchers in the geosciences, environmental and archeological fields, and for mineral exploration and mining groups.

Bilyara Aviation Services Pty Ltd
ABN: 96 003 908 414

Bilyara Advanced Technologies Pty Ltd
ABN: 67 095 469 113

Bilyara Aviation Services Pty Ltd is a privately owned Australian company providing high technology goods and services to the aviation industry in Australia, China and the Pacific Rim. Bilyara Advanced Technologies, formed in 1992, specialises in support services for the non ferrous metals industry, particularly alumina refineries and aluminium smelters, in Australia and China.

The Bilyara Group is now a successful international company, providing marketing and project management services to Australian and international companies seeking to do business in Australia, China and the Pacific Rim.

JHEDI joint venture

JHEDI is a 60/40 joint venture company formed between John Holland and Evans Deakin Industries. The company was formed specifically to undertake the replacement research reactor project.

During the tender for this project, Ralph M Lee (RML) was engaged as part of the INVAP and John Holland team to undertake the electrical and instrumentation parts of the tender. Evans Deakin Industries – the parent company of RML – subsequently became a joint venture partner with John Holland. Since then, Evans Deakin Industries has been bought by Downer and the new entity is known as Downer RML.

Shire of Sutherland Credit Union
ABN: 89 087 650 708

The Sutherland Shire Credit Union operates an automatic teller machine in ANSTO's Reception Centre, and has an office on site where staff can see a Credit Union staff member by appointment.

Commonwealth Scientific and Industrial Research Organisation (CSIRO)
– Division of Minerals and Division of Energy Technology
ABN: 41 687 119 230

Both CSIRO Energy Technology and CSIRO Minerals Divisions are represented at the Lucas Heights site. CSIRO Energy Technology undertakes research and development on clean coal utilisation, gas utilisation, hybrid solar-fossil energy technologies and greenhouse gas mitigation. CSIRO Energy Technology also contributes to CSIRO's broader environmental capability through expertise in advanced analytical and biological chemistry applied to water quality through the Centre for Advanced Analytical Chemistry. The Centre is a world leader in ultratrace analysis of environmental samples and the environmental chemistry of natural water systems.

CSIRO Minerals has established a reputation as a world leader in the development, implementation and commercialisation of on-line analysis systems in the mineral and coal industries. The current emphasis of the CSIRO Minerals Lucas Heights Group is on meeting the needs of Australian industry for on-line analysis systems by applying nuclear, microwave, ultrasonic and optical techniques to on-line determination of composition, mineralogy, flow and particle size for ore sorting.

Optus Mobile Pty Limited

Optus Mobile – a division of integrated communications company SingTel Optus – is a leading provider of mobile telecommunications services in Australia. With more than 4.7 million customers, the company has around one third of the total Australian GSM mobile market and provides mobile coverage to 94% of the Australian population. Optus Mobile is recognised for bringing innovative ideas, technologies and solutions to Australian mobile users.

Appendix 5
ANSTO Technology Park Tenants

Silex Systems Limited
ABN: 69 003 372 067

Silex Systems is an Australian technology company listed on the Australian Stock Exchange. The principal business activity is the development of laser isotope separation technology known as "SILEX". The main applications for this technology are:

- uranium enrichment for nuclear power fuel; and
- silicon and carbon enrichment for advanced semiconductor materials such as enriched silicon wafers.

Silex Systems Ltd also has extensive interest in several advanced semiconductor technologies, with activities in the photonics/fibre optic arena as well as in the conventional silicon semiconductor industry.

Vita Life Sciences Ltd

Vita Life Sciences is a successful healthcare company servicing clients in two market segments:

- **Vita Medical** – research and development, innovation and distribution of proprietary medical equipment in the niche but large market of nuclear medicine, specialising in the area of lung diagnostics and cardiac stress testing; and
- **Vita Health** – development, manufacture and distribution of vitamins as well as complementary and alternative medicines, dietary supplements and health foods under well known brand names.

Tru-Tec Australasia (Koch Australia Pty Ltd)
ABN: 70 080 357 366

The Process Diagnostic Division of Tru-Tec Services Inc. specialises in unique diagnostic techniques used to evaluate the integrity and performance of distillation columns, reactors, heat exchangers and other critical process systems. Tru-Tec has become a world leader in industrial process diagnostics, helping to solve practical on-line problems that relate to plant operation and maintenance.

Waste Service NSW
ABN: 93 524 709 106

Waste Service NSW provides putrescible and non-putrescible waste disposal facilities for the community and encourages waste recycling and processing. The organisation operates regional solid and liquid waste management facilities, including landfill sites, transfer stations and recycling and processing centres in the Sydney metropolitan area. It offers consultancy services based on 25 years of experience to local and overseas projects whether private, public sector or joint private/public sector. A major consultancy project was the remediation of Homebush Bay in Sydney.

Appendix 6
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.

The Health, Safety and Environment Policy of the organisation places the "protection of human health and safety and the environment" as ANSTO's highest priority. The commitment involves "the implementation of an ISO 14001 compliant Environmental Management System", which is a recognised framework for continuous improvement in environmental performance. The ISO Standard will be fully implemented before the commissioning of the replacement research reactor. An Environmental Principles Plan is being implemented to ensure incorporation of ecologically sustainable development principles through all stages of the design and construction of the replacement reactor. A specific construction environmental management plan has been prepared for the construction stage.

Under its Health, Safety and Environment Policy, ANSTO "provides verifiable evidence of the fulfilment of this policy through a program of monitoring and audit, and regular public reporting of results". The scope of the monitoring program and the results are published in a series of annual reports: *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 activities, such as the Cronulla Sewage Treatment Plant and the sea surrounding the effluent release point at Potter Point.

Further details are provided in the publication, *Protecting People and the Environment: ANSTO Report Card, Environment and Safety*. Copies are available through ANSTO's Communications Unit on 02 9717 3168.

Commitment to ecologically sustainable development includes the handling of ANSTO's historical wastes and the management of the current waste stream in a manner that protects human health now and in the future. Emphasis is being placed on waste minimisation measures. It also includes the management of engineering services on site in a manner that leads to savings in electricity and water consumption.

Finally, ANSTO is regulated under the *Australian Radiation Protection and Nuclear Safety (ARPANS) Act* 1998, which includes specific reference to the protection of the environment from the harmful effects of radiation.

Appendix 7
Commonwealth Disability Strategy

ANSTO's primary role under the Commonwealth Disability Strategy is as an employer. As such, ANSTO is committed to equity and fairness in the workplace and in its recruitment practices.

All job advertisements state that ANSTO is an equal opportunity employer. All new employees are made aware of our practices during induction. During 2003-04, we plan to enhance the delivery of information about ANSTO's human resources policies, which includes the approach to employees with disabilities.

No complaints were made or grievances raised by people with disabilities in relation to ANSTO's employment practices during the year. We have formal complaints and grievance processes set out in the 2002 Enterprise Agreement through which any such complaints may be directed.

We maintain a network of internal contact officers with whom difficulties may be discussed. Staff also have access to an independent employee assistance program, which is publicised throughout the organisation.

ANSTO may have secondary roles as a policy adviser and as a regulator.

As a policy adviser, we consider the impact of our products and services on people with disabilities and provide appropriate information where required.

As a regulator, we ensure that internal policy and procedures comply with relevant legislation, and that staff are kept informed of requirements under organisational policy.

Appendix 8
Performance reporting

In accordance with the Commonwealth Authorities and Companies (Report of Operations) Orders 2002 under the *Commonwealth Authorities and Companies Act* 1997 (As amended), ANSTO is required to report against the key performance indicators set out in its Portfolio Budget Statements (PBS) for the 2002-03 financial year.

The table below sets out where performance against these indicators is addressed in this annual report.

Appendix 8

Performance reporting

PBS KEY PERFORMANCE INDICATORS	ANNUAL REPORT SECTION
Outcome 1 **Nuclear-based infrastructure effectiveness – Overall achievement of the outcome – (measures, indicators and targets used as appropriate)** The replacement research reactor is operational and providing improved core nuclear facilities for medical, industrial and R&D applications by 2006. Level of compliance with project plan – achievement of specific milestones: • On time • Within budget **Contributions of outputs to outcome** ANSTO's specific output relates directly to client supervision of the design construction and pilot testing of the outcome in the form of an operational replacement research reactor together with instrumentation. **Performance information for departmental outputs** **Output 1.1** Effective contract management for the design and construction of the replacement research reactor. **Targets** • Complete detailed engineering work packages (October 2002) • Construct reactor building up to 17 metre level (March 2003) • Complete auxiliary building structure (April 2003) • Commence construction of offices and visitors centre (May 2003)	**CFOD**

PBS KEY PERFORMANCE INDICATORS	ANNUAL REPORT SECTION
Outcome 2 **Disposition of spent fuel effectiveness – Overall achievement of the outcome (measures, indicators and targets used as appropriate)** Removal of spent fuel from the ANSTO site in line with stringent arrangements and community views. Safety procedures adhered to fully and shipments and were: • on time • within budget **Contribution of outputs to outcome** The output is directly related to the outcome. **Performance information for departmental outputs** **Output 2.1** A program of shipments for reprocessing of all HIFAR spent fuel in place. • Shipment effected according to schedule • A sixth shipment of HIFAR spent fuel is currently scheduled for late 2002	**CFOD**

Appendix 8

Performance reporting

PBS KEY PERFORMANCE INDICATORS	ANNUAL REPORT SECTION
Outcome 3 **Science and technology solutions effectiveness – Overall achievement of the outcome (measures, indicators and targets used as appropriate)** Timely delivery of valued nuclear related scientific and technical advice services and products to government and other stakeholders. ANSTO operates within a set of performance indicators agreed with Government to provide an insight into its overall effectiveness and success in achieving the science and technology outcome. • Client satisfaction and user adoption of ANSTO developments • Earnings and net contributions from external research and services contracts and from commercial operations • Level and quality of scientific and technical publications and conference contributions • Level of external use of ANSTO facilities • Level of involvement in international policy developments • Level of successfully completed research and services contracts for industry and government ANSTO reports against those indicators in its annual report.	**KPIs**

PBS KEY PERFORMANCE INDICATORS	ANNUAL REPORT SECTION
Performance information for departmental outputs **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. • World leading capabilities available and access provided to full customer expectations • Excellence in service delivery • Facilities maintained to world standard • Expanding customer base	**CFOD, ORDS, SICI, ISRN, AINSE, ASRP, AMNFP**
Performance information for departmental outputs **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. • Response rate at target of 100% • Accurate and relevant • Full client satisfaction	**ISRN**
Performance information for departmental outputs **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. • Research internationally recognised	**Highlights, ISRN, NSES, TMRS, SICI**

Appendix 8

Performance reporting

PBS KEY PERFORMANCE INDICATORS	ANNUAL REPORT SECTION
• Research projects developed addressing identified business opportunities • Appropriate networking established • Research results contributing to policy on environmental issues such as global climate change • Publication of results in leading scientific journals • New and improved technologies developed and assessed • Collaborative arrangements in place with CRCs and other organisations	
Performance information for departmental outputs 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. • Appropriate networking established • External funds gained as a percentage of total funds • Publication of collaborative results in leading scientific journals • New and improved technologies assessed • Results delivered on time and to budget • Radiation protection services commercially utilised by external clients • Solutions for the mining industry	**KPIs, NSES, TMRS, SICI, ISRN, AINSE**

PBS KEY PERFORMANCE INDICATORS	ANNUAL REPORT SECTION
Performance information for departmental outputs Output 3.5 Regular production and sale of radiopharmaceuticals and radioisotopes for medical and industrial applications and other services, through designated business units. • Profitable operation of radioisotope business for health and industrial applications • Adoption of ANSTO developed technology	**Highlights, CFOD, SICI**
Performance information for departmental outputs Output 3.6 The exploitation of ANSTO's intellectual and physical assets. • Facilities maintained to world standard • Adoption of ANSTO developed technology, including patent and licensing arrangements • Management of ANSTO Technology Park	**Highlights, CFOD, NSES, TMRS, SICI, ORDS, Appendix 5**

Appendix 9

Index of compliance with reporting guidelines under various Acts, Regulations and Orders applicable to ANSTO

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Glossary

ACA	Australian Communications Authority
ACE-Asia	Asian Regional Aerosol Characterisation Experiment
AHSEC	ANSTO Health, Safety and Environment Committee
AINSE	Australian Institute of Nuclear Science and Engineering
ALCVD	Atomic layer chemical vapour deposition
AMRFP	Access to Major Research Facilities Program
AMS	Accelerator mass spectrometry
ANAO	Australian National Audit Office
ANBF	Australian National Beamline Facility
ANSTO	Australian Nuclear Science and Technology Organisation
ANTARES	Australian National Tandem Accelerator for Applied Research
APIA	Australian Pipeline Industry Association
ARC	Australian Research Council
ARI	ANSTO Radiopharmaceuticals and Industrials
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASNO	Australian Safeguards and Non-proliferation Office
ASRP	Australian Synchrotron Research Program
BIPM	Bureau International des Poids et Mesures
BNFL	British Nuclear Fuels plc
CEA	French Atomic Energy Commission
CEMP	Construction Environmental Management Plan
CFOD	Core Nuclear Facilities Operation and Development
COGEMA	Compagnie Generale des Matieries Nucleaires
CRC	Cooperative Research Centre
CRP	Coordinated Research Project
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCC	Digital Coincidence Counting
DFAT	Department of Foreign Affairs and Trade
DLWC	Department of Land and Water Conservation (NSW)
EEO	Equal Employment Opportunity
EMP	Environmental Management Plan
EPA	Environment Protection Authority
FOI	Freedom of Information
FNCA	Forum for Nuclear Cooperation in Asia
GST	Goods and Services Tax
HIFAR	High Flux Australian Reactor
IAEA	International Atomic Energy Agency
IBA	Ion beam analysis

Glossary

ILLW	Intermediate level liquid waste
INIS	International Nuclear Information System
ISI	Institute for Scientific Information
ISO	International Standards Organisation
ISRN	International Strategic Relevance of Nuclear Science
LENS	Learning Environment for New Strategies
LHSTC	Lucas Heights Science and Technology Centre
LLWP	Local Liaison Working Party
MNRF	Major National Research Facilities
mSv	millisieverts
NEA	Nuclear Energy Agency
NMC	National Medical Cyclotron
NORM	Naturally occurring radioactive material
NPT	Nuclear Non-Proliferation Treaty
NPW	Nuclear-powered warships
NRP	National Research Priority
NSES	Nuclear Science for Environment and Sustainability
NSRRC	National Synchrotron Radiation Research Centre
NSW	New South Wales
NTD	Neutron transmutation doped
OECD	Organisation for Economic Cooperation and Development
ORDS	Organisational Development and Support
ORES	Ores, radioactivity and environmental solutions
ORMOSOLS	Organically modified silicates
OSRP	Objective Setting and Review Process
PBS	Portfolio Budget Statement
PMC	Patent Management Committee
PSAR	Preliminary Safety Analysis Report
RCA	Regional Cooperative Agreement
R&D	Research and development
RERTR	Reduced Enrichment for Research and Test Reactors
SIMS	Secondary ion mass spectrometry
STAR	Small tandem accelerator
TGA	Therapeutic Goods Administration
TMRS	Treatment and Management of Man-made and Naturally Occurring Radioactive Substances
UTS	University of Technology, Sydney
WAN	Wide area network

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