Australian Government

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Nuclear-based science benefiting all Australians

Annual Report 2003-04

ANSTO scientific facilities

- 10MW HIFAR MULTIPURPOSE RESEARCH REACTOR
- ANTARES 10MV TANDEM ACCELERATOR
- 2MV TANDETRON ACCELERATOR
- ELEMENTAL ANALYSER – ISOTOPE RATIO MASS SPECTROMETER
- WATER TUNNEL FACILITY
- GAMMA IRRADIATION FACILITIES
- CERAMIC POWDER CHARACTERISATION FACILITIES
- COLLOIDAL CHARACTERISATION FACILITIES
- HOT AND COLD ISOSTATIC PRESSES
- TRANSMISSION AND SCANNING ELECTRON MICROSCOPES
- SCANNING PROBE MICROSCOPE
- SCANNING LASER DILATOMETER
- 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

Australian Government

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Annual Report 2003-04

Chairman's Letter

18 September 2004

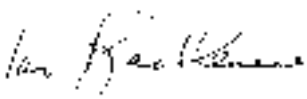
The Hon. Peter McGauran MP
Minister for Science
Parliament House
CANBERRA ACT 2600

Dear Minister

In accordance with Section 9 of the *Commonwealth Authorities and Companies Act* 1997 (CAC Act), I am pleased to present the Annual Report of the Australian Nuclear Science and Technology Organisation for the period 1 July 2003 to 30 June 2004.

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 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, 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
- apply resulting technologies and other relevant, unique capabilities to focused 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
- perceptive leadership and good management.

External environment

ANSTO's strategic directions are also based on 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
- 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
- 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 and Powers of the Organisation under the ANSTO Act", Appendix 2 of this report.

About ANSTO

Responsible Minister

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 guidelines provided for the presentation of Government documents, published by the Department of the Prime Minister and Cabinet in April 2004 and the *Commonwealth Authorities and Companies (Report of Operations) Orders* 2002. An index of compliance is provided in Appendix 8.

The Hon Peter McGauran MP (Minister for Science)

Organisational Chart

As at 30 June 2004

Minister

The Hon Peter McGauran MP (Minister for Science)

The Board

Dr Ian D Blackburne (Chairman)

Mr Michael A Eager (Deputy Chairman)

Mr Grahame Cook

Dr Carrie (Carmel) J Hillyard

Dr Agatha van der Schaaf

Dr Klaus Schindhelm

Dr Ian Smith (Executive Director)

Chief Executive and Executive Director

Dr Ian Smith

Division Directors

Mr Robert Muir
Business Development

Mr Ian Cullen
Corporate Services

Mr Barrie Hill
Engineering Services

Professor Ann Henderson-Sellers
Environment

Dr Ron Cameron
Government and Public Affairs

Dr George Collins
Materials and Engineering Science

Mr Jack Dillich
Nuclear Technology

Dr Stuart Carr
Radiopharmaceuticals

Mrs Cait Maloney
Safety and Radiation Science

Members of the Board

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

Chairman
Chairman since 1 July 2001

Company director, former chief executive, scientist

Appointed 1 July 2001
Term concludes
30 June 2006

Mr Michael A Eager
BE (Mining), FAusIMM

Deputy Chairman
Deputy Chairman since 26 June 2002

Company director, mining engineer

Appointed 1 January 2002
Term concludes
31 December 2006

Mr Grahame Cook
PSM BEc, AIMM

Deputy Secretary, Department of Education, Science and Training

Appointed 13 June 2001
Term concludes
4 April 2006

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

Venture Capital Partner, CM Capital Investments, biotechnologist

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

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

Head, Department of Nuclear Medicine, Sir Charles Gairdner Hospital

Appointed 25 July 2002
Term concludes
24 July 2007

Dr Klaus Schindhelm
BE, PhD

Senior Vice President Cardiorespiratory Development, ResMed Ltd

Appointed 20 March 2003
Term concludes
19 March 2008

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

Executive Director, ANSTO

Appointed 17 May 2004
Term concludes
16 May 2008

Professor Helen Mary Garnett
BSc (Hons), PhD, FTSC, FAICD
Executive Director, ANSTO

Appointed 11 May 1995

Reappointed 11 May 2000
Resigned 2 October 2003

Chairman's Report

Welcome to ANSTO's 2004 annual report. I am proud to be able to present it to you and trust that, having looked through it, you too will share my sense of excitement about our achievements and future.

Australian nuclear science and technology is poised on the cusp of a new era. Every day, another piece of the nation's largest ever scientific investment – the 20MW replacement research reactor – is put into place. As construction nears completion, we at ANSTO have been busy making plans to realise the opportunities this new world-class facility will bring. Not only will it provide opportunities to unlock vast amounts of knowledge in diverse fields of science and technology, it will boost innovation and competitiveness in Australian industry, improve our radiopharmaceutical production capabilities and promote our nation's standing internationally. The reactor, together with its state-of-the-art neutron beam instruments, will place ANSTO amongst the top research centres in the world and make us a regional centre of excellence in the Asia-Pacific.

The future is already starting to take shape. This year we began preparing ANSTO's new Strategic Plan, which will take effect from July 2005. As well as creating and applying world-class science and technology, it is important that ANSTO is transparent and accountable in its operations, and that it cooperates with researchers from other institutions in collaboratively solving some of the nation's major challenges. Across the organisation, teams are identifying new research projects, collaborative opportunities and future commercial prospects.

ANSTO's programs are committed particularly to the peaceful application of nuclear science and technology. This is especially so in our region, where the organisation contributes

technology in support of the United Nations' Millennium Development Goals. In the wider international arena, ANSTO actively contributes to the International Atomic Energy Agency (IAEA). Our development and deployment of new techniques to counter terrorism activities and to detect illicit nuclear materials has given the organisation a strong reputation in regional and international peace and security.

ANSTO operates at the leading edge of nuclear medicine, helping Australians enjoy healthier lives. This year we have been developing new radiopharmaceuticals and advanced techniques for diagnosing and treating cancer, heart attacks, and major neurological diseases such as Alzheimer's and multiple sclerosis. We also signed a major licence and supply agreement with a US pharmaceutical company to produce and distribute Bexxar, a drug to help combat Non-Hodgkins Lymphoma.

Australians have benefited from our work in areas such as aerospace, agriculture, manufacturing, mining, minerals, food, and oil exploration. These are just some of the industries our advanced materials and engineering applications have contributed to. In July, we launched ANSTO Minerals, to provide scientific leadership, practical solutions and innovative technologies for Australia's mining and minerals processing industries, whilst the Bragg Institute has been investigating, in partnership with industry, the molecular structure of advanced materials, such as polymers, that have a whole range of industrial applications.

ANSTO's environmental research and initiatives have also achieved significant outcomes this year. For instance, our scientists completed an important five-year study into the impact of human activity on climate change; developed new technology and techniques for managing Australia's groundwater; and contributed to our understanding of global pollution levels and long-term environmental stability. Closer to home, ANSTO's own Environmental Management System achieved certification to the International Organisation for Standardisation (ISO) standard ISO14001 in June.

Safety is a top priority at ANSTO. The excellent safety record of the High Flux Australian Reactor has been maintained and we continue to comply with all licences from the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) for our facilities and radioactive sources.

Government funding in 2003-04 comprised:

- $106.5m appropriation for research and operational services
- $5.5m equity injection for upgrading site security
- $79.2m equity injection for construction of the replacement reactor
- $14.5m appropriation for the disposition of HIFAR spent fuel.

Some of our achievements over the year past year have been:

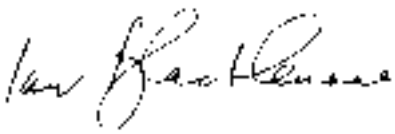
- Published papers: 435 papers in scientific journals and presented to conferences

Chairman's Report

- Patents: ANSTO's patent portfolio at 30 June 2004 comprised 49 granted patents and 49 patent applications – stemming from 34 inventions
- Radiopharmaceutical sales of $20.066 million, of which $3.495million was exports
- Income from external research services, radioisotopes for medicine and industry, and other services: $40.6 million (2002-03 $38.1 million).

In October 2003, after nine years at the helm, our Executive Director Professor Helen Garnett resigned from ANSTO to take up the position of foundation Vice-Chancellor of Charles Darwin University, Northern Territory. Dr Ron Cameron acted very capably in the role until we found a new Executive Director. In May, we welcomed Dr Ian Smith to the position. Dr Smith's arrival is actually a return, because in fact he was a postgraduate student with our organisation 35 years ago. Over those intervening years he has established himself in academia and industry, particularly in the areas of metallurgy and material science, and has retained a strong focus on research and development. His previous appointment was Deputy Vice-Chancellor (Research, Enterprise and International) at Otago University, New Zealand. On behalf of everyone at ANSTO, I thank Dr Cameron for steering the ship so capably in the interim, and I extend a warm welcome to Dr Smith, who comes to ANSTO at such an important time.

It has been a busy year. We have continued to strive for excellence and innovation in research and development. We have at the same time been laying the strategic foundations, building the organisational infrastructure, and developing the expertise which, together with the daily progress of our new state-of-the-art research facilities, will pave the way for ANSTO to play a vital role in Australia's future.



Ian D Blackburne
Chairman

Executive Director's Report

Thirty-five years ago I arrived at the Australian Atomic Energy Commission as a postgraduate student. That Commission evolved into ANSTO, with its clear focus on applying nuclear science and technology for the benefit of all Australians, and I was pleased to accept its Executive Director position. I very much look forward to both the challenges and rewards of the role.

I am particularly pleased to announce that this year a new Triennium Funding Agreement has been finalised with the Government – to take effect from July 2004 – which will provide the kind of long-term financial support that innovative research needs if it is to produce ground-breaking results and translate into important technological, social, environmental, medical and economic benefits for Australia and the world.

For the first time the contribution that ANSTO funded research makes to the nation has been framed within the Government's new National Research Priorities (NRPs): environmental sustainability, good health, innovation for industry, and national security. ANSTO has developed an NRP Implementation Plan and all new science projects address these national priorities. In addition, ANSTO has made significant submissions to major federal government inquiries concerning publicly funded research in Australia during the year. We have already begun incorporating outcomes of these inquiries into our future.

ANSTO has continued to monitor, evaluate and improve its own performance. In the area of stakeholder perceptions of ANSTO, we conducted our most comprehensive survey to date of business, government and community attitudes to the organisation. The results were extremely encouraging. Community approval of our role in Australian society was 88%. Business approval rated even higher at 93%, with government stakeholders topping this at

94%. We have already begun integrating the results of the survey into the development of our next Strategic Plan and communications strategies.

We employ several quality assurance mechanisms to assess new project proposals and to keep existing projects on track. One of the most important of these is our Technical Advisory Committee (TAC), an external panel of four Australian and international experts which meets once a year to review current projects and project proposals. This year the TAC reviewed 25 projects and proposals against criteria of scientific merit, collaboration, application and dissemination.

The most significant project at ANSTO, of course, is the replacement research reactor. This year we completed the construction of all major structural components of the reactor, the design of eight neutron beam instruments, and in May the reactor pool was lowered into position. We have also begun detailed planning and documentation for operations.

Meanwhile, we have maintained or exceeded operational performance of our core facilities this year. We achieved a new operating record for HIFAR – 154 days of operation without an unplanned shutdown – and we successfully completed the last major shutdown, a four-yearly maintenance procedure, before the reactor is finally decommissioned. We also installed a new particle accelerator which will make world-class facilities available in Australia for ion beam and mass spectrometry. ANSTO's major facilities have been well used over the year not only by our own staff but also by research and development teams from Australian universities, industry and Cooperative Research Centres (CRCs), as well as by visiting scientists from other countries – under the auspices of the Australian Institute for Nuclear Science and Engineering (AINSE) and other cooperative programs and agreements.

The organisation's business acumen has continued to evolve under the banner 'Good Science is Good Business @ ANSTO'. Our 'cradle to grave' Business Lab has focused on the core areas of nuclear science and technology with applications in the areas of industry and manufacturing, radiopharmaceuticals and biotechnology, advanced materials (including nanotechnology), environmental management, and minerals.

This year ANSTO became a key member of two new CRCs – for Sustainable Resource Processing and for Integrated Engineering Asset Management. We are responding to significant global business opportunities including nuclear waste management, water sustainability and salinity, personalised medicine, and weather prediction. We developed a new strategy for business continuity planning, and in June we gained ISO 9001:2000 quality certification for the ANSTO Business Management System (ABMS). Our commitment to careful management of environmental impacts is demonstrated by the award of ISO 14001:1996 certification to the organisation.

As ANSTO increases its business collaboration and commercialisation opportunities, it must also better protect its intellectual property (IP). In the Australian Graduate School of Management/Freehills November 2003 survey 'The Management of Intellectual Property in Australian Organisations', ANSTO is listed as one of three 'successful local firms utilising solid models for the discovery, management, exploitation and protection of IP'. In the Australian National Audit Office (ANAO) February 2004 survey of 'Intellectual Property

Executive Director's Report

Policies and Practices in Commonwealth Agencies', ANSTO is one of seven organisations showcased out of the 74 surveyed.

Clearly, ANSTO has made significant progress over the past year, contributed to many aspects of Australian life and taken part in a diverse array of international initiatives. I hope you find considerable evidence of these activities in this annual report and look forward to providing you with further news of our work at ANSTO in the future.

Ian Smith
Executive Director

Highlights

July 2003

- The analysis undertaken of Australian bushranger Joe Byrne's armour generated extensive national positive media coverage
- ANSTO and Russian atomic energy body, Minatom, made significant progress towards the establishment of a facility to demonstrate the commercial feasibility of radioactive waste immobilisation in ceramic-type matrices
- ANSTO Minerals was launched with a mission to provide scientific leadership, practical solutions and innovative technologies for the Australian mining and minerals processing industries
- The first BusinessANSTO eZine for 2003-04 was published with a focus on the important area of advanced materials.

August 2003

- ANSTO was a key organiser of the 15th International Symposium of Radiopharmaceutical Chemistry. ANSTO also generated national media coverage for radiopharmaceutical research as part of the Symposium
- A proton beam was successfully accelerated by the new Tandetron accelerator to the ion beam analysis end station
- ANSTO's global profile in nanotechnology was raised by our successful organisation of the 12th International Workshop on Sol-Gel Science and Technology with 250 delegates from 35 countries.

September 2003

- A new lease with WasteServices NSW for the Waste Management Centre ensures a return on investment on the land for the next 23 years
- 'Nuclear Powered Warships', a joint exercise with the Royal Australian Navy, was held
- Executive Director Helen Garnett left ANSTO after 11 years with the organisation.

October 2003

- A spent fuel shipment left for France, on schedule and without incident
- Seven ANSTO scientists participated in the 'Science meets Parliament' day attended by over 350 scientists and 140 members of parliament
- ANSTO assisted the Army in 'Exercise Clean Slate', which enhanced the ability of the Army's Incident Response Regiment to deal with possible future "dirty bomb" incidents
- HIFAR reached a new operating record of 154 days of operation without an unplanned shutdown
- ANSTO was a co-organiser of the Second France-Australia Symposium on Nuclear Medicine, held in Tours, France.

November 2003

- ANSTO sponsored the visit to Australia of a French Commission of Atomic Energy science director who is a leading nanobiotechnology researcher. This was in relation to the Forum for European-Australian Science and Technology

Highlights

Cooperation's Networking for Excellence conference

- The CRC for Sustainable Resource Processing and CRC for Integrated Engineering Asset Management opened, with ANSTO as a core participant in both
- Major positioning research was undertaken of ANSTO's main stakeholder groups, identifying their knowledge, attitudes and behaviour in relation to the organisation
- ANSTO's novel inorganic ion exchange technology began supporting targeted applications in nuclear waste, environment and health
- ANSTO was named as one of three Australian firms, "Utilising solid models for the discovery, management, exploitation and protection of Intellectual Property", by the Australian Graduate School of Management/Freehills survey 'The Management of Intellectual Property in Australian Organisations'.

December 2003

- Approval was given to ANSTO by the Parliamentary Public Works Committee for the construction of the new main entrance and radiopharmaceutical production facilities.

January 2004

- ANSTO introduced the 'green office' initiative, encouraging all parts of the organisation to take environmentally responsible actions
- Staff from Materials and Engineering Science were recognised with grants as part of the Australian Government's Innovation Access Programme
- Professor Henk Heijnis, an ANSTO senior research scientist, and the ANSTO Green Trends environmental consultancy were included in a grant from the Australian Research Council of $330,000 to investigate human migration in the Pacific Islands.

February 2004

- ANSTO released its 50th Anniversary Booklet featuring stories and images from our work over the last half-century
- Professor Ann Henderson-Sellers' research on stable water isotopes in climate forecasting received national press coverage
- Key factors regarding low level waste and its transport were outlined by Dr Ron Cameron at the ARPANSA public forum on the proposed radioactive waste repository in South Australia
- In support of ANSTO Minerals' comprehensive heap management system, a Patent Cooperation Treaty application was filed for a method to measure the intrinsic oxidation rate
- An audit by the ANAO on 'Intellectual Property Policies and Practices in Commonwealth Agencies' was tabled in Parliament. ANSTO was one of seven organisations showcased out of 74 organisations surveyed.

March 2004

- ANSTO staff completed the final extended shutdown for the 46 year-old research reactor in 40 days, the shortest time in its history
- The Technical Advisory Committee met over three days to review 25 current and

Graham Smith was one of the ANSTO scientists who analysed bushranger Joe Byrnes' armour. Graham is pictured holding the armour. He is not the bushranger.

proposed new research projects, for its annual report to ANSTO's Board on research excellence, collaboration, application and dissemination

- The replacement research reactor pool was lowered into position
- The Australian Government published major reports on collaboration between publicly funded research agencies and universities and on research infrastructure. ANSTO contributed significantly to these reports.

April 2004

- ANSTO received national media attention for the re-starting of Saturday site tours for the community
- ANSTO signed an Employer Statement of Commitment, produced by Comcare, to actively work towards achieving a set of occupational health, safety and rehabilitation targets over the next 10 years
- ANSTO participated in a joint safety exercise with NSW ambulance services.

May 2004

- Dr Ian Smith joined ANSTO as its new Executive Director
- ANSTO and the Centre of Medical Radiation Physics at the University of Wollongong signed an agreement to start collaboration on research into new methods of cancer therapy
- We gained additional funding in the Federal Budget for staff to support the replacement research reactor and for a regional program to better secure radioactive sources
- A provisional patent application was filed in support of ANSTO's new bioreactor technology. Preliminary data clearly demonstrates superior potential for the use of this new bioreactor technology in the biosynthesis of antibiotics and for wastewater treatment
- A provisional patent application was filed for ANSTO Minerals' new gas permeability meter aimed at optimising heap design with potential to reduce overall mining heaps' operating costs.

June 2004

- ANSTO achieved certification for its Environmental Management System to the international standard ISO 14001, and gained overall certification of our management systems to the international quality standard ISO 9001.

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 – 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 Agreements include indicators that are used to monitor and evaluate science agencies' performance in relation to the Agreement.

The following indicators cover the period of ANSTO's Agreement that operated from 2000-01 to 2003-04, having been extended for a year beyond the usual three-year term. The indicators should be read in conjunction with the Report of Operations in this annual report.

A new Triennium Funding Agreement came into effect in July 2004.

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 below).

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

Our vision is to benefit all Australians and the international community through the innovative applications of nuclear science…

List of distinguished awards and major prizes:

- Dr Jill Trewhella, sponsored jointly with Sydney University, was awarded a Federation Fellowship
- Dr Lou Vance was elected as a Fellow of the Australian Academy of Technological Sciences and Engineering
- Paul Phelps Continuing Education Prize awarded to Wollongong University Postgraduate student for research in collaboration with ANSTO scientists
- Research into cosmogenic erosion rates included in Editors' Choice section of *Science* magazine, March 2004.

Number of nominations as host agency by internationally recognised researchers

- 18 nominations (10 in 2003, 25 in 2002)

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

	2003-04	2002-03	2001-02
Books, chapters & monographs	1	5	7
Journal articles (refereed)	113	147	125
Conference papers/abstracts	322	300	268
Commercial & technical reports	291	477	553
Total	**727**	**929**	**953**

Note: As a result of a new reporting system introduced during 2002-03, year-to-year figures are not directly comparable. In addition, during the year a number of staff were diverted to support the replacement research reactor project. This also applies to subsequent tables.

Key Performance Indicators

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 users (includes science and academic communities). The performance indicator is the level of use of ANSTO's facilities (see Table 2).

Table 2: Number of users of ANSTO's facilities

	2003-04	2002-03	2001-02
Postgraduate/undergraduate students	186	197	181
Postdoctorals	32	38	57
Collaborative research projects	136	284	376
Others	47	34	42
Total number of users	**401**	**553**	**656**

Note: As a result of a new reporting system introduced during 2002-03, year-to-year figures are not directly comparable. Indicators for 2002-03 for Liaison and collaboration have been adjusted for comparative purposes. In addition, during the year a number of staff were diverted to support the replacement research reactor project. This also applies to subsequent tables.

3. Technology transfer and commercialisation

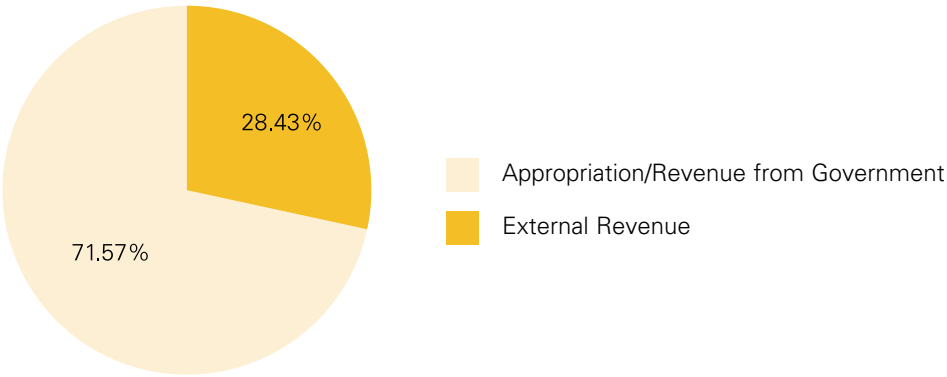
This indicator measures ANSTO's performance in terms of its objective to encourage and facilitate the application of knowledge and technology developed by the organisation for the benefit of industry and others for the maximum long-term benefit of Australia.

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 in Outcome 3 ($000's)

	2003-04	2002-03	2001-02
Appropriation revenue from Government, (net of capital usage charge, equity injections and special maintenance supplementation)	101,244	93,986	88,877
External revenue (net of asset disposal proceeds)	40,215	37,638	34,401
Total revenue (Outcome 3)	141,459	131,624	123,278
External revenue as a percentage of total	**28.43**	**28.60**	**27.91**

External earnings gained, 2003-04



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).

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

	2003-04	2002-03	2001-02
Number of projects	20	15	16
Number of person years	31.7	26.3	28.6
Amount expended ($m)	**5.23**	**5.29**	**5.78**

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 use of successfully completed research and service contracts for industry and government (see Table 5 below).

Key Performance Indicators

Table 5: Contract performance

	2003-04	2002-03	2001-02
Number of contracts completed during report period	1299	1311	935
Number of contracts due for completion during reporting period	1299	1321	944
Proportion of contracts completed against the number of contracts due (%)	100	99	99
Number of continuing contracts at end of period with period milestones met	32	95	70
Number of continuing contracts at end of period with milestones to be met during period	37	96	81
Proportion of continuing contracts that met milestones during period (%)	86	99	86
Proportion of all contracts that were completed or met milestones	**97**	**99**	**98**

REPORT OF OPERATIONS

Report of Operations

Enzo Valente

Enzo Valente has worked with ANSTO for over 20 years, and for the last three as Assistant Production Manager for manufacturing radiopharmaceutical products. The half-life of many critical medical radioisotopes such as thallium and molybdenum is very short, which means that the turnaround time for processing orders is usually no more than a day. Arriving in the morning from the reactor or cyclotron, these isotopes are transformed by Enzo and his team of 20 into dispensable radiopharmaceuticals that will be used for patient treatment within 48 hours of their production. It is Enzo's job to oversee production, quality, health standards, and delivery.

Pictured: Enzo at the 'cell face' production facility for manufacturing iodine-131 capsules.

ANSTO's activities in 2003-04 were grouped in more than 100 projects within the core business areas. Each project has clear objectives to contribute to one or more of our target areas of government, society, the Australian economy, international relationships and the pursuit of scientific and technological knowledge.

The projects selected for this Report of Operations have either achieved significant results or were completed this year. Each project is described in terms of four criteria:

- **activity** – a summary of the work being done
- **output** – a brief account of results to date (such as papers, patents, products, capabilities and services)
- **outcomes** – an explanation as to how the project benefits science, industry, government, the community at large, or ANSTO's own operations
- **future** – a preview of where the project is going, including anticipated results and new opportunities, where appropriate.

Core Business Areas

ANSTO pursues its mission and strategic objectives through Core Business Areas (CBAs). There are six CBAs, and all projects are managed under them. The aims and activities of each CBA are summarised below.

International Strategic Relevance of Nuclear Science and Technology (ISRN)

This CBA provides technical advice to government about the nuclear fuel cycle and advice and information to international and local communities about nuclear-related issues.

In addition, ANSTO is taking a lead role in promoting the implementation of appropriate nuclear-related capabilities, including the application of security and safeguards technologies and processes to nuclear material and facilities.

Radioactivity is part of our everyday lives.

Core Nuclear Facilities Operation and Development (CFOD)

Within this CBA, ANSTO operates core facilities in Australia and overseas for the benefit of Australia's research and development community and industry. Critical to success are safety, efficiency and the effective provision of access to nuclear infrastructure.

Nuclear Science for Environment and Sustainability (NSES)

The projects in this CBA use nuclear-based techniques to improve our understanding of natural processes and the impact of human activity on the environment in order to identify strategies and solutions for environmental sustainability.

NSES also provides technical advice on issues of public importance and offers a range of services to government, industry and the research and development community.

Treatment and Management of Man-made and Naturally Occurring Radioactive Substances (TMRS)

The focus of this CBA is on developing advanced processes for treating radioactive waste and giving expert advice to government about radioactive waste management.

One of its highest priorities is to safely manage ANSTO's own radioactive waste, which includes conditioning for storage and disposal.

Sustainability and International Competitiveness of Industry (SICI)

ANSTO recognises that good science promotes good business. Through this CBA's activities, ANSTO is strengthening Australia's research base and developing exciting business opportunities.

Research and commercial activities include manufacturing and distributing radioisotopes to diagnose and treat life-threatening diseases, to address environmental problems and to improve industrial processes.

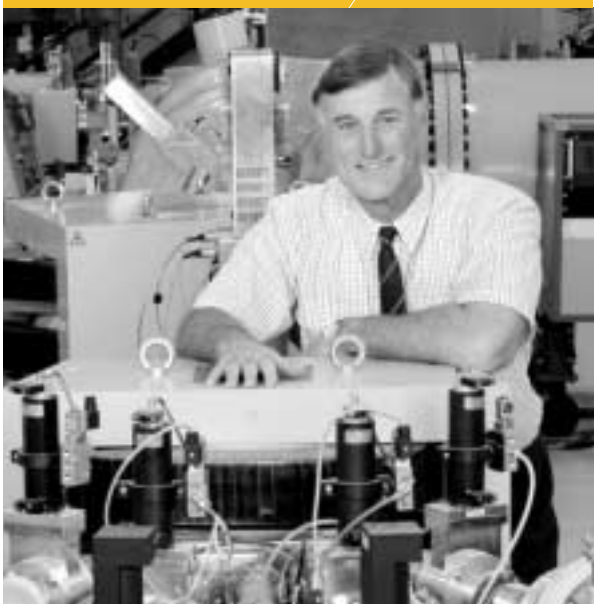
Organisational Development and Support (ORDS)

Projects in this CBA ensure that ANSTO's business processes, safety systems, information services and human resources management are best practice.

Outcome–Output framework

Every project contributes to ANSTO's framework of outcomes and outputs, which is the basis for ANSTO receiving Appropriation funding from the Australian Government (see Appendix 6).

International Strategic Relevance of Nuclear Science and Technology



Dr David Cohen

David Cohen is a senior scientist working in environmental fields. He is in charge of research and operations for ANSTO's three charged particle accelerators. This year, as part of the IAEA's Regional Cooperative Agreement, he has worked on a collaborative project with 13 countries in south-east Asia to investigate and analyse the composition and sources of fine particulate air pollution over major cities in the region. As leader of ANSTO's Accelerator Science project, David applies accelerator-based research and ion-beam analysis to a broad range of disciplines including the life sciences, materials research, and environmental science.

Pictured: David with the high-energy beamline switching magnet on the recently acquired High Voltage Engineering Europa (HVEE) 2MV Tandetron used for ion-beam analysis and accelerator mass spectrometry (AMS) experiments.

Advising government

Activity

ANSTO provides advice on a range of national and international nuclear issues – including counter-terrorism initiatives, and developments at the International Atomic Energy Agency – to ministers, Parliament, government departments and agencies. ANSTO also contributes to government policy on science and technology, health, environment, industry, foreign affairs and trade.

Output

During the year, ANSTO provided a range of advice on issues including nuclear fuel cycle developments in Asia, whether exported equipment could be used for non-peaceful purposes and developments of importance to Australia in the United States and South America. We also provided analytical services to help detect clandestine nuclear activities in Middle East countries and supported Government interactions on security and safeguards with neighbouring countries.

Other interactions included significant contributions to two major Federal Government inquiries: the Review of Closer Collaboration between Universities and Major Publicly Funded Research Agencies, and the Research Infrastructure Taskforce. In addition, we wrote responses to Federal Government reviews of intellectual property management, university funding and salinity science, and we submitted reports to government ministers and the Parliamentary Public Works Committee on the progress of the replacement research reactor project. We also made several representations to the NSW Government Inquiry into the Transport and Storage of Radioactive Waste, and provided submissions to NSW Government reviews of science commercialisation and of medical and health research.

Report of Operations

Outcomes

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

Future

The Government's National Research Priorities will be further incorporated into ANSTO's operations over the coming year.

Leading the way in security and international safeguards

Activity

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

Output

ANSTO's facilities were inspected by the IAEA and regularly audited by ASNO. The IAEA inspections confirmed compliance with accounting and reporting requirements. ANSTO facilities and expertise were also used to train safeguards staff from other countries. A new project on security entails ANSTO working with international agencies to improve detection of illicit trafficking in nuclear and radiological material, providing training to emergency services on response to terrorism and developing linkages with Australian agencies in the application of nuclear techniques to forensics.

Outcomes

ANSTO's management of nuclear materials enabled Australia to continue to comply with the Non-Proliferation Treaty and implement Integrated Safeguards. Its facilities were also used to train representatives from countries around the world.

Future

ANSTO's experience in managing radiological and nuclear material will form the basis of a major initiative, with the US and the IAEA, to assist neighbouring countries to secure such materials against terrorism.

Representing Australia internationally

Activity

ANSTO has continued to maintain a strong presence and high profile in established international and regional fora, including our support for Australia's permanent position on the Board of Governors of the IAEA. In these roles we support Australia's commitment to peaceful nuclear cooperation and respond to its obligations under the Nuclear Non-Proliferation Treaty. We also advance ANSTO's own international and regional scientific standing.

Output

ANSTO staff provided their expertise across a wide spectrum of assignments to support the IAEA's nuclear-related programs, especially its Technical Cooperation Program. These assignments, funded by ANSTO, included

International Strategic Relevance of Nuclear Science and Technology

participating in consultants and technical meetings, providing specialist advice to developing countries, and delivering lectures at IAEA training events. Key leadership was provided in chairing meetings aimed at developing international agreements on safety and security of radioactive sources and nuclear liability. The IAEA also funded ANSTO staff to undertake 32 missions, totalling 195 days. And, as part of an ongoing arrangement with the IAEA, ANSTO coordinated the placement of 54 Fellows and scientific visitors for specialist training in Australia.

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

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

Outcomes

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

Future

ANSTO will continue to take the lead in international and regional nuclear cooperation arrangements and in implementing ongoing technical and management initiatives to encourage countries in the Asia-Pacific region to achieve increased responsibility and self-reliance in using nuclear science and technology peacefully and safely.

Protecting our coasts

Activity

We are developing nuclear techniques to study how contaminants become dispersed around Australia's coastal zone. We are also using these techniques, under the auspices of IAEA technical cooperation and bilateral programs, to solve major environmental problems in the Asia-Pacific.

Outputs

This small project achieved several notable successes during the year. We published nine papers in refereed journals; applied reactor-activatable tracers to cohesive sediments (muds) for the first time (in the scientific literature); helped investigate major environmental problems in Homebush Bay, Manila Bay, Fiji and Noumea; and contributed to ANSTO's support of IAEA programs.

Outcomes

We concluded our study involving the development and application of reactor-activatable tracers to monitor the dispersion of contaminated sediments in urban estuaries like Homebush Bay that have been affected by human habitation. The technique was found to provide an excellent alternative to the well-known radiotracers, which are not always suitable for dispersion studies in populated urban estuaries because of regulatory concerns. Results of the study have been incorporated into a management strategy for the environments investigated.

Future

Outcomes from our research will be applied to new studies of contaminant transport and their impacts on coastal ecosystems in Australia and Asia.

→ **Manila Bay**

CASE STUDY

Most countries that have a shellfish industry, and this includes Australia, experience major problems with harmful algal blooms. Around the world each year, contaminated shellfish poison tens of thousands of people, and the problem is getting worse.

To address the problem, a special worldwide program is being sponsored by the IAEA, and ANSTO is contributing. In this capacity ANSTO is helping to achieve the United Nation's Millennium Development Goals for developing countries in Asia.

The program's basic idea is to enable early (and successful) intervention by improving our ability to predict when and where algal blooms are likely to occur. There are two ways of doing this: one is an 'archival' approach; the other involves numerical modelling.

With the archival method, we assess how often algal blooms have occurred in the past by dating the bottom muds (sediments) where their skeletal remains lie buried. We date these sediments by using 'lead-210' techniques. This is similar to dating artifacts using carbon-14, except that lead-210 has a far shorter half life (22 years as opposed to carbon-14's 5,720 years) which means it can be used to date sediments in the last 100 years; and this covers the period of industrialisation and major changes in development patterns. From this information, we can correlate the frequency of algal bloom occurrences with changes in climate or with changes in development patterns affecting the coastal region. ANSTO has participated in studies like these in Thailand, with the Office of Atomic Energy for Peace, and with the Philippines Nuclear Research Institute (PNRI).

A more direct method of predicting the occurrence of algal blooms is to create numerical models that map the movements of their precursors - nutrients, for example. In a major study of Manila Bay, the site of one of Asia's largest cities, ANSTO and the PNRI have used radiotracer techniques to evaluate the accuracy of one such model constructed by the Water Research Laboratory of the University of New South Wales (UNSW).

In collaboration with BATAN, Indonesia's national nuclear energy agency, ANSTO will model threats that pollutants in Jakarta's waters pose to the local ecology. Jakarta has suffered massive fish kills, possibly caused by algal blooms or heavy metal poisoning. This is disastrous for the poor coastal populations which rely on fisheries for their food and income.

Core Nuclear Facilities Operation and Development

Dr Jamie Schulz

Jamie Schulz is leader of neutron beam operations on the Replacement Research Reactor project. In his capable hands is the management of all the new world-class neutron beam instruments and associated infrastructure – laboratories, safety, workshops, staff, and customer support. He is also a member of the project teams working on the Characterisation of Biomolecules project and the Controlled Encapsulation and Release of Active Molecules project.

Photo caption: Jamie standing in front of the replacement research reactor's neutron guide hall, in which the new world-class neutron beam instruments are being built.

Launching new STAR accelerator

Activity

In a collaborative project partially funded through AINSE, ANSTO has successfully installed a new High Voltage Engineering Europa accelerator and is now in the process of fully commissioning it. This new, small tandem accelerator (STAR), a 2MV Tandetron, replaces the 40-year-old 3MV Van de Graaff.

Output

The new accelerator offers researchers in Australia world-class ion beam and accelerator mass spectrometry capabilities and facilities. In particular, it will create new opportunities in the key research fields of environmental science, archaeology and geology, and it will enable research and development groups and industry to use nuclear techniques to resolve strategic and tactical problems.

Outcomes

STAR is integral to ANSTO's provision of accelerator-based nuclear research facilities to Australia's universities, government agencies and industry. Not only will it offer new research capabilities across the broadest range of scientific disciplines, it will also be of great service to graduate and undergraduate education and industry training.

Future

ANSTO's cutting-edge STAR facility will put major nuclear science and technology infrastructure within easy reach of Australian researchers for decades to come. It will accommodate emerging scientific demands and it will encourage innovative research in fields previously unavailable locally.

Report of Operations

HIFAR operation and maintenance

Activity

ANSTO's 10MW HIFAR research reactor, Australia's only nuclear reactor, operated safely, reliably and efficiently throughout the year.

Output

Our operations and maintenance procedures met all the performance indicators for safety and reliability set out in the business plan for ANSTO's Nuclear Technology division to:

- minimise all challenges to reactor protection systems
- measure the human performance error rate
- meet the 'as low as reasonably achievable' goals for reducing occupational radiation doses to staff
- reduce workplace accidents
- gain efficiencies in irradiation services for our customers
- provide reliable services to our many business partners.

Outcomes

We met all our performance targets and improved on the previous year's performance. This success was achieved by a policy of continuous improvement through self-assessment, training and increased staff accountability.

Future

We will improve our existing performance initiatives to ensure that the needs of our partners continue to be met and that HIFAR runs even more smoothly until its expected shutdown after the replacement research reactor (RRR) is fully commissioned.

HIFAR major shutdown

Activity

Every four years, in line with regulatory requirements, we carry out a major shutdown on HIFAR to perform maintenance on reactor infrastructure that is inaccessible during normal operations and minor shutdowns. We completed this, HIFAR's last ever major shutdown, successfully.

Output

We upgraded important parts of the infrastructure to ensure that HIFAR continues to operate safely and reliably until it is decommissioned.

Outcome

All shutdown activities were carried out on schedule and in a safe and effective manner.

Future

The project to decommission HIFAR is planned to commence in late 2006.

New neutron beam instruments

Activity

This project's objective is to design, procure, install and commission eight leading-edge neutron beam instruments at the replacement research reactor.

Outputs

The conceptual and engineering designs of the eight instruments are mostly complete. We are now half way through procurement. The project is progressing well and within budget

and we are on target to have seven out of eight beam lines operating by the time the reactor is commissioned.

Outcomes

The performance of our instruments is expected to place ANSTO in the top three such research centres in the world, and in one case it will be the best. The instruments will be used to solve important problems in physics, chemistry, materials science and engineering, as well as in the life and earth sciences. These capabilities, along with operational excellence and user-friendly personnel and processes, will maximise the scientific productivity and impact of the replacement reactor.

Future

In the next financial year, we will complete procurement and take delivery of most major instrument components. Installation can commence once the instrument halls of the new reactor buildings can be occupied in September 2004.

→ **Counting down the days**

CASE STUDY

Nuclear science has been part of Australian life since 1958, when our first research reactor HIFAR began operations. That facility is to be superseded by a new reactor, due to be completed next year, which will launch Australia's nuclear science and technology capabilities well into the 21st century.

The new multi-purpose facility will outperform HIFAR in every department, making it quicker, cheaper and more efficient to produce radioisotopes for nuclear medicine, to irradiate materials for commercial and scientific purposes, and to generate neutron beams for molecular-level analysis of plastics, metals and other important materials. There will be many other benefits: the replacement reactor will be the key to new research, development and applications not only in medicine and materials but also in agriculture, minerals exploration, energy, industry, manufacturing, construction, environmental science, biotechnology, sustainability, engineering, nanoscience, even archaeology and other diverse fields of inquiry.

Having our own world-class facility will be of enormous value to researchers and students from Australian universities, research institutions and industry; it will meet our scientific and medical needs well into the future. The replacement reactor will also make us a regional centre of excellence in the Asia-Pacific, and it will dramatically increase our standing in the research community internationally.

Project update: preparing for operations

Construction of the new facility will be finished in the coming year, but that's not the end of the story. Before we can get a new reactor up and running, a great deal of planning and preparation has to be done. That's what we've started focusing on this year: operational planning.

The replacement reactor – like ANSTO's other facilities – will require an operating licence. Obtaining approval to operate a nuclear research facility is a complex process. We have therefore spent several months in the last year preparing the application, which we will submit to ARPANSA for approval in September 2004.

A crucial part of our preparations is training. The new facility is going to be world-class, and

we intend to operate it in like fashion. For this reason we are investing heavily in operations and support staff and will begin training them in the second half of 2004 using specialised training programs and highly qualified instructors. A computerised simulator will be part of the training, and this will give personnel plenty of 'hands-on' learning *before* the reactor is commissioned.

What is 'commissioning'? Before the replacement reactor goes 'live', we have to demonstrate that it performs in accordance with the approved design. This process, which will begin in 2005, can take several months. Throughout this commissioning period we will continue to operate HIFAR, safely and reliably.

The year ahead is going to be busy; after all, it isn't easy bringing a new nuclear research facility into the world. But we are well prepared to make its delivery safe and smooth.

→ Low enriched fuel for a high-flux reactor

CASE STUDY

The HIFAR reactor is loaded with 25 fuel elements and operates almost continuously to provide services to customers. Currently, HIFAR fuel elements consist of Highly Enriched Uranium (HEU). HEU means that more than 20% of the uranium in the fuel itself is uranium-235. After considerable efforts, ANSTO is now ready to convert HIFAR from HEU to Low Enriched Uranium (LEU).

LEU fuel elements are scheduled to be irradiated in HIFAR over the next two years (before HIFAR is shut-down permanently). Less than 20% of the uranium in LEU fuel is uranium-235.

LEU fuel is incompatible with weapons production. For this reason, the use of LEU fuel in HIFAR will comply with the objectives of the Reduced Enrichment for Research and Test Reactors Program. This international program was initiated in 1978 with the mission of developing the technologies necessary to convert research and test reactors from using fuels containing HEU to fuels containing LEU. This mission is consistent with non-proliferation policy goals of minimising and eventually eliminating the use of HEU in civil programs worldwide.

The fuel elements were purchased from RISO National Laboratory following the closure of a Danish DIDO-type reactor three years ago. Due to the similarity between this reactor and HIFAR, the fuel elements required little modification. The same type of fuel had been used successfully in the Danish reactor for over 10 years.

Regulatory approval for use of the LEU fuel in HIFAR was obtained in June 2004. To apply for approval, ANSTO had first to update the HIFAR Safety Case, which required staff to do a lot of work over the last three years on reactor safety analysis calculations, reactor physics and thermal-hydraulics calculations, changes to operational limits and conditions, planning for a measurement program, changes to the computer codes used for fuel management, updates to relevant documentation, and so on.

The effect of a fully loaded LEU core compared to a fully loaded HEU core, is a reduction in neutron thermal flux across the reactor of about 10%.

Nuclear Science for Environment and Sustainability

Professor Henk Heijnis

Professor Henk Heijnis is a geoscientist who works on projects in the application of nuclear techniques to global climate change. He is also the manager of ANSTO Green Trends, a unique environmental consultancy within ANSTO's Isotopes for Water project. Green Trends can construct environmental histories over extensive periods of time using a combination of nuclear expertise with chemical, sedimentological and microbiological techniques. Henk is also an Adjunct Professor of Quaternary Science at the University of Technology, Sydney.

Pictured: Dr Henk Heijnis, a specialist in natural radioactivity, studying sediment core containing a pollution history of the area.

Human activity and climate variability

Activity

In this project we employ nuclear techniques to investigate the impact – in the past and present – of human activity on climate change in the Asia-Australasia region, and to improve our ability to predict global climate change in the future.

Outputs

To date, we have produced over 45 refereed publications in high-quality high-impact scientific journals. We have also built a large, continuous data set which demonstrates the nature and source of aerosol pollution in south-east Asia.

Outcomes

The project has improved our understanding of climate change in four important areas:

- the natural and anthropogenic factors that influence change in our environment
- the effects of aerosols on the climate in the Asian region
- long-term changes in the concentrations of trace species in the atmosphere both regionally and globally
- the impact of different land-surface schemes on simulations by atmospheric models.

Future

The results of this project will improve our ability to evaluate global climate models, to predict climate change, to model the long-term effects of aerosol pollution on global and local climates, and to develop better climate management policies and long-term strategies.

Report of Operations

Managing groundwater sustainably

Activity

We have developed new techniques for determining groundwater flow parameters in sediments and rock, particularly sub-metre scale hydraulic conductivity (this is a measure of how quickly water can move through a substance), flow direction and velocity from boreholes. We have also made improvements to surface seismo-electric geophysical instrumentation for imaging aquifer structure.

Output

By coupling a high resolution gamma detector with a neutron source, we have developed a method for providing high resolution analysis of the average elemental composition from boreholes. This analysis can then be used to determine water content, sediment characteristics/mineral composition and the porosity of the aquifer, and for estimating the permeability of the aquifer to groundwater using a salt water tracer which is pumped into the borehole and then moves into the aquifer.

We have also developed radiotracer technology, using the radiotracer bromine-82A, to provide flow direction and velocity from a single borehole.

In addition, we have designed a new seismo-electric, or Electro-Kinetic Sounding, remote sensing tool which overcomes significant shortcomings in existing technology and will make it faster and cheaper to estimate hydraulic conductivity in aquifers from surface measurements.

Outcome

These new techniques and technologies have several valuable applications. They can be used to measure the aquifer extent (including depth to basement, aquifer volume and sustainable yield), to predict the rate of movement of salt in groundwater, and to solve common hydrogeological problems such as charting aquifer tidal flow and estimating river loss to alluvium and the mobility of salt stores.

Future

The technologies developed in this project will be used to improve measurements of Australia's groundwater resources, which will enable better sustainable groundwater management. An additional benefit is the potential of these technologies to be used in the mining industry for measuring rock characteristics and ore grade.

Measuring historic methane

Activity

We are developing equipment and techniques to measure the radiocarbon content of methane extracted from air bubbles trapped in ice sheets. Our aim is to retrieve samples of air trapped at different periods of history to understand the origin of the methane component. We are focusing on the period from the year 1800 onwards, so that we can assess the effect of the Industrial Revolution on the atmosphere.

Output

A novel micro-furnace and ice-melting flask are under construction. New linkages have been established with leading international

researchers, which gives us access to ancient methane samples from Greenland. We have forged stronger ties with colleagues at the National Institute of Water and Atmospheric Research Ltd, New Zealand, where methane extraction takes place; and we continue to collaborate closely with the Australian Antarctic Division and the CSIRO, which provide methane samples from Antarctica.

Outcome

This research will lead to a fuller understanding of past sources of the potent greenhouse gas, methane, and this will in turn give us greater insight into climatic scenarios for the future. Also, the development of new equipment and techniques will enhance ANSTO's capability to measure the radiocarbon content of small samples using accelerator mass spectrometry.

Future

We will obtain more methane samples from Greenland in August 2004, and for the 2005/06 season we are planning an expedition to Antarctica where we will use thermal drilling to locate and retrieve ice cores from the year 1800 to the present day.

→ Delving into our environment's past

CASE STUDY

Using nuclear dating techniques and trace metal analyses of sediment cores, we have reconstructed an environmental history of western Tasmania to determine the impact on the region of human activity.

We wanted the study to encompass a variety of environments, so we chose seven sites ranging from the almost pristine to the highly exploited. The near-pristine sites, which included sub-alpine tarns and coastal lowland lakes, were located in regions such as the Tasmanian Wilderness World Heritage Area. The sites exploited by human activity were those which had a history of logging, mining and colonial settlement.

We used lead-210 and radium-226 – radioisotopes found in nature – to determine sediment accumulation rates and to establish chronologies. We expected that sediment cores collected from near-pristine lakes would reveal low and relatively constant trace metal concentrations, consistent with areas subject to little or no human impact. On the contrary, the evidence from these sediment cores revealed that trace metal concentrations peaked in the 1960s and began to decrease in the 1980s. This trend was even more evident in the sediment cores from sites affected by human activity, particularly those around the Queenstown mining area.

Of all the metals investigated, the most marked increases were in lead, arsenic, tin and copper. Understandably, concentrations of these metals were highest close to the mining areas. Of more interest, however, is the evidence that sites as far away as 150 kilometres showed marked increases in metal concentrations for the 1960s – above background levels – which means these metal pollutants were dispersed through the air.

We found that the increase in metal concentrations was due to mining activities in the Queenstown area. The most significant increase, as shown by the trace metal profile, coincided with the escalation of open-cut mining. The decrease in metal concentrations in the 1980s coincided with the cessation of mining.

→ Up, up and away?

CASE STUDY

Everyone's heard of greenhouse gas emissions, but what about 'particulate' emissions? When you burn wood in a fireplace, a pile of black ash accumulates at the base, and finer particles of ash (soot) disappear up the chimney. Something similar happens, on a much larger scale of course, in large coal-fired power plants. When coal combusts in the boiler, particles of bottom ash drop to the bottom and 'fly ash' disappears up the smoke stack.

But it doesn't disappear. Most of it is trapped by mechanical or electrostatic filters in the smoke stacks. Some of it escapes and disperses into the atmosphere. That which leaves the top of the smoke stack is called 'escaped fly ash' (EFA), and these particles are generally smaller than 10 µm.

EFA may have nasty consequences. It is highly enriched in coal-related toxic and radioactive elements, so if inhaled or ingested it could harm the lungs or gastrointestinal tract. Alternatively, elements carried by the fly ash could be adsorbed and affect other organs or processes. These health risks apply not only to humans but to all species. Furthermore, because EFA particles are so small, they can remain suspended in the atmosphere for a long time, upwards of 18 months. This can affect the weather by interfering with the atmosphere's chemistry or radiation-scattering characteristics. Fly ash that is trapped in filters can also prove harmful. Often it ends up buried in landfill, where it may release toxic or radioactive elements into the soil and groundwater.

To date, very little research has been done on particulate emissions. That's where our project comes in. First, we collected fly ash from known fuel under controlled conditions. Now we are characterising and 'mapping' it. Some of our results are unexpected. We have, for example, found 90 µm particles in EFA that must have condensed from vapour above all the filters. We have also found that EFA has about 10 discrete phases.

We applied a 'microanalytical hub' strategy in this study and employed several complementary technologies and techniques to the samples. Consequently we had to develop new methods for handling samples and collecting data. The techniques we used included: scanning electron microscopy, transmission electron microscopy, secondary ion mass spectrometry, ion beam analysis and synchrotron microprobe techniques.

Looking to the future, we plan to help design better filters and to find out which toxic and radioactive elements align with which EFA phases.

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

Lubi Dimitrovski

Lubi Dimitrovski runs ANSTO's radioactive waste management processes. As leader of Waste Operations and Technology Development, he manages a team of about 35 staff responsible for collecting, storing and treating the organisation's radioactive wastes safely and efficiently. These responsibilities include preparing the spent reactor fuel for transport overseas. This year Lubi was responsible for the successful project to construct and commission a new Waste Treatment and Packaging Facility.

Pictured: Lubi with the new cement facility for conditioning low level solid wastes.

Developing selective inorganic sorbents for liquid waste

Activity

Separation and purification processes are at the heart of many chemical industries. This project seeks to develop new adsorbent materials, as well as processes that use them, for selectively removing metallic species from aqueous streams.

Output

To date, we have developed inorganic materials that can selectively remove a range of species – including cesium, strontium, silver, lead, polonium and thallium – from liquids. In bench-scale experiments, these inorganic materials have extracted cesium and strontium from liquid radioactive waste that arises from the production of medical radioisotopes. We have also conducted laboratory tests to explore other possible applications as well as the commercial potential of these new materials.

Outcomes

By thoroughly investigating the ion-exchange properties of several new and existing microporous inorganic materials, we may discover metal ion selectivities of great value to industry. For example, adsorbents could be used to purify drinking water and to treat industrial water; and by recovering radioisotopes such as strontium and cesium from what we currently call 'waste', we could reduce ANSTO's environmental footprint and simultaneously extract useful radioisotopes.

Future

It will be possible to reduce the radioactivity in liquid waste and recover useful isotopes such as strontium. We will also explore extracting other potentially valuable radioisotopes from liquid wastes; and we plan to put greater

Report of Operations

ANSTO is responsible for delivering specialised advice, scientific services and products to government, industry, academia and other research organisations.

emphasis on the use of ANSTO separation technologies in the general area of water treatment.

Managing radioactive waste

Activity

The safe disposal of ANSTO's radioactive wastes is managed under this project. Tasks include collecting, processing and conditioning low level waste and packaging it in a suitable solid form for transportation.

Output

Further improvements were made this year to waste handling and treatment processes which ensure that radioactive wastes are managed and transported safely. Of particular note is progress made in implementing ANSTO's own ceramic titanate technology (synroc) for the long-term immobilisation of waste from molybdenum production.

Outcomes

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

Future

ANSTO will continue to develop world-class facilities and processes for managing radioactive waste.

→ **Waste disposal in a nuclear age**

CASE STUDY

There are two sides to every coin. On one side, nuclear science and technology improves our quality of life: nuclear medicine can save lives; and nuclear technology can benefit agriculture, industry and our understanding of the environment. On the other side is the responsibility to manage the wastes from nuclear production activities safely.

Human activity has always produced waste. With the advent of the Industrial Revolution the volume and the types of waste produced by society increased dramatically. But it was not until the 1940s, when industrialised nations began using nuclear energy for power, and radioisotopes for military, industrial and medical purposes, that radioactive waste management came into the equation. As with all wastes, solutions had to be developed to manage this type of waste.

In Australia, we have come up with some specialised techniques for managing waste so that it will not impact on people or the environment. In anticipation of the establishment of a National Radioactive Waste Repository and Store, in 1999 ANSTO began work on a $5 million project to design, build

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

and equip a special Waste Treatment and Packaging Facility (WT&PF).

Most of Australia's radioactive waste is low-level solid waste, some of it produced by the work carried out at ANSTO. It is this waste – some 1,300 cubic metres comprising mainly contaminated gloves, paper towelling, plastic, and laboratory glass ware – that we will process and package in the WT&PF.

What steps will be involved in this process? ANSTO's low-level solid waste is currently stored in 200-litre metal drums, which are gamma scanned to measure the radionuclide content. We first have to open each drum and inspect the waste inside to determine if it needs further processing. This takes place in a specially-engineered ventilated waste inspection chamber, so that the entire process is carried out in the safest conditions. A drum that contains some moisture will be vacuum- and thermally-dried in a purpose-built drying apparatus. After this, the drum may be capped or in-mixed with a specially formulated cement-based mortar that will stabilise the package. This cement is designed for maximum durability and has the same formulation as that used in the Sydney Harbour Tunnel. The completed drum is then certified for transportation.

These treatment and packaging operations will comply with criteria defined by the Australian Government and approved by ARPANSA.

ANSTO has 45 years experience in handling and storing radioactive materials safely. With our new treatment and packaging facility, we will continue to maintain our clean record in waste-management.

→ Radioactive waste in Australia

Radioactive wastes are classified as high-, intermediate- or low-level according to internationally recognised criteria. Classification depends on the type and amount of isotopes present in the waste, and how much heat is generated by the waste form itself.

Australia has no high-level waste.

Australia has about 3,700 m3 of low-level waste in solid form. This has been accumulated over approximately 50 Years. Nearly two-thirds of it is slightly-contaminated soil, from the CSIRO's processing of radioactive ores in the 1950s and 1960s. Some 210 cubic metres of it has been produced by the Department of Defence and consists of contaminated soil, sealed sources and gauges, and other equipment. Approximately 1,320 cubic metres is the by-product of ANSTO's operations and is predominantly low-level solid waste.

Australia also has about 500 cubic metres of intermediate level waste of which about 400 cubic metres is held by the Commonwealth, consisting of ANSTO operational waste (target cans, ion exchange columns, used control arms; aluminium end pieces); historical waste (thorium and uranium residues from mineral sands processing); and disused sources from medical, research and defence equipment. The rest (about 100 cubic metres) is held by the states and territories, mainly used sources from medical and research equipment.

Report of Operations

Sustainability and International Competitiveness of Industry

Paula Berghofer and Dr Vu Nguyen

Paula and Vu are members of ANSTO's pharmacology team. Their roles are to study the effects of radiopharmaceuticals on human cells and animal systems and to provide support to collaborators from industry and universities. Currently they are investigating and evaluating new drugs designed to improve the diagnosis and treatment of cancers and neurological disorders. Using the new SPECT (Single Photon Emission Computed Tomography) system – a gamma camera for animal imaging – they can 'watch' to see if a radiotracer injected into the body reaches its destination – a tumour, for example, or a diseased organ – and they can assess, once it gets there, how much radioactivity accumulates and is retained to do its job.

Pictured: Vu and Paula are pictured here with the new SPECT system.

Nanostructure of complex systems

Activity

In collaboration with Australian industry partners, we are investigating the structure of polymer molecules, the molecular architecture of composite materials and the porosity of oil-bearing rocks. The project uses a broad range of ANSTO's research facilities and expertise, and specifically exploits small angle x-ray and neutron-scattering techniques.

Output

We have developed a new capability for using radiation-scattering techniques to solve complex problems encountered by Australian industry in its endeavours to be more competitive. This has increased our understanding of industrial products and processes, particularly in the polymer and oil exploration industries.

Outcomes

In anticipation of the world-class facilities being developed for the replacement research reactor and the Australian synchrotron, we have consolidated an extensive network with industry incorporating long-term research strategies. This will expand the user base for these major investments in research infrastructure, and it will give industry better access to ANSTO's specialist skills and facilities.

Future

We will continue to collaborate with Australian industry and undertake internationally competitive research. Major developments are planned in the field of novel nanocomposites (new materials) and in the biomedical application of polymers (e.g. drug delivery and stem cell scaffolds).

Report of Operations

Diagnostic radiopharmaceuticals for melanoma

Activity

We are developing and evaluating new chemical entities to aid in the diagnosis and treatment of melanoma. Activities include the clinical evaluation of an iodine-radiolabelled benzamide molecule in comparison to the industry-standard fluoro-deoxy glucose, and the development of entities with greater specificity and selectivity for the purposes of imaging and other applications.

Output

We have systematically identified, synthesised, radiolabelled and screened a large number of drugs. From these, we have found two molecules which appear promising for the diagnosis of melanin-sensitive tumours and of metastases that may be melanin-related. The project has also led to new publications and conference proceedings as well as important collaborations with premier institutions and industry nationally and internationally.

Outcome

Since Australia has a high incidence of malignant melanoma, any improvements we make to diagnostic and therapeutic radiopharmaceuticals can have a huge impact on the delivery of care to patients. The benefits from this will also flow to the clinical and scientific communities, industry, ANSTO and the wider Australian community.

Future

The early clinical data will provide proof of principle for developing melanoma diagnostic markers to assist in the design of therapeutic agents. More generally, the project will lead to new capabilities, expertise and infrastructure, and potentially to intellectual property and marketable products.

Nanostructural engineering

Activity

A comprehensive strategic technology platform is being developed – based on sol-gel processing, atomic layer deposition and plasma processing – for engineering a range of nanostructured materials with applications in biotechnology (e.g. production of pharmaceuticals), optics and optoelectronics (e.g. sensors and anti-reflection coatings on plastics) and protective coatings (e.g. to provide enhanced protection against abrasion and corrosion, self-cleaning surfaces, etc).

Output

The project has produced several important results in the development of generic technologies that will underpin a wide range of applications:

- new capabilities for engineering titania, silica and self-assembling nanohybrid materials at low temperatures on various substrates (particularly polymers) with controlled nanostructures
- nanostructured inorganic hosts containing functioning biocatalysts for biosynthesis applications
- a submission to patent new bioreactor technology
- share in competitive grant funding of $1.2 million to support the research and development of new sol-gel technology with Australian and international collaborators over the next two years.

Outcome

This project is developing frontier technology in an important emerging area of science and engineering that will enable us to to design and build new functional nanostructured materials for high-technology applications, particularly at temperatures compatible with polymeric substrates and biologically active species. The new academic and commercial collaborations that are evolving through this project will further enhance ANSTO's strong standing in the nanotechnology community, enabling us to better resource Australian industry.

Future

ANSTO's established strengths in the materials field provide a firm basis for creating a competitive edge and a strong international position in nanotechnology in both the platform science and the tactical applications of the technology.

Controlled encapsulation and release of active molecules: MuCaps technology

Activity

We are developing materials and process technology for encapsulating and releasing a wide range of active molecules from ceramic micro- and nano-particles. The particles produced have a defined microstructure which can be tailored to commercial requirements for specific dose and release rates. This year we have concentrated on reaching proof of concept stage for medical and industrial applications and on prospecting potential industrial partners for future collaborations.

Output

The visibility of MuCaps technology has been significantly increased through discussions with local experts, delivering invited talks at key conferences, generating an internet profile and publishing an e-zine. We are also holding discussions with venture capitalists and using direct mail to target specific industries where we believe MuCaps technology can be advantageous – namely home-, health- and personal-care.

On the technical side, we have successfully demonstrated that the MuCaps production process can be scaled up from bench to laboratory reactor. We have also developed a novel method for producing nanoparticles with the size and long-term release capabilities necessary for the passive targeting of tumours. This is currently being patented.

Outcome

We are now finalising several collaborations with industry which will generate external revenue and demonstrate the validity of MuCaps technology as a commercial alternative to conventional encapsulation and release technologies. Moreover, the latest technical developments from our studies into radiolabelling nanoparticles for drug delivery have revealed the technology's extreme flexibility: the encapsulation and release of a whole range of molecules can be achieved under varied conditions and constraints.

Future

We are expanding the technology to encapsulate biomolecules (enzymes and proteins) and functionalising nanoparticles for

smart-targeted drug delivery to specific organs or cells in the body. This will create more niche-market opportunities for MuCaps in the industries we have identified.

Neutrons for engineering

Activity

Using neutrons, we have developed residual stress measurement (RSM) capabilities which will enable Australian industry to better assess engineering components.

Output

We have further developed our RSM capabilities and expertise for use by Australian industry and academia. We succeeded in benchmarking the neutron strain scanner at HIFAR against a standard specimen; as a result, residual stress measurements to an ISO draft standard are now routine. We also made residual stress measurements using neutrons and x-rays for four external and three internal clients.

Outcome

Our RSM facilities and services have the potential to improve industry competitiveness and efficiency by improving our understanding of the behaviour of engineering components in a wide range of industries. The measurement of residual stress means that the fabrication, heat treatment and in-service behaviour of engineering components can be more accurately measured, modelled and predicted.

Future

Market intelligence indicates that the technique will be increasingly utilised by industry and academia for solving real-world engineering problems.

Characterising biomolecules

Activity

We are applying neutron and x-ray techniques to analyse the relationship between structure and function in large molecules of biological origin.

Output

In collaboration with our research partners at Australian and international universities we have conducted studies (and published the results) on a range of biomaterials including biopolymers, biogenic silica, sol-gel immobilised biocatalysts, plant materials and blood. Properties we characterised include porosity and surface area, association between cell components, and structural changes in biocatalyst components after assembly.

Outcomes

The biomaterials we investigated have potential application in the production of biomedical prostheses, drug-delivery systems, environmentally-friendly biodegradable polymers and communication infrastructure. This project also strengthens ANSTO's expertise in the biological application of neutrons and has developed the capability of isotopic (deuterium) labelling of molecules, which is critical to such investigations.

Sustainability and International Competitiveness of Industry

Future

Our growing showcase of successful applications will stimulate industry and tertiary sector demand for neutron science in the fields of biotechnology, nanotechnology and structural biology utilising the replacement research reactor currently under construction.

Asset management tools for engineering

Activity

In this project we conducted research and development in partnership with other members of the CRC for Welded Structures and the CRC for Integrated Engineering and Asset Management.

Output

We have developed new capabilities in high-temperature materials-testing and in materials performance, and new methodologies in predicting and extending component life. These techniques are of great use to Australian industry and are being implemented, for example, in coal-fired power stations. Over the year, we have also published numerous journal articles, reports, and technical articles, and given conference presentations locally and internationally.

Outcome

As a result of better understanding industry needs and cooperating more closely with other research organisations, we have been able to utilise ANSTO's capabilities to enhance the production and extend the life of major Australian infrastructure such as power stations and pipelines.

Future

We will continue to conduct research in collaboration with Australian industry and other research organisations and to focus on solving problems that will benefit all Australians.

→ Developing 'second sight' in the fight against cancer

CASE STUDY

Cancer, perversely, is as close as we get to immortality. This is because every cell in the human body is programmed to die a natural death, yet in cancer the program fails and the cells go on living. The program which tells a cell its time is up, is called 'apoptosis'. To treat cancer, therefore, we use drugs (chemotherapy) or radiation (radiotherapy) to induce apoptosis, as nature intended. The problem remains, however, that we cannot monitor the rate at which the induced apoptosis is occurring, and this means we do not know how well the treatment is working, or indeed if it is working at all.

Scientists in ANSTO's radiopharmaceuticals division have teamed up with the University of New South Wales to address this problem. Together they are developing an imaging agent that will allow doctors to 'see' how the apoptotic process is progressing in response to treatment. The idea is to find specific molecules that selectively look for certain markers on cells inside or outside the tumour which show if an apoptotic process is occurring or not. The project is still in its early stages, but the UNSW team has already developed a compound especially designed to image pathological conditions associated with apoptosis, and the research group at ANSTO

has successfully radiolabelled this compound with a number of isotopes. These radiolabelled entities are scheduled to be evaluated in biological systems and eventually in humans. The project has received a much needed boost by performing *in vivo* imaging studies using ANSTO's recently purchased state-of-the-art gamma-ray and x-ray tomography imaging system.

The quality of a doctor's diagnosis is only as good as the quality of the information at his or her disposal. This radiopharmaceutical imaging agent can greatly improve the prognosis of treatment by allowing the doctor to monitor apoptosis in action. It will also have benefits for staging or managing the patient's therapy: if a cancer drug isn't working, the doctor can intervene immediately with a better alternative. One of the great advantages of this kind of nuclear medicine, for both diagnosis and therapy, is that it is non-invasive: even as it does its job, it does not affect the functionality of tissues.

Many chemotherapeutics that have been around for 30 years work by inducing cell death. If we can tap into the cascade of events in a more selective way, then we can be more selective in our 'killing' process. We have to target 'the right pathway'.

Imaging agents will help in the treatment of other diseases too. Conversely to cancer, in which apoptosis doesn't happen at all, there are numerous diseases in which apoptosis occurs prematurely. These include neurodegenerative diseases such as dementia, stroke and Alzheimer's, and cardiovascular diseases, the most common of which is the heart attack. Cell death in these circumstances is 'unprogrammed' and dangerous. Rather than the neat, ordered chain of events following natural (programmed) apoptosis, unprogrammed apoptosis causes cells to rupture, spilling their contents into the body and disturbing neighbouring cells.

Whether to fight cancer, neurological or cardiovascular disease, the clinical benefits of selective radiopharmaceutical imaging agents are many and the commercial applications numerous. Although hundreds of groups around the world are developing cancer treatments, this project is only one of a handful attempting to monitor these myriad treatment processes. These new radiopharmaceutical imaging agents will give the medical community new 'sight'.

→ **Straight out of the mould**

CASE STUDY

Polymers are part of everyday life. They are in cars and computers, paints and prostheses, ropes and resins, and even in the fabric of many clothes we wear. The number and variety of polymers is astonishing. One of the more common types of polymers is thermoplastics, and a standard industrial method for manufacturing thermoplastics is injection-moulding. Look at the casing of your mobile phone and you'll see a high-precision example of injection-moulded plastic: it is light, thin, and tough too.

In principle, manufacturing injection-moulded plastic parts is straightforward. You create a mould, inject molten polymer into it, let it cool, open the mould and release a perfectly-shaped piece of plastic. But in practice, it's not so simple. Sometimes the polymer, once released from the mould, loses its shape by

warping or shrinking. It can be very costly if the pieces of your product don't fit together: not only is the polymer wasted, but the mould, which is an expensive part of the process, has to be redesigned and retooled. With this in mind, mould design engineers are grateful for any information, before they start cutting the mould, that can help predict the properties of injection-moulded parts.

It is to investigate the morphology of polymers that a project at ANSTO's Bragg Institute has been set up. The project is being run in collaboration with the CRC for Polymers, whose members include scientists from industry and from Sydney and Melbourne universities. The ANSTO team is studying the effect that material parameters and processing conditions have upon the final polymer morphology. Only by understanding these factors can we hope to predict the properties of injection-moulded parts and manage problems such as shrinkage and warpage.

How does it all work? Polypropylene is injected into the mould at enormously high pressure. This squeezes the polymer around and against the mould's contours – a frictional movement called 'shearing'. The force of this friction – 'shear' force – alters the polymer's molecular state, its crystal structure on cooling, and this affects the properties and behaviour of the plastic. Using x-ray and neutron-scattering technology, the ANSTO team is mapping exactly what happens to polypropylene under shear forces and is investigating the crystalline structure that results. Small-angle x-rays fired through the polymer produce time-lapse images, of exceptional quality and detail, of the general sequence of events. Neutrons beamed through the polymer delineate what happens to the chain architecture of individual molecules. Together, the two complementary techniques paint a complete picture of what is a very complex process.

Much of this research is being conducted in overseas facilities. Through international linkages established and maintained by the Australian Synchrotron Research Program (ASRP) and the Access to Major Research Facilities Program (AMRFP), the team has access to major research facilities around the world. The x-ray work is done at the Advanced Photon Source, a synchrotron in Chicago. The neutron scattering work is conducted at the National Institute of Standards and Technology, near Washington DC. The analysis and interpretation (plus supporting experiments) all happen here in Australia. By early 2005, ANSTO will have its own state-of-the-art, small-angle x-ray scattering machine, and of course the new reactor and synchrotron beamlines will be up and running in only a few years' time. These facilities will make it possible to conduct this type of research within Australia and to provide quick and comprehensive solutions to industry.

A fine example of collaborative science, the project combines the expertise of scientists from ANSTO, industry and universities, with cutting-edge technology both here and overseas, to produce leading-edge commercial solutions for Australian industry and at the same time to advance our theoretical knowledge of the nanostructure of complex systems.

Report of Operations

Organisational Development and Support

Tricia Mawson

Tricia Mawson is involved in learning and development (LD) at ANSTO. LD projects ensure staff get the professional and personal support they need to be successful in their jobs and further develop their careers. As the Learning and Development Professional at ANSTO, Tricia assists staff assuming management roles in completing the FrontLine Management Course. This course helps them become effective leaders. Tricia also manages the Learning Environments for New Strategies project which aims to foster an improved feedback culture, good leadership styles and an organisation that continues to learn from experience.

Pictured: Tricia Mawson assisting staff in the Objective Setting and Review Process training.

Financial support services

Activity

The Finance unit provides effective and efficient accounting, planning and budgetary support services to all ANSTO projects.

Output

We have continued to enhance management control by reporting accurate and timely accruals-based monthly accounts against budget.

Outcome

We achieved value for ANSTO by continuing to provide strategic advice and support to all business units and senior management on a wide range of issues including treasury, budgeting, taxation, insurance and financial management.

Future

Next year we will be introducing a new structure for the Fixed Asset Register which will enhance reporting capabilities for ANSTO's business needs. Also, ANSTO's new Triennium Funding Agreement with the Government will begin on 1 July 2004, with new performance indicators and commitments for reporting to Government.

Implementing ANSTO's Business Management System

Activity

Over the year we refined business processes, conducted audits and improved the performance of key components of the ANSTO Business Management System. We also introduced training to educate staff about the requirements of the quality standard AS/NZS ISO 9001:2000.

Report of Operations

Empower and motivate staff to be at the cutting edge of their disciplines

Outputs

We developed and issued clear descriptions of ANSTO-wide processes, as well as organisational and divisional procedures and guidelines, which helped to achieve the desired outcomes efficiently and effectively. We also received external certification that the ABMS meets the requirements of the Australian – and international – standard for quality management systems.

Outcomes

Operating a certified business management system helps demonstrate ANSTO's commitment to continual improvement in meeting customer and stakeholder needs. The ABMS itself is helping us achieve successful outcomes more effectively and consistently. It also provides a basis for ANSTO's environmental management certification.

Future

Now that all areas of ANSTO have ISO 9001:2000 quality certification, we intend to improve the ABMS further by integrating existing divisional systems into a single system for the whole organisation. This will provide a more effective basis for assessing the quality of our science and operations. The ABMS will also provide the vehicle for integrating ANSTO's business, environmental and safety systems.

Developing ANSTO people

Activity

Under this project we provide learning and development services to ANSTO staff.

Outputs

The number of training courses run during the year is shown in Table 1 (over page). The numbers of postdoctoral, year-in-industry, vacation, and work experience students ANSTO supervised are shown in Table 2.

Outcomes

The training courses helped staff improve their skills in managing people, projects and resources, and enhanced personal and operational effectiveness. The postdoctoral program provided valuable mentoring and skills development for promising young scientists. The year-in-industry, vacationer, and work experience programs improved undergraduate and high school students' knowledge of nuclear science; they also served, informally, to increase the broader community's understanding of ANSTO's work.

Future

We will redefine and continue to develop our Learning Environments for New Strategies (LENS) project so that it continues to meet the organisation's changing needs.

Organisational Development and Support

Table 1. Overview of courses run by Strategic Learning and Development. July 2003 – June 2004

Course x duration	Number of courses delivered 2003-04	Total Number of Days	Number of attendees
Frontline Management x 1 or 2 days	7	11	90
Project Management x 3 days	3	9	43
Recruitment Training 1½ days	2	3	24
Objective Setting Training x ½ days	3	1½	27
Assessor Training x 2 days	2	4	15
LENS x ½ or 1 day or 3 days		73	339
3 day Workshops	8		
1 day Workshops	6		
½ day Workshops	17		
Totals	**48**	**101½**	**538**

Table 2. Supervision of students

Program	Numbers
Postdoctoral Fellowships	15
Year-in-Industry (undergraduate)	20
Vacationers (undergraduate)	20
Work Experience (high school)	43

SAFETY ARRANGEMENTS

Safety Arrangements

Karen Wolfe

Karen Wolfe is the Leader of Occupational Safety Services. This group provides occupational health and safety advice and support and first response emergency services across the whole ANSTO site. The ANSTO Contractor Safety Management System, which she and her team devised and put together, recently won the Safety, Rehabilitation and Compensation Commission Safety Awards.

Pictured: Karen assisting with safe entry to a confined space.

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

Our objectives

To ensure that our activities do not have an adverse impact on the community, our objectives are to:

1. protect human health and safety – this is the organisation's highest priority
2. develop and maintain safety systems and assessment procedures that comply with national and international standards
3. create and promote a positive safety culture
4. strive for continual improvement in safe work practices so that any risk to staff and the public from ANSTO's operations is as low as reasonably achievable.

Outcomes during the year

We have improved 'ownership' of safety at the individual level by setting up a Contractor Safety Management System, as part of which ANSTO staff are trained and authorised to supervise on-site contractors.

Control of radiation exposure for employees again ensured that employee radiation doses remained well within regulatory limits.

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

→ Measuring radiation by the 'dose'

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

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

Activities and outputs

ARPANSA licensing and regulation

All of ANSTO's major facilities are covered by operating licences issued by ARPANSA. We have submitted quarterly reports to ARPANSA as required by facility and source licence conditions.

Regulatory attention continues to be paid to our compliance with licence conditions. To this end, ARPANSA has instituted a program of planned inspections of ANSTO's controlled facilities and sources. The results of inspections carried out during the year demonstrate that ANSTO is fully compliant with all licence conditions.

Safety management

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

ANSTO's safety goals are to:

- improve the efficiency and effectiveness of our safety systems
- promote safety initiatives and safety awareness programs
- improve protection from radiation
- ensure that staff are trained to deal with all potentially hazardous activities
- comply with the requirements of the safety regulators – Comcare and ARPANSA.

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

A key element of our safety management system is the monitoring of safety performance. This role is performed at the highest level by the ANSTO Health, Safety and Environment Committee (AHSEC), which includes external members as well as ANSTO directors and senior staff. The committee monitors ANSTO's health, safety and environmental performance and advises the Executive Director of performance status. AHSEC met four times in 2003-04.

At the operational level our Safety Assessment Committee, which also has external membership, provides a review of all potentially hazardous activities involving

Safety Arrangements

ANSTO staff. From July 2003–June 2004 the committee assessed and endorsed 107 submissions.

Comcare approved a further two year period of self audit of OH&S arrangements for the 2003-2005 financial years. The revised focus is on reviewing OH&S arrangements at a local level within ANSTO. During the year audits have been conducted in the Bragg Institute, Materials and Engineering Science, Environment and Radiopharmaceuticals divisions. Findings were generally positive and a program of improvement actions has been developed and is continuing.

Our new Contractor Safety Management System won the Safety, Rehabilitation and Compensation Commission Safety Awards

Radiation protection

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

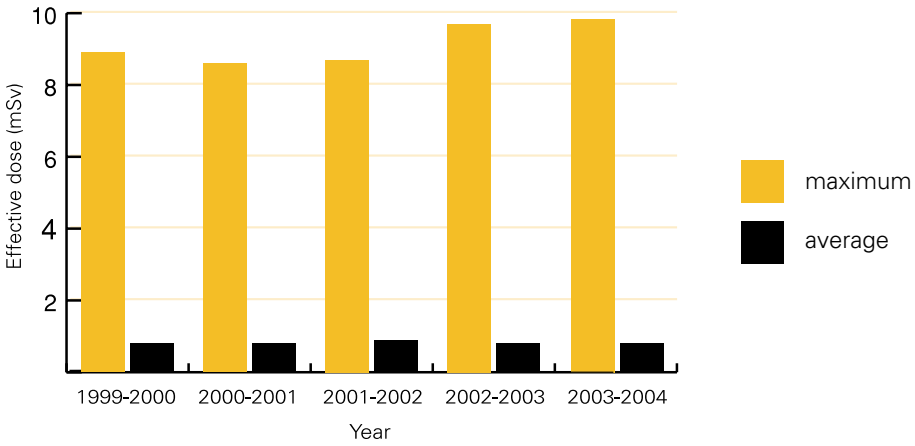
Table 1: Effective dose

		1999-00	2000-01	2001-02	2002-03	2003-04
Maximum effective dose	mSv	8.9	8.6	8.7	9.7	9.8
Average effective dose	mSv	0.8	0.8	0.9	0.8	0.8
Collective effective dose	man mSv	617	630	749	684	692

Table 2: Distribution of individual effective dose

Individual effective dose ranges (mSv)	1999-00	2000-01	2001-02	2002-03	2003-04
≤ 2	669	700	726	756	824
> 2 to 5	67	65	77	80	82
> 5 to 10	26	23	25	23	18
> 10 to 15	0	0	0	0	0
> 15	0	0	0	0	0

Figure 1: Comparison of the maximum and average effective doses



ANSTO's Radiation Monitoring Group provides dosimetry services, measures airborne discharges, and conducts radiation instrument calibration services. The dosimetry service monitors any radiation doses that workers receive from radiation sources. This is part of our policy of assuring safety at work for all personnel. In 2003-04 the service monitored 924 workers, 84% of whom received less than 1 mSv. No person received more than 10mSv. The highest dose is well below the regulatory annual dose limit of 20 mSv (averaged over five years) for radiation workers. 17 of the 18 workers with doses between five and 10 mSv were involved in the production of radiopharmaceuticals either at ANSTO's Lucas Heights site or its National Medical Cyclotron.

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

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

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

In 2003-04 the highest shallow dose to any individual was 28.6 mSv, which is a small fraction of the national and international annual dose limit of 500 mSv. Staff who handle radiation sources may receive doses to their hands and fingers that are significantly different from the dose to their body, so extremity doses are monitored separately. The

Safety Arrangements

highest extremity dose to any individual was 257 mSv, which is again less than the annual dose limit of 500 mSv.

We routinely monitor staff who work with unsealed sources for possible internal exposures. Methods include bioassay, and whole body and thyroid counting. Any internal doses are assessed and added to those from external radiation, to produce a total effective dose.

Occupational health and safety

Accidents and incidents

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

In 2003-04 we notified Comcare of six notifiable incidents, five of which were reported as serious personal injuries (or possible serious injury) and one as a dangerous occurrence. None of these were radiation related. We investigated all incidents and made improvements to work practices as a result.

Safety training

Over the year we gave safety induction training to 212 new employees and 540 contractors. We also fulfilled all requirements for role-specific safety training. In addition we:

- ran one-day 'confined space' refresher courses to keep staff's accreditation up to date (79 staff)
- trained staff in the supervision of contractors, as part of ANSTO's Contractor Safety Management System (205 staff)
- organised OH&S induction for construction work to enable 62 staff to receive the Workcover Greencard, a requirement for access to the replacement research reactor site.

Overall, we ran 173 courses covering 42 different safety topics for a total of 2,455 participants.

Emergency preparedness and effective responses

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

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

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

An additional response plan is being developed at NSW State and district levels to deal

specifically with the unlikely event of a significant release of radioactive material from the LHSTC.

ANSTO maintains a close working relationship with the emergency service organisations by way of the Local Liaison Working Party (LLWP). The working party includes ANSTO specialists, the emergency service organisations, local government, and support organisations including NSW Health. ARPANSA is an observer.

Several exercises have been held during the year to test the effectiveness of ANSTO's Emergency Response Plan and standing operating procedures and the degree of coordination between ANSTO's 'first response' personnel and outside agencies.

- A combined exercise was held with the local Ambulance Rescue Service to simulate a rescue from the top of the water tower.
- We ran an exercise to evacuate the HIFAR 'fenced area', with expert observers from the NSW Police, Fire Brigade and District Emergency Management Office.
- We assisted the Australian Defence Force's Incident Response Regiment in simulating its response to a terrorist 'dirty bomb'.
- We participated in an Australian Defence Force exercise that simulated the detection and recovery of radioactive material in satellite debris falling on Australia.
- We conducted a table-top exercise to test the procedures for responding to an emergency in the Gamma Technology Research Irradiator.

A program to familiarise local NSW ambulance staff with the ANSTO site has proved highly successful. It has been supplemented by a cooperative program with ARPANSA which offers radiation training and a familiarisation tour for personnel from emergency service organisations.

ENVIRONMENTAL PROTECTION

Environmental Protection

Dr Kath Smith

In addition to contributing to a number of research projects addressing environmental issues, Kath Smith also manages the Materials Characterisation group of 19 people and an inventory of equipment worth over $15 million. Kath is responsible for ensuring that these materials characterisation capabilities remain at world's best practice, and for consolidating and extending international linkages so that our scientists have access to the world's best equipment.

Pictured: Kath with the new X'Pert Pro, a x-ray diffractometer for analysing the structures of solid and liquid samples. Kath's interests include the damage to these structures caused by radiation.

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

Environmental Management System

In line with the high priority ANSTO places on the environment, we are implementing an Environmental Management System that has recently been certified to the International Standard ISO14001. This standard requires that environmental risks are understood and minimised, an appropriate measurement system is in operation, and there is an organisational commitment to continuous improvement. ANSTO received ISO14001 certification in June 2004, consistent with our commitment to have this certification prior to commissioning of the replacement research reactor, scheduled for 2005.

Accurate measurements with independent verification

At ANSTO, we operate a routine monitoring program for measuring our air and liquid emissions and for sampling water, air and soil in the local environment. We undertake measurements in radio-analytical laboratories using equipment sensitive enough to detect radioactivity at the trace levels present in these samples.

The ANSTO program of environmental and effluent monitoring operates within a quality system that complies with the ISO9001:2000 standard for Quality Management Systems. To verify our results, we send key environmental samples to an external laboratory (ARPANSA Melbourne) which undertakes parallel measurements.

Focus on core business opportunities to generate economic, environmental or social benefits

Gaseous emissions

In the course of normal operations, some ANSTO facilities produce minor gaseous radioactive emissions. These emissions are minimised by treatment and filtration before discharge and all are constantly monitored. The effect on the local environment is too small to be detected directly, so we estimate the doses to the surrounding region and to the public by using an independently evaluated atmospheric dispersion model, known as PC-CREAM. The outcome of this modelling estimated the maximum potential public dose derived from ANSTO in 2003-04 was 0.004 mSv. This corresponds to less than 0.5% of the 1.0 mSv annual limit for members of the public recommended by the National Health and Medical Research Council[1].

Liquid effluent discharges within limits

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

Good quality storm and groundwater

ANSTO regularly monitors the storm water leaving the site. Results show that tritium concentrations were well below the Australian drinking water guidelines and that gross alpha and beta measurements were also below the levels required of Class C surface waters designated by the NSW Environmental Protection Authority (EPA).

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

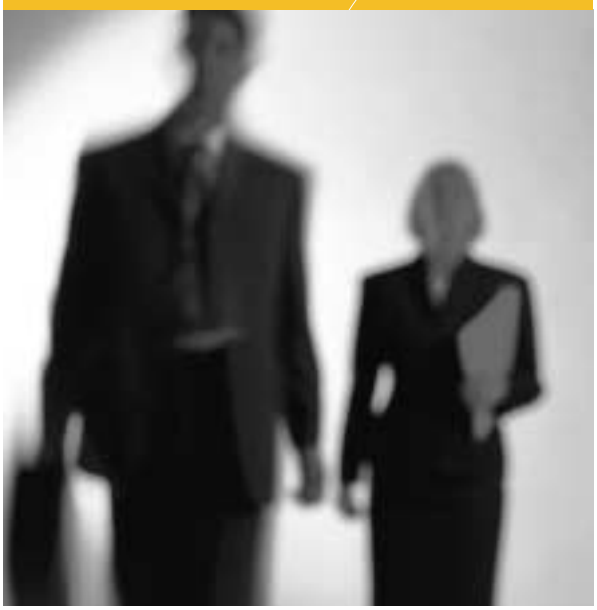
Detailed reporting

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

[1]The National Health and Medical Research Council's recommended limit applies to any 'added dose' of radiation above the normal levels of radiation Australians receive from natural background sources. On average, natural background radiation is 1.5 mSv per year. This means that ANSTO's emissions represent only a tiny fraction both of the 'added dose' limit and of natural background radiation.

CORPORATE GOVERNANCE

Corporate Governance



Compliance with Commonwealth legislation

ANSTO is subject to the provisions of the *Australian Nuclear Science and Technology Organisation Act* 1987 (ANSTO Act) and to the following key Commonwealth Acts and Awards:

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

- *Archives Act* 1983
- *Freedom of Information Act* 1982
- *Long Service Leave (Commonwealth Employees) Act* 1976
- *Superannuation Act* 1976.

ANSTO has established 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 Board

ANSTO is governed by a Board, as established under Section 8 of the ANSTO Act.

During the 2003-04 financial year the Board comprised six non-executive members, drawn from the broader community and not involved in the day-to-day running of the organisation, and the ANSTO Executive Director. The non-executive members are appointed, for specified periods, by the Governor-General. The Executive Director is appointed by the Board and cannot be the Chair. 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.

Board members possess complementary skills, knowledge and experience. This year they brought to the Board a wealth of experience in areas such as academia, the public service, industry, mining, scientific research, medicine and the commercialisation of research. (For further details, see *Members of the Board*.)

Functions of the Board

The general functions of the Board, as set out in Section 9 of the ANSTO Act, are as follows:

- to ensure that the organisation performs its functions properly and efficiently
- to determine the organisation's policy on any matter relating to the current policies of the Commonwealth Government.

In particular the Board is responsible for:

- approving the organisation's strategy, annual business plan, and budget
- monitoring financial performance
- monitoring managerial performance
- ensuring that any significant risks facing the organisation are identified, and consequently that the necessary control, monitoring and reporting mechanisms are in place.

The Commonwealth Authorities and Companies Act 1997 (CAC Act) requires that the Board comply with certain accountability and corporate governance principles, including:

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

All CAC Act requirements are currently being met.

Corporate Governance

The Board has established an Audit Committee (see p70). All matters considered by that Committee are submitted to the Board for information and, where appropriate, ratification. The Board is also supported in its role by committees and mechanisms relating to safety, environmental management and technical assessment (described in the following pages).

Processes are in place for the induction of new Board members and for the ongoing education and performance assessment of the Board and its committees.

Board meetings

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 *ad hoc* papers on a range of other issues relevant to the organisation. Senior managers attend Board meetings as required, to report on matters relevant to their areas of responsibility.

Six Board meetings were held during the 2003-04 financial year. The table below shows the number of Board meetings each member attended.

Remuneration and allowances

Remuneration and allowances for non-executive members of the Board and for the Executive Director are determined by the Commonwealth's Remuneration Tribunal. Details of remuneration are in the Financial Statements.

Disclosure of interests

Section 21 of the CAC Act provides that Board members must disclose any material personal interests they have in a matter being considered by the Board and must abstain from all participation, deliberation and decision making on such a matter.

All these requirements were met during the year.

Meetings

Member	Held	Attended
Dr I D Blackburne (Chair)	6	6
Mr G Cook	6	5
Mr M A Eager	6	6
Professor H M Garnett (Executive Director; resigned 2 October 2003)	1	1
Dr C J Hillyard	6	5
Dr A A van der Schaaf	6	6
Dr K H Schindhelm	6	5
Dr Ian Smith (Executive Director; appointed 17 May 2004)	1	1

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 sets out the requirements. The format and content of this 2003-04 Annual Report, including the financial statements, address these requirements in general; Appendix 8 sets out details of compliance with particular requirements.

The Board reports that:

- ANSTO's mission and strategic plan have not changed from those reported for the previous financial year and continue to be managed through six core business areas
- the work of each core business area is reported against in terms of its outputs and its strategies for achieving and contributing 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
- ANSTO has continued to manage both the risks it faces and the opportunities that arise.

In the opinion of senior management and the Board, at the time of making this report, adequate cash resources are, and will continue to be, available to cover ANSTO's requirements for working capital, paying existing debts, and meeting 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 implementing best practices in safety and environmental protection and to having these practices independently verified.

The Board continued to prioritise the recommendations on safety made by the Australian Radiation Protection and Nuclear Safety Agency. Under the ARPANSA Regulations 1999, ANSTO has received appropriate licences for all ANSTO facilities and radioactive sources, as well as a construction licence for the replacement research reactor. Procedures are in place to ensure that ANSTO complies with all licence conditions.

An ANSTO Health, Safety and Environment Committee oversees health, safety and environmental management and advises 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.

Corporate Governance

In 1999 Comcare granted ANSTO occupational health and safety self-audit status for two years. This self-audit status was renewed for a further two years in 2001 and again in 2003, which takes us up to 2005. In the 2003-04 year, ANSTO completed its self-audit program successfully. Comcare also conducted its own audit of ANSTO's self-audit activities; results were positive and were reported to the Executive Director, Board Audit Committee and the Board.

Audit Committee

The Audit Committee is the Board's only formal sub-committee. In 2003-04 it comprised Mr M A Eager (Chairman), Dr C J Hillyard (replaced by Dr K Schindhelm), and a member external to ANSTO, Mr W Wilton, who is a Chartered Accountant. ANSTO's Chairman is an *ex officio* member of this Committee. The Executive Director, the Director Corporate Services, the Chief Financial Officer, representatives of the Australian National Audit Office and the Chief Internal Auditor attend, by invitation, all meetings or relevant parts of all meetings. Others attend meetings, as appropriate, at the Committee's invitation. 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.

The Audit Committee was established by the Board, under a formal written charter, to oversee the organisation's risk management policies, practices and controls in relation to financial and commercial activities. These include the financial reporting process, and legislative and regulatory conformance, including corporate governance and asset protection. The Audit Committee's 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 in them. 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.

Meetings

Member	Held	Attended
Mr M A Eager (Chairman)	5	5
Dr C J Hillyard	4	4
Dr K Schindhelm (replaced Dr C J Hillyard from 22/6/04)	1	1
Mr W Wilton (external member)	5	5

The Committee meets at least quarterly. The table above shows the number of Committee meetings each member attended.

Technical Advisory Committee

The Technical Advisory Committee, formally established in accordance with a Board decision, usually comprises four members, all of whom are external to ANSTO. Members are chosen on the basis of internationally recognised scientific expertise and experience. The Committee's members, as at 30 June 2004, were Dr Roy Green (Australia), Professor Alan Leadbetter (United Kingdom), Professor Peter Robinson (Australia) and Dr Dan Shochat (United States).

This Committee operates under a written terms of reference and was established by the Board to advise on research proposals, with specific regard to the following questions:

- whether the projects are nationally or internationally important
- the quality of the science and whether it is appropriately focused and achievable
- consideration of ANSTO's competitive advantage for each project
- the quality of the networks and/or collaborations with other relevant research leaders and industry, and whether other contacts and networks could add value
- whether the research is being presented at the most appropriate fora, and are there other ways ANSTO research can be fully recognised and the value captured
- whether the research has commercial potential.

The Committee was formally constituted in October 1996 and is required to meet at least once a year. It met during the 2003-04 financial year and presented a formal report to the Board.

Risk management

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

It is the Board's responsibility to ensure that policies are in place to cover identified risks. It is management's responsibility to develop 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. The program's methodology is consistent with the Australian Risk Management Standard AS/NZS 4360:1999. The Audit Committee and the Australian National Audit Office receive summaries of all risk assessment reports.

ANSTO has a risk management policy which states that it is the responsibility of ANSTO's operational management to develop and implement risk mitigation strategies. The risk framework is actively applied to all ANSTO's operations and especially to new initiatives. Project risk management remains crucial to the replacement research reactor project, business information system project, and specific capital works projects.

Corporate Governance

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

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

Ethical standards

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

Fraud control

ANSTO has an established policy and plan for fraud control. These comply with the Commonwealth Fraud Control Guidelines released by the Minister for Justice and Customs.

External audit

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

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

The Audit Committee reviews the ANAO audit plan and reports. It also 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 by the Audit Committee and through the Internal Audit function.

Service charter

ANSTO's Service Charter states what ANSTO does and what standards of products and services can be expected from the organisation by its customers, stakeholders and the community. 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 was one judicial decision that ANSTO was party to during the reporting year. A decision was handed down in the Federal Magistrates Court of Australia on 6 August 2003, in which ex-ANSTO employee Samantha Mayer applied for compensation on the

Contribute to new knowledge in research areas in the applications of nuclear science

grounds of unlawful discrimination and termination of employment. Ms Mayer was awarded $39,294 in damages.

Ministerial directions

In August 2003, the Minister for Education, Science and Training directed ANSTO under the CAC Act to comply with the Commonwealth Fraud Control Guidelines. There were no other ministerial directions to ANSTO made under either the ANSTO Act or the CAC Act during the reporting year.

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.

Nuclear safeguards

ANSTO continues to observe and comply with strict national and international safeguards guidelines and requirements established by the International Atomic Energy Agency and by the national safeguards regulator, the Australian Safeguards and Non-Proliferation Office.

IAEA inspectors carried out inspections of ANSTO's nuclear material during a short announcement inspection in December 2003 and a full Physical Inventory Verification in March-April 2004. For each of the inspections, the IAEA inspectors requested and were granted complimentary access. The inspections produced satisfactory results, which were supplemented by ASNO's regular audits of ANSTO's nuclear material accounting system.

ANSTO is further strengthening its nuclear safeguards by making each of its divisions more accountable for the nuclear material in its custody.

In 2003-04, by continuing to implement all safeguards provisions, ANSTO again demonstrated its commitment to fulfilling both the national Non-Proliferation Safeguards Act and the Agreement with IAEA.

Business continuity planning

Continuity of ANSTO business is a critical issue that has been considered by the Board, the Executive Director and senior management. Many services delivered by ANSTO are crucial to Australia's economic and social well-being. Failure to deliver could have significant consequences. It is therefore vital that, in order to support essential business processes, all key resources are available without interruption.

Corporate Governance

In 2003-04 ANSTO addressed this matter by setting up a well-resourced project to ensure that any anticipated problems would have minimal disruption in the future. The methodology that was adopted follows the ANAO Better Practice Guide on business continuity planning, which presents a structured approach to business continuity management. It involves, firstly, identifying preventative measures for continuity risks that can be routinely managed, and secondly, developing an ANSTO-wide business continuity plan to deal with the consequences should the preventative measures fail. The plan satisfies the major steps identified for business continuity management in the context of overall risk management, as well as ANSTO's unique requirements.

All aspects of business continuity management will be reviewed regularly to make sure that ANSTO remains well prepared for all contingencies.

ASSOCIATED ORGANISATIONS AND PROGRAMS

Associated Organisations and Programs

Dr Chris Barbé

Chris Barbé specialises in developing new ceramic and glass materials for medical and industrial uses. He is currently leading a project which is designing ANSTO proprietary sol-gel technology for the encapsulation and controlled release of active molecules to be used in a wide range of commercial applications, from releasing enzymes in washing powders to delivering drugs to fight tumours.

Pictured: Chris holding a sample of our MuCap micro-particles with a pink dye (Rhodamine 6G) encapsulated inside.

Australian Institute of Nuclear Science and Engineering

Located next to ANSTO at Lucas Heights, the Australian Institute of Nuclear Science and Engineering Incorporated is a consortium of 37 universities (36 Australian plus the University of Auckland) in partnership with ANSTO. AINSE is a not-for-profit institute incorporated under the *NSW Associations Incorporation Act* 1984 and was established by the Commonwealth Government in 1958. It has four full-time staff.

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

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

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

Since AINSE operates on a calendar-year basis, this report covers the period 1 January to 31 December 2003. Its income of $3,681,578 comprised:

- $1,405,174 from ANSTO and the Federal Government
- $734,115 from university subscriptions

- $929,206 from conference sponsorships and registrations
- $470,688 from external grants
- $136,920 from interest on investments
- $5,476 from other sources.

Core business

AINSE uses its funds primarily to provide access to nuclear and other facilities at ANSTO and to AINSE-supported facilities. In 2003, it supported 239 university projects (186 new projects and 53 carried over from 2002) and provided supplements to 41 postgraduate research students: total value $1,697,322. Some 25% of these researchers had not previously had access to ANSTO's facilities; and for 15 of the postgraduates, the award was their first from AINSE.

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

AINSE has been notified that, over the course of the year, 372 articles were published as a result of AINSE-supported research.

AINSE supported two international conferences, two national conferences and one workshop during the year by subsidising travel and accommodation for researchers and students from member universities.

The Sixth AINSE Winter School was held in July 2003. A scholarship was offered to each of the 37 member universities to enable a nominated third-year student to participate. The program was judged an outstanding success and will be held again in July 2004. AINSE is very grateful to the staff at ANSTO who give their time and expertise to this important program. The Winter School contributes significantly to AINSE's and ANSTO's public profiles, and it is a particularly good opportunity for potential users to see ANSTO's facilities in operation.

Additional projects

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

An application in 2003 to the Australian Research Council (ARC) Research Infrastructure and Equipment Fund was successful. The grant of $245,509 for access to the UK facility ISIS, the world's most powerful pulsed-neutron source, was supplemented by $110,000 from universities, $25,000 from ANSTO and $25,000 from AINSE. Twenty-five experiments were accepted for a total of 28 days on the facility; and AINSE was notified during the year that 23 articles were published from the research.

The commissioning of the new Tandetron accelerator has been delayed. It is expected to begin performing routine accelerator mass spectrometry and ion-beam analyses from July 2004. (The accelerator was purchased with the assistance of a 2000 ARC Linkage-Infrastructure Grant and financial support from 27 universities and ANSTO. It was ordered in December 1999 and delivered in October 2002.)

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

Associated Organisations and Programs

facilitate the automatic preparation of graphite targets for AMS analysis and will 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 has been operational since late 2003.

Access to Major Research Facilities Program

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

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

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

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

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

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

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

During the 2003-04 financial year the AMFRP funded 82 teams to perform experiments using facilities in the USA, Europe and Asia. Eighteen ANSTO teams were funded to visit overseas neutron scattering, synchrotron and accelerator facilities.

Australian Synchrotron Research Program

The Australian Synchrotron Research Program gives Australian science access to a comprehensive range of synchrotron x-ray

research capabilities overseas that can assist research in the fields of physics, chemistry, materials science, structural biology, polymer research, environmental science and geophysics. ANSTO has been the managing agent for the ASRP since its inception in 1996.

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 and the ASRP was awarded $14.8 million to operate until mid-2007.

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.

In 2002 the ASRP negotiated a new collaborative agreement with Taiwan's National Synchrotron Radiation Research Center, which operates a 1.5 giga electron volt synchrotron facility in Hsinchu. Under this agreement, ASRP users have access to all beamlines at the Center, 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 Australian synchrotron user community has grown steadily since the ASRP was established. The ASRP currently supports visits to these overseas synchrotron facilities by more than 100 Australian research teams a year, with a total user community of more than 300. Scientists from 24 universities, four government laboratories including ANSTO, and five CRCs, have used ASRP beamlines in the past seven years.

During the last financial year, ANSTO continued to be a significant user of ASRP facilities, with funding and beamtime awarded to 12 teams from ANSTO's Environment and Materials and Engineering Science divisions and its Bragg Institute. Projects ranged from the characterisation of novel materials, to studies of polymers, to investigations of airborne pollutants.

The ASRP administers a postdoctoral fellowship program funded by subscriptions from its 16 member organisations. In July 2003 the ASRP awarded six fellowships, taken up at the Curtin University of Technology, Monash University, Swinburne University, the University of New South Wales, the University of South Australia, and the University of Sydney. An additional fellowship round closed in June 2004, with six fellowships being taken up by candidates from ANSTO, CSIRO, the Australian National University and the Universities of Newcastle, Queensland and Western Australia.

Member organisations

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

FINANCIAL STATEMENTS

Independent Audit Report

Australian National Audit Office

To the Minister for Science

Scope

The financial statements comprise:

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

of the Australian Nuclear Science and Technology Organisation for the year ended 30 June 2004.

The Directors are responsible for the preparation and true and fair presentation of the financial statements in accordance with the Finance Minister's Orders made under the Commonwealth Authorities and Companies Act 1997. This includes responsibility for the maintenance of adequate accounting records and internal controls that are designed to prevent and detect fraud and error, and for the accounting policies and accounting estimates inherent in the financial statements.

Audit approach

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

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

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

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

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

Independence

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

Audit Opinion

In my opinion, the financial statements:

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

(ii) give a true and fair view, of the matters required by 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 2004, and of its 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 2004

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130 Elizabeth Street
SYDNEY NSW
Phone (02) 9367 7100 Fax (02) 9367 7102

Statement by Directors

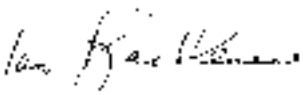
Australian Government

Australian Nuclear Science and Technology Organisation

In our opinion, the attached financial statements for the year ended 30 June 2004 are based on properly maintained financial records and give a true and fair view of the matters required by the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act* 1997.

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

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



Ian D Blackburne
Chairman

19th August 2004
Sydney

Ian O Smith
Executive Director

19th August 2004
Sydney

Statement of Financial Performance
for the year ended 30 June 2004

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
REVENUE			
Revenues from ordinary activities			
Revenues from Government	2(p), 5A	**121,054**	168,252
Goods and services	5B	**36,708**	33,645
Grants	5C	**410**	624
Interest	5D	**3,065**	3,356
Revenue from sale of assets	5E	**425**	507
Net foreign exchange gains - non speculative	5F	**32**	12
Revenues from ordinary activities		**161,694**	206,396
EXPENSES			
Expenses from ordinary activities (excluding borrowing costs expense)			
Employees	6A	**56,357**	49,738
Suppliers	6B	**58,012**	55,904
Depreciation and amortisation	6C	**28,617**	28,368
Write down of assets	6D	**2,150**	585
Grants	6E	**2,402**	2,278
Value of assets sold	6F, 5E	**241**	333
Expenses from ordinary activities (excluding borrowing costs expense)		**147,779**	137,206
Borrowing costs expense	6G, (a)	**140**	132
Operating surplus from ordinary activities		**13,775**	69,058
Net (debit) credit to asset revaluation reserve	10	**(37,284)**	24,320
Decrease in accumulated results on application of transitional provision in accounting standard AASB 1041 Revaluation of Non-current Assets	10	**(2,754)**	-
Total revenues, expenses and valuation adjustments recognised directly in equity	2k	**(40,038)**	24,320
Total changes in equity other than those resulting from transactions with the Australian Government as owner		**(26,263)**	93,378

Statement of Financial Performance
for the year ended 30 June 2004

Note:

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

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

Statement of Financial Position as at 30 June 2004

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
ASSETS			
Financial assets			
Cash	7A, 22	**6,742**	5,426
Receivables	7B, 22	**86,873**	85,181
Investments	7C, 22	**55,690**	53,083
Total financial assets		**149,305**	143,690
Non-financial assets			
Land and buildings	8A	**162,219**	167,627
Infrastructure, plant and equipment and major facilities	8B	**450,811**	389,765
Inventories	8C	**7,480**	8,114
Intangibles	8D	**1,425**	2,906
Other	8E	**811**	380
Total non-financial assets		**622,746**	568,792
Total assets		**772,051**	712,482
LIABILITIES			
Interest bearing liabilities			
Other	9A, 22	**2,466**	2,326
Total interest bearing liabilities		**2,466**	2,326
Provisions			
Employees	9C	**20,557**	20,433
Other	9D	**5,569**	8,949
Total provisions		**26,126**	29,382
Payables			
Suppliers	9E, 22	**18,672**	14,707
Grants	9F, 22	**57**	57
Other	9G, 22	**14,503**	14,210
Total payables		**33,232**	28,974
Total liabilities		**61,824**	60,682
NET ASSETS		**710,227**	651,800

Statement of Financial Position
as at 30 June 2004

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
EQUITY	10		
Contributed equity		350,579	265,889
Reserves		289,950	319,579
Accumulated surpluses		69,698	66,332
Total equity		710,227	651,800
Current assets		153,399	146,898
Non-current assets		618,652	565,584
Current liabilities		50,786	50,334
Non-current liabilities		11,038	10,348

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

Statement of Cash Flows
for the year ended 30 June 2004

	Notes	FINANCIAL YEAR 2004 $'000 Inflows (Outflows)	2003 $'000 Inflows (Outflows)
OPERATING ACTIVITIES			
Cash received			
Goods and services		**32,529**	38,490
Interest		**3,112**	3,248
GST received from ATO		**17,470**	13,147
Appropriations		**121,054**	168,252
Total cash received		**174,165**	223,137
Cash used			
Employees		**(56,234)**	(50,666)
Suppliers		**(73,668)**	(62,618)
Grants		**(2,402)**	(2,278)
Total cash used		**(132,304)**	(115,562)
Net cash from operating activities	11	**41,861**	107,575
INVESTING ACTIVITIES			
Cash received			
Proceeds from sales of property, plant and equipment		**425**	507
Proceeds from sales/maturity of investments		**26,000**	18,000
Proceeds from foreign currency disposals		**-**	87
Total cash received		**26,425**	18,594
Cash used			
Purchase of property, plant and equipment	(a)	**(123,053)**	(107,034)
Purchase of investments		**(28,607)**	(53,130)
Purchase of foreign currency for future supplier payments		**-**	(319)
Total cash used		**(151,660)**	(160,483)
Net cash used by investing activities		**(125,235)**	(141,889)

Statement of Cash Flows
for the year ended 30 June 2004

	Notes	FINANCIAL YEAR 2004 $'000 Inflows (Outflows)	2003 $'000 Inflows (Outflows)
FINANCING ACTIVITIES			
Cash received			
Appropriation - contributed equity		84,690	73,836
Total cash received		84,690	73,836
Cash used			
Capital use charge paid		-	(68,851)
Total cash used		-	(68,851)
Net cash from financing activities		84,690	4,985
Net increase/(decrease) in cash held		1,316	(29,329)
Cash at 1 July		5,426	34,523
Cash at 30 June		6,742	5,194
Cash per statement of financial position	7A	6,742	5,426
Cash not used in the daily cash management function – Foreign currency held as forward cover for future supplier payments		-	(232)
		6,742	5,194

Note:

(a) The major portion of the figure in 2004 relates to the cash flow impact of the replacement reasearch reactor of $93.801 million (2003: $79.196 million).

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

Schedule of Commitments not recognised as Liabilities for the year ended 30 June 2004

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
BY TYPE			
CAPITAL COMMITMENTS			
Infrastructure, plant and equipment		10,133	1,900
Fuel elements purchase		3,863	3,718
Total capital commitments		13,996	5,618
By maturity			
Capital commitments payable			
One year or less		13,523	4,738
From one to five years		473	880
Over five years		-	-
		13,996	5,618
OTHER COMMITMENTS			
Replacement Research Reactor Project	(b)	111,401	207,324
Disposition of spent fuel	(a)	46,287	60,646
Operating lease	(c)	2,425	2,543
Total other commitments		160,113	270,513
Total commitments payable		174,109	276,131
Other commitments receivable			
Replacement Research Reactor Project	(b)	111,401	207,324
Disposition of spent fuel	(a)	32,452	46,811
GST recoverable from ATO		1,272	511
Total other commitments receivable		145,125	254,646
Net other commitments		14,988	15,867
By maturity - operating lease - minimum payments			
One year or less		118	118
From one to five years		591	591
Over five years		1,716	1,834

Schedule of Commitments not recognised as Liabilities
for the year ended 30 June 2004

(a) In 1997-98 the Government determined to provide $98.807 million in 2004 dollars ($86.4 million in 1997 dollars) to remove spent fuel rods from the Lucas Heights Science and Technology Centre and meet the costs of reprocessing offshore. An amount of $52.52 million has been drawn down. The amount of $46.287 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 7B(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 $111.401 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 25 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 timing of the other commitments payable is matched to the receipt of other commitments receivable.

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

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

Schedule of Contingencies
as at 30 June 2004

	FINANCIAL YEAR	
	2004 **$'000**	2003 $'000
Contingent Liabilities		
Other guarantee	15	-
Total Contingent Liabilities	15	-

The amount reported this year as contingent liabilities refers to a three year security bond in favour of Energy Australia.

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 2004

1 Economic dependency

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

2 Summary of significant accounting policies

(a) Basis of accounting

The financial statements are required by clause 1(b) of Schedule 1 to the *Commonwealth Authorities and Companies Act* 1997 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 Act* 1987 (as amended)

ii. in accordance with:

- Finance Minister's Orders (FMOs), being the Commonwealth Authorities and Companies (Financial Statements for reporting periods ending on or after 30 June 2004) Orders;
- Australian Accounting Standards and Accounting Interpretations issued by the Australian Accounting Standards Board (AASB); and
- Consensus views of the Urgent Issues Group (UIG).

Schedule 1 requires statements to be prepared having regards to:

- The explanatory Notes;
- The Statements of Accounting Concepts (SACs); and
- Finance Briefs, Finance Circulars and other Guidance Notes issued by Finance and, in addition in 2003-04, Estimates Memoranda and Financial Management Guidance.

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

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

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.

(b) Changes in accounting policies

The accounting policies used in the preparation of these financial statements are consistent with those used in 2002-03, except in respect of buildings, plant and equipment where assets are revalued on a fair value basis (refer to Note 2k).

(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 4.

(d) Revenue recognition

Parliamentary appropriations

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

Revenue from Government - Output Appropriations

Revenues from Government are revenues for the core activities of ANSTO and are recognised generally in accordance with policy 2A.5 of the Finance Ministers Orders 2003-04. Any undrawn appropriation at the end of financial year is recognised as Appropriation Receivable in accordance with policy 2A.4 of the FMOs.

Equity Injections

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

Operating revenue from goods and services

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

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

Revenue received in advance

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

Contract revenue

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

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

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

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

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

(e) Employee benefits

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

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

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

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability. The current Enterprise Agreement pay rates applicable on 1 July each year are considered in the calculation. The financial effect of this was an accrual of $0.599 million (2003: $0.549 million).

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

(f) Superannuation

The Australian Nuclear Science and Technology Organisation contributes to the Commonwealth Superannuation (CSS) and the Public Sector (PSS) superannuation schemes which provide retirement, death and disability benefits to employees. Contributions to the schemes are at rates calculated to cover existing and emerging obligations. Current contribution rates in 2004 were 9.6% of salary (PSS) and 11.7% of salary (CSS). An additional 3% is contributed for employer productivity benefits. The vast majority of staff are covered by one of these two schemes. For those staff who do not contribute to either of these two schemes, ANSTO contributes 9% of salary to the Australian Government Employees Superannuation Trust fund. Additional employer contributions are made to nominated complying funds on behalf of several term employees at a rate of 9% where the employee chooses not to make a personal contribution, or 11% where the employee chooses also to contribute. Contributions during the year are detailed in Note 6A. No liability is shown for superannuation in the Statement of Financial Position as the employer contributions fully extinguish the accruing liability which is assumed by the Commonwealth.

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

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

	$'000
Accrued Benefits (Present Value)	139
Plan Assets (Fair Value)	129
Net Assets	(10)
Vested Benefits	124

(g) Leases

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

(h) Cash

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

(i) Financial instruments

Accounting policies for financial instruments are stated at Note 22.

(j) Bad and doubtful debts

Bad debts are written off during the period in which they are identified.

(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 2003-04) Orders and AASB 1041 requires that from 1 July 2002, entities must revalue every class of asset that includes land, building, infrastructure, plant and equipment to fair value. Clause 3C.1.2 of the FMOs allows entities to utilise the transitional arrangements as stated in AASB 1041. Entities that are progressively revaluing a class of asset over a number of years may continue to do so, provided that the requirements of AASB 1041 in respect of progressive revaluations are met.

Land was revalued 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 2003-04) Orders have been implemented as follows:

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

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

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

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

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

The financial effect of this change in policy relates to those assets recognised at fair value for the first time in the current period where the measurement basis for fair value is different to that previously used.

The financial effect by class is as follows:

Asset Class	Increment/(decrement) $'000	Contra Account $'000
Land	5,527	Revaluation Reserve
Buildings	(10,836)	Revaluation Reserve
Site infrastructure	(5,618)	Revaluation Reserve
Electrical infrastructure	(4,519)	Revaluation Reserve $3,151 Accumulated Results $1,368
Plant and equipment	(17,201)	Revaluation Reserve $17,186 Accumulated Results $15
National & major facilities	(7,391)	Revaluation Reserve $6,020 Accumulated Results $1,371
Total	(40,038)	

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

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

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

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

Depreciation and amortisation

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

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

	2004	2003
Buildings on freehold land	**30 years**	30 years
Plant and equipment	**2 to 30 years**	2 to 30 years
Infrastructure	**20 years**	20 years
National and major facilities	**5 to 30 years**	5 to 30 years

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

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

Recoverable amount test

Those assets carried at cost 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 diminution 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.

There is no material internal software development.

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

Licences

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

Amortisation

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

Amortisation rates applying to intangibles are as follows:

	2004	2003
Purchased software	**2 to 7 years**	2 to 7 years
Licences	**3 years**	3 years

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

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

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

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.

(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 2004 there were 144 patents, trademarks, design and applications (159 at 30 June 2003) registered to ANSTO and no associated costs are recognised as an asset (nil at 30 June 2003).

(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

Capital use charge was discontinued from 1 July 2003 and therefore no amount is included in this year's appropriation. However, included in last year's revenues from Government was an appropriation to cover the capital use charge of 11% on budgeted estimate of net assets of ANSTO for the 2002-03 financial year (Note 5A, $68.851 million).

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 Statement of Financial Position (refer Note 9B).

(q) Taxation

ANSTO is exempt from all forms of taxation in Australia except fringe benefits tax and 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 receivables 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 forgiven and the financial statements reported are that of ANSTO as a single entity. The financial effect of the debt forgiven was a cost of $0.204 million in last years results, refer Note 7D.

(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 2004

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

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

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

Profit entities complying fully with the Australian Equivalents will be able to make an explicit and unreserved statement of compliance with IFRSs and as well with the Australian Equivalents.

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

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

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

ANSTO has commenced transitioning its accounting policies and financial reporting from current Australian Standards to Australian Equivalents (IFRSs). ANSTO has allocated internal resources and will consult with experts when necessary. The overall process is being managed by ANSTO executives and progress is to be reviewed by the ANSTO Audit Committee.

To date this process has identified that ANSTO's current policy regarding capitalisation of intangible assets will need to change. ANSTO currently capitalises some product licence fees and amortises them on a straight line basis for periods of three to seven years. The introduction of the Australian Equivalent to IAS38 will require these costs to be expensed. As at 30 June 2004, the impact of this change would be $0.017 million.

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

4 Segment and outcomes reporting

Reporting by segments

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

Reporting by outcomes:

ANSTO has three outcomes and each has 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			
	2004	2003	**2004**	2003	**2004**	2003	**2004**	2003
	$'000	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000
Operating revenues								
Revenue from Government			14,512	336	106,542	99,065	121,054	99,401
Sale of goods and services					36,708	33,645	36,708	33,645
Interest					3,065	3,356	3,065	3,356
Revenue from sale of assets					425	507	425	507
Other					442	636	442	636
Total operating revenues	**0**	**0**	**14,512**	**336**	**147,182**	**137,209**	**161,694**	**137,545**
Operating expenses								
Employees			269	95	56,088	49,643	56,357	49,738
Suppliers			13,743	231	44,269	55,673	58,012	55,904
Depreciation and amortisation					28,617	28,368	28,617	28,368
Other					4,933	3,328	4,933	3,328
Total operating expenses	**0**	**0**	**14,012**	**326**	**133,907**	**137,012**	**147,919**	**137,338**

Notes:

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

The capital use charge, Nil (2003: $68,851 million) 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 2004

5 Revenue

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
5A. Revenues from Government			
Appropriation for outputs		121,054	168,252
5B. Goods and services			
Radioisotope sales		20,066	21,203
Services and contract research		5,081	4,117
Silicon irradiation		3,445	3,290
CSIRO site support		937	695
Training courses		97	109
Land management		3,790	2,606
Australian Synchrotron Research Project		2,226	813
AINSE interactions		1,066	812
Total sales of goods and services		36,708	33,645
5C. Grants		410	624
5D. Interest		3,065	3,356
5E. Net gain from sale of assets			
Infrastructure, plant and equipment:			
Revenue from sale of assets		425	507
Value of assets sold	6F	(241)	(333)
Net gain from disposal of infrastructure, plant and equipment		184	174
5F. Net foreign exchange gains - non speculative		32	12
5G. Sales of goods and services	5B		
Goods		20,066	21,203
Services		16,642	12,442
Total sales of goods and services		36,708	33,645
Provision of goods to:			
Related entities		-	-
External entities		20,066	21,203
Total sales of goods		20,066	21,203

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

5 Revenue (continued)

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
Rendering of services to:			
Related entities		937	695
External entities		15,705	11,747
Total rendering of services		16,642	12,442
Cost of sales of goods		19,802	20,547

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

6 Operating expenses

The breakdown of operating expenses is:	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
6A. Employee expenses:			
Salaries		**41,462**	39,593
Superannuation		**6,312**	5,083
Annual leave		**4,762**	4,100
Long service leave		**2,622**	388
Separation and redundancy		**547**	236
Total employee benefits expenses		**55,705**	49,400
Workers compensation premiums		**652**	338
Total employee expenses		**56,357**	49,738
6B. Supplier expenses:			
Goods from external entities		**16,576**	14,125
Services from related entities		**7,215**	10,408
Services from external entities		**34,162**	31,280
Operating lease rentals		**59**	91
Total supplier expenses		**58,012**	55,904
6C. Depreciation and amortisation			
Depreciation of property, plant and equipment (a)	8B	**26,866**	26,659
Amortisation of intangible assets - licence	8D	**301**	345
Amortisation of intangible assets - software	8D	**1,450**	1,364
Total depreciation and amortisation		**28,617**	28,368
6D. Writedown of assets			
Financial assets:			
Receivables for goods and services	7B	**1,567**	-
Foreign exchange loss	7A	**115**	66
Other	7D	**-**	204
Non financial assets:			
Materials - Write off obsolete stock		**4**	-
Nuclear material stock devaluation		**464**	315
Total writedown of assets		**2,150**	585

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

6 Operating expenses (continued)

		Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
6E.	Grants		2,402	2,278
6F.	Value of assets sold		241	333
	Total operating expenses		147,779	137,206
6G.	Borrowing costs expense	9A	140	132
(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		4,877	4,854
	Plant and equipment		11,665	11,543
	Infrastructure		2,138	2,137
	National and major facilities		8,186	8,125
	Total allocated		26,866	26,659

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

7 Financial assets

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
7A. Cash			
Cash at bank for operating needs		6,742	5,194
Foreign currency held as forward cover for future supplier payments (a)		-	232
Total cash		6,742	5,426

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

7B. Receivables			
Goods and services	(a)	9,287	4,866
Less provision for doubtful debts of 60 days and over		1,943	376
		7,344	4,490
Interest accrued		130	178
Reimburseable foreign exchange loss		-	86
Other	(b)	77,867	77,909
GST receivable		1,532	2,518
Total receivables (net)		86,873	85,181
(a) Goods and services (trade debtors)			
Age analysis of trade debtors			
Current		4,961	3,079
Overdue:			
Less than 30 days		1,255	1,059
30 to 60 days; and		739	467
60 to 90 days		465	128
More than 90 days		1,867	133
		9,287	4,866

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

7 Financial assets (continued)

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
(b) Of the total amount for 2004 and 2003, $77.832 million represents approriations receivable from Government for undrawn equity injection ($63.997 million) and spent fuel appropriation ($13.835 million). It is expected that the spent fuel appropriation of $13.835 million will be utilised in 2004-05.			
7C. Investments			
Bank accepted bills		**49,690**	21,083
Term deposit		**6,000**	32,000
Fixed term investments (a)		**55,690**	53,083

(a) The majority of the value held is to meet contracted future payments, including construction of the replacement research reactor.

7D. Investment in subsidiary

ANSTO Inc. was incorporated in Delaware, USA on 27 October 1999. At 30 June 2004: US$100 (2003: US$100) of capital has been invested in this wholly owned subsidiary.

A loan to ANSTO Inc. of A$0.204 million was 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 2004

8 Non-financial assets

	Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
8A. Land and buildings			
Land - at independent valuation - 30 June 2004 (fair value)	(a), (d), (e)	82,027	-
Land - at independent valuation - 30 June 2003 (fair value)	(c)	-	76,500
		82,027	76,500
Buildings - at cost		-	9,676
Less accumulated depreciation		-	420
		-	9,256
Buildings - at independent valuation - 30 June 2004 (fair value)	(a), (d)	80,192	-
Buildings - at Directors valuation - 30 June 2001 (deprival value)	(b)	-	109,865
Less accumulated depreciation	(a), (d)	-	27,994
		80,192	81,871
Total buildings		80,192	91,127
Total land and buildings		162,219	167,627
8B. Infrastructure, plant, equipment and major facilities			
(i) Plant and equipment			
Plant and equipment - at cost		-	13,010
Less accumulated depreciation		-	2,417
		-	10,593
Current years additions - at cost		6,431	6,013
Less accumulated depreciation		410	2,178
		6,021	3,835

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

8 Non-financial assets (continued)

		Notes	FINANCIAL YEAR 2004 $'000	2003 $'000
	Plant and equipment - at independent valuation - 30 June 2004 (fair value)	(a), (d)	**70,487**	-
	Plant and equipment - at Directors valuation - 30 June 2001 (deprival value)	(b)	-	203,064
	Less accumulated depreciation	(a), (d)	-	116,318
			70,487	86,746
	Plant and equipment under construction		**42,632**	29,679
	Total plant and equipment		**119,140**	130,853
(ii)	Infrastructure			
	Electrical/site services			
	Electrical/site services facilities - at cost		-	**151**
	Less accumulated depreciation		-	**9**
			-	142
	Electrical/site services facilities at independent valuation - 30 June 2004 (fair value)	(a), (d)	**20,992**	-
	at Directors valuation - 30 June 2001 (deprival value)	(b)	-	50,807
	Less accumulated depreciation	(a), (d)	-	22,980
			20,992	27,827
	Total infrastructure		**20,992**	27,969

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

8 Non-financial assets (continued)

	Notes	2004 $'000	2003 $'000
		FINANCIAL YEAR	
(iii) Major national and major research facilities			
Major national research facilities - at cost		35	487
Less accumulated depreciation		13	77
		22	410
Major national research facilities			
at independent valuation - 30 June 2004 (fair value)	(a), (d)	21,923	-
at Directors valuation - 30 June 2001 (deprival value)	(b)	-	111,052
Less accumulated depreciation	(a), (d)	-	79,721
		21,923	31,331
Major research facilities			
at independent valuation - 30 June 2004 (fair value)	(a), (d)	10,156	-
at Directors valuation - 30 June 2001 (deprival value)	(b)	-	23,203
Less accumulated depreciation	(a), (d)	-	9,498
		10,156	13,705
Replacement Research Reactor Project capitalised cost		278,578	185,497
Total major national and major research facilities		310,679	230,943
Total infrastructure, plant, equipment and major facilities		450,811	389,765
Total land, buildings, infrastructure, plant, equipment and major facilities		613,030	557,392

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

8 Non-financial assets (continued)

Movement summary 2003-04 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 2003	**76,500**	**119,541**	**196,041**	**622,964**	**819,005**
Additions - new assets	-	55	**55**	122,776	**122,831**
Additions - replacements	-	-	-	-	-
Transfer/reclassification	-	-	-	(246)	**(246)**
Revaluations	5,527	(39,404)	**(33,877)**	(290,744)	**(324,621)**
Changes in accounting policy	-	-	-	(2,754)	**(2,754)**
Disposals	-	-	-	(762)	**(762)**
Write-offs	-	-	-	-	-
Gross value as at 30 June 2004	**82,027**	**80,192**	**162,219**	**451,234**	**613,453**
Accumulated depreciation/ amortisation 1 July 2003	-	**28,414**	**28,414**	**233,199**	**261,613**
Depreciation/amortisation	-	4,877	**4,877**	21,989	**26,866**
Transfer/reclassifications	-	-	-	(198)	**(198)**
Revaluations	-	(33,291)	**(33,291)**	(254,046)	**(287,337)**
Adjustment for disposals	-	-	-	(521)	**(521)**
Write-offs	-	-	-	-	-
Accumulated depreciation/ amortisation 30 June 2004	-	-	-	**423**	**423**
Net book value as at 30 June 2004	**82,027**	**80,192**	**162,219**	**450,811**	**613,030**
Net book value as at 30 June 2003	**76,500**	**91,127**	**167,627**	**389,765**	**557,392**

Note:

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

(b) 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.

(c) The 2003 independent valuation of land was performed by Mr John Starr (registered valuer No. 2388) of the Australian Valuation Office in May 2003.

(d) In accordance with the requirements of Schedule 1 of the *Commonwealth Authorities and Companies Act* 1997 (Financial Statements 2003-04) Orders, all revalued assets are shown on a gross basis: asset values are at fair value and accumulated depreciation has been written back. The resulting adjustment has been transferred directly to the asset revaluation reserve and/or Statement of Financial Performance if the reserve is insufficient. The amount transferred to the Statement of Financial Performance was $2.754 million.

(e) The value of land in 2004 was increased by $5.527 million due to revaluation (2003: $24.32 million).

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

8 Non-financial assets (continued)

Movement summary 2003-04 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 2004					
Gross value	82,027	80,192	162,219	123,558	285,777
Accumulated depreciation/amortisation	-	-	-	-	-
Net value	82,027	80,192	162,219	123,558	285,777
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

Summary of all assets under construction as at 30 June 2004

Item	Land	Buildings	Total land and buildings	Infrastructure, plant, equipment national and major facilities	Total
	$'000	$'000	$'000	$'000	$'000
As at 30 June 2004					
Gross value	-	-	-	321,210	321,210
Accumulated depreciation/amortisation					
Net value as at 30 June 2004	-	-	-	321,210	321,210
Net value as at 30 June 2003	-	-	-	215,176	215,176

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

8 Non-financial assets (continued)

	FINANCIAL YEAR	
	2004 $'000	2003 $'000
8C. Inventories		
Raw materials and stores - not held for resale		
Stores - at cost	**1,662**	2,027
Cobalt-60 sources - at net realisable value	**216**	246
Reactor fuel and heavy water - at average purchase price	**4,287**	5,832
Nuclear materials - at net realisable value	**101**	73
Provision for stock diminution	**(220)**	(64)
	6,046	8,114
Work in progress		
Work in progress - at cost	**883**	-
Finished goods - at cost	**551**	-
Total inventories	**7,480**	8,114
8D. Intangibles		
Licences at deemed cost	**1,109**	1,033
Less accumulated amortisation	**1,066**	720
	43	313
Design fees at cost	**-**	76
Less accumulated amortisation	**-**	45
	-	**31**
Software at cost	**4,606**	4,138
Less accumulated amortisation	**3,319**	1,611
	1,287	2,527
Software at deemed cost	**458**	458
Less accumulated amortisation	**363**	423
	95	**35**
Total intangibles	**1,425**	2,906

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

8 Non-financial assets (continued)

Movement summary 2003-04 for all intangibles irrespective of valuation basis

	Licences $'000	Software $'000	Total $'000
Gross value as at 1 July 2003	1,109	4,596	5,705
Additions - new assets	-	222	222
Transfer/reclassification	-	246	246
Revaluations			
Disposals			
Gross value as at 30 June 2004	1,109	5,064	6,173
Accumulated depreciation/amortisation 1 July 2003	765	2,034	2,799
Depreciation/amortisation	301	1,450	1,751
Additions - new assets			
Transfer/reclassification	-	198	198
Revaluations			
Adjustment for disposals			
Writeback of accumulated depreciation			
Accumulated depreciation/amortisation 30 June 2004	1,066	3,682	4,748
Net book value as at 30 June 2004	43	1,382	1,425
Net book value as at 30 June 2003	344	2,562	2,906

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

8 Non-financial assets (continued)

	FINANCIAL YEAR	
	2004 $'000	2003 $'000
8E. Other		
Prepayments	811	380
Total other	811	380
Total non-financial assets	622,746	568,792

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

9 Liabilities

		FINANCIAL YEAR	
		2004 $'000	2003 $'000
9A.	Interest bearing liabilities		
	Other - (a)	**2,466**	2,326
	Total interest bearing liabilities	**2,466**	2,326
	Provision and payables		
9B.	Capital use charge		
	Capital use charge	-	-
	Balance owing 1 July	-	1,355
	Capital use charge provided for during the period (e)	-	68,851
	Capital use charge paid	-	(70,206)
	Balance owing 30 June	-	-
9C.	Employees		
	Accrued salaries and wages	-	1,427
	Annual leave	**7,745**	7,416
	Long service leave	**12,812**	11,590
	Aggregate employee entitlement liability	**20,557**	20,433
9D	Other		
	HIFAR spent fuel rods (b)	**1,000**	1,000
	Provision for HIFAR licence review (c)	-	4,749
	Superannuation fluctuation (d)	**1,692**	1,692
	Waste management cost (f)	**1,320**	-
	Common law and other claims	**1,557**	1,508
		5,569	8,949
9E	Suppliers		
	Trade creditors	**18,672**	14,707
		18,672	14,707
9F	Grants		
	Non-profit entities	**57**	57
		57	57

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

9 Liabilities (continued)

		FINANCIAL YEAR	
		2004 $'000	2003 $'000
9G	Other		
	Revenue received in advance	**668**	375
	Unearned revenue (g)	**13,835**	13,835
		14,503	14,210
	Total provisions and payables	**59,358**	58,356
	Total liabilities	**61,824**	60,682

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 2002-03 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) This provision was created last year for the cost of disruption to business arising from a scheduled routine maintenance program to meet ongoing ARPANSA operating licence conditions. This provision has now been fully utilised.

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

(e) Amount has been repaid last year to Department of Finance and Administration.

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

(g) Revenue to cover costs of spent fuel shipment scheduled for year ended 30 June 2003, deferred to 2004-05 year. Refer to Note 7B(b).

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

10 Equity

	FINANCIAL YEAR	
	2004 $'000	2003 $'000
Contributed equity		
Replacement research reactor equity injections		
Balance 1 July	**248,938**	111,105
Equity injections from Government - replacement research reactor (a)	**79,210**	137,833
Balance 30 June	**328,148**	248,938
Other equity injections		
Balance 1 July	**16,951**	16,951
Equity injections from Government - Other (a)	**5,480**	-
Balance 30 June	**22,431**	16,951
Total contributed equity	**350,579**	265,889
Reserves, including movements		
Asset revaluation reserve		
Balance 1 July	**294,179**	269,859
Net revaluation	**(37,284)**	24,320
Balance 30 June	**256,895**	294,179
Fuel elements reserve		
Balance 1 July	**12,400**	5,600
Transferred from accumulated surpluses	**-**	6,800
Balance 30 June - (b)	**12,400**	12,400
Instrumentation reserve		
Balance 1 July	**6,200**	4,500
Transferred from accumulated surpluses	**-**	1,700
Balance 30 June - (c)	**6,200**	6,200
Waste treatment reserve		
Balance 1 July	**-**	4,300
Transferred to accumulated surpluses - (d)	**-**	(4,300)
Balance 30 June	**-**	-

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

10 Equity (continued)

	FINANCIAL YEAR	
	2004 $'000	2003 $'000
RRRP training & business initiatives reserve		
Balance 1 July	**6,800**	-
Transferred from accumulated surpluses	**-**	6,800
Balance 30 June - (e)	**6,800**	6,800
New main entrance reserve		
Balance 1 July	**-**	-
Transferred from accumulated surpluses - (f)	**5,155**	-
Balance 30 June	**5,155**	-
Reactor licensing reserve		
Balance 1 July	**-**	-
Transferred from accumulated surpluses - (g)	**2,500**	-
Balance 30 June	**2,500**	-
Total reserves	**289,950**	319,579
Accumulated surpluses		
Accumulated surpluses 1 July	**66,332**	77,125
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 initiatives reserve	**-**	(6,800)
Transfer to new main entrance reserve	**(5,155)**	-
Transfer to reactor licensing reserve	**(2,500)**	-
Operating surplus from ordinary activities	**13,775**	69,058
Capital use charge	**-**	(68,851)
Decrease in accumulated results due to revaluation	**(2,754)**	-
Accumulated surpluses 30 June	**69,698**	66,332
Total equity	**710,227**	651,800

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

10 Equity (continued)

(a) Equity injection

The total drawdown of $84.690 million (2003: $73.836 million) is for expenditure on capital projects.

Total equity injections for $350.569 million includes undrawn amount of $63.997 million, refer note 7B(b). These will be drawn as required.

(b) Fuel elements reserve

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

(c) 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.

(d) 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 was used in 2003.

(e) RRRP training and business initiatives reserve

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

(f) New main entrance reserve

A reserve to meet contracted construction costs relating to a new main entrance has been created.

(g) Reactor licensing reserve

A reserve to meet future licensing costs for decommissioning the HIFAR reactor and commissioning the replacement reactor has been created.

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

11 Cash flow reconciliation

	FINANCIAL YEAR	
	2004 $'000	2003 $'000
Reconciliation of Operating Surplus to Net Cash from Operating Activities:		
Operating surplus before extraordinary items	**13,775**	69,058
Non-cash items		
Depreciation/amortisation	**28,617**	28,368
Gain on disposal of assets	**(184)**	(174)
Write off obsolete stock	**4**	-
Nuclear materials (devaluation)	**(464)**	(315)
Changes in assets and liabilities		
(Increase)/decrease in receivables	**(2,854)**	489
Decrease in other receivables	**128**	1,386
Decrease in GST receivables	**986**	697
(Increase)/decrease in prepayments	**(431)**	5,122
Decrease/(increase) in inventories	**1,094**	(2,610)
Increase/(decrease) in creditors	**3,965**	(7,306)
Increase/(decrease) in employee entitlements	**124**	(1,355)
Increase/(decrease) in other creditors	**293**	(1,228)
Increase in unearned revenue	**-**	13,835
Increase/(decrease) in accrued interest	**48**	(109)
(Decrease)/increase in other provision	**(3,380)**	1,585
Increase in revenue in advance	**140**	132
Net cash from operating activities	**41,861**	107,575

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

12 Appropriations

Particulars	Departmental Outputs		Equity		Total	
	2004	2003	**2004**	2003	**2004**	2003
	$'000	$'000	**$'000**	$'000	**$'000**	$'000
Year Ended 30 June 2004						
Balance carried forward from previous year	**13,835**	-	**63,997**	33,658	**77,832**	33,658
Appropriation Acts 1	**121,054**	113,236	**-**	-	**121,054**	113,236
Appropriation Acts 2	**-**	-	**84,690**	104,175	**84,690**	104,175
Balance carried forward to next year	**13,835**	13,835	**63,997**	63,997	**77,832**	77,832
Available for payment of CRF	**134,889**	113,236	**148,687**	137,833	**283,576**	251,069
Payments made out of CRF	**121,054**	99,401	**84,690**	73,836	**205,744**	173,237
Represented by: Appropriation Receivable	**13,835**	**13,835**	**63,997**	**63,997**	**77,832**	**77,832**

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

The 2003 values excludes capital use charge of $68.851 million, nil 2004.

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

13 Remuneration of members of the Board

	FINANCIAL YEAR	
	2004 $	2003 $
Members' remuneration is determined by the Remuneration Tribunal and payment is made in accordance with Section 12 of the *ANSTO Act* 1987 (as amended).		
Included in operating expenses (Note 6) are:		
Aggregate amounts of superannuation payments in connection with the retirement of members of the Board	**17,763**	31,880
Other remuneration received, or due and receivable by members of the Board	**554,003**	439,035
	571,766	470,915
The number of members included in these figures is shown below in each relevant remuneration band:		
Remuneration between	**Number**	Number
$Nil and $9,999	**1**	2
$10,000 and $19,999	**-**	2
$20,000 and $29,999	**3**	1
$30,000 and $39,999	**1**	-
$40,000 and $49,999	**2**	2
$50,000 and $59,999	**-**	-
$320,000 and $329,999 (a)	**-**	1
$370,000 and $379,999 (b)	**1**	-
	8	8

(a) Includes payment of special allowances

(b) Includes termination payment

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

14 Remuneration of executives

	FINANCIAL YEAR 2004 $	2003 $
Executive remuneration is determined by the ANSTO Enterprise Agreement 2002 which is underpinned by the ANSTO Award. Included in operating expenses (Note 6) is total remuneration received or due and receivable, by executives (excluding the Executive Director who is included in Note 13) who earn $100,000 or more in connection with the management of ANSTO.	**2,074,431**	1,434,608
The number of executives included in these figures is shown below in each relevant remuneration band:		
Remuneration between	**Number**	Number
$100,000 and $109,999	**1**	2
$110,000 and $119,999	**-**	3
$120,000 and $129,999	**1**	2
$130,000 and $139,999	**1**	-
$140,000 and $149,999	**-**	-
$150,000 and $159,999	**1**	3
$160,000 and $169,999	**1**	-
$170,000 and $179,999	**1**	1
$180,000 and $189,999	**3**	-
$190,000 and $199,999	**1**	-
$210,000 and $219,999	**1**	-
$220,000 and $229,999 (a)	**1**	-
	12	11

(a) Includes termination payment

15 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.

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

16 Insurances

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

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

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

17 Remuneration of auditors

	FINANCIAL YEAR	
	2004 $	2003 $
Remuneration to the Auditor-General for auditing the financial statements for the reporting period	**96,000**	90,000

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

18 Board membership

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

Member	Appointed	Term Concluded	Term Concludes
H M Garnett	11 May 2000	2 October 2003	
I O Smith	17 May 2004		16 May 2008
I D Blackburne	1 July 2001		30 June 2006
A Van der Schaaf	25 July 2002		24 July 2007
K Schindhelm	20 March 2003		19 March 2008
G Cook	13 June 2001		4 April 2006
M Eager	1 January 2002		31 December 2006
C Hillyard	21 July 1999		21 July 2004
C Hillyard	22 July 2004		21 July 2009

For the 2003-04 financial year the aggregate remuneration paid to members of the Board is disclosed in Note 13.

The aggregate of superannuation payments paid to the Commonwealth Superannuation Scheme and Public Sector Superannuation Scheme, in connection with the retirement of members of the Board was $17,763 (2003: $31,880).

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

19 Related party disclosures

Several members of the ANSTO Board were also members of Boards of entities with which ANSTO had commercial transactions. None of these members were in a position to exercise significant influence on these transactions. All such transactions were in accordance with commercial practice and on normal terms and conditions.

20 Average staffing levels

	FINANCIAL YEAR	
	2004	2003
The average staffing levels for ANSTO during the year were:	**837**	824

21 Trust money

	$'000	$'000
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	**2,883**	4,156
Add: receipts	**4,391**	1,708
interest received	**126**	140
Deduct: payments	**(4,006)**	(3,121)
Balance 30 June	**3,394**	2,883
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	**6**	5
Add: receipts	**-**	14
interest received	**-**	-
Deduct: payments	**-**	(13)
Balance 30 June	**6**	6

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

21 Trust money (continued)

	FINANCIAL YEAR	
	2004 $'000	2003 $'000
MNRF Synchrotron		
The Australian Synchrotron Research Program Incorporated was established under the Major National Research Program.		
Balance 1 July	**2,827**	4,103
Add: receipts	**4,391**	1,693
interest received	**126**	139
Deduct: payments	**(3,976)**	(3,108)
Balance 30 June	**3,368**	2,827
ISRC - 2003		
ANSTO received this trust money to facilitate assistance to the attendance of students to the International Symposium on Radiopharmaceutical Chemistry - 2003.		
Balance 1 July	**30**	29
Add: receipts	**-**	1
interest received	**-**	-
Deduct: payments	**(30)**	-
Balance 30 June	**-**	30
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	**20**	19
Add: receipts	**-**	-
interest received	**-**	1
Deduct: payments	**-**	-
Balance 30 June	**20**	20

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

22 Financial instruments

(a) terms, conditions and accounting policies

Financial Instruments	Notes	Accounting Policies and Methods (including recognition criteria and measurement basis)	Nature of underlying instrument (including significant terms & conditions affecting the amount, timing and certainty of cash flow)
Financial assets		Financial assets are recognised when control over future economic benefits is established and the amount of the benefit can be reliably measured.	
Cash at bank	7A	Cash is recognised at cost. Interest is accrued as it is earned.	All Australian dollar cash balances are with the Commonwealth Bank of Australia. At 30 June current rates were 3.73%pa (2003 3.50%pa), calculated daily
Fixed term investment	7C	The deposits or investments are recognised at cost. Interest is accrued as it is earned.	The deposits & investments are with the Commonwealth Bank of Australia, and earn an effective rate of interest of 4.74% for 90 days (2003 4.30%pa for 90 day terms) payable on maturity.
Foreign exchange holdings	7A	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 (2003 2.25% pa) payable monthly.
Receivables for goods & services	7B	Receivables are recognised at the nominal amounts due less any provision for bad and doubtful debts. Provisions are made when collection of the debt is judged to be less rather than more likely. The provision includes cover for unforseen events.	Credit terms are net 30 days (2003 - 30 days).
Other debtors	7B	Receivables are recognised at the nominal amounts due less any provision for bad and doubtful debts.	Majority of the amount ($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 (recognised)		Financial liabilities are recognised when a present obligation to another party is entered into and the amount of the liability can be reliably measured.	
Trade creditors	9E	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	9G, 9F	Revenue received in advance is initially brought to account as "other payables" and subsequently recognised as revenue when earned.	Revenue earned is brought to account when the transaction is completed.
Financial liabilities (unrecognised)		Outstanding foreign currency hedges not recognised in the Statement of Financial Position	Hedge contracts that were entered into prior to the Department of Finance and Admistration implementing its new policy regarding foreign currency hedging. Contracts total $0.323 million maturing August and October 2004.

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

22 Financial instruments (continued)

(b) Interest rate risk - consolidated

Financial Instruments	Notes	Floating Interest Rate		Fixed Interest Rate				Non-Interest Bearing		Total		Weighted Average Effective Interest Rate	
				1 year or less		2 - 5 years							
		2004 $'000	2003 $'000	**2004 $'000**	2003 $'000	**2004 $'000**	2003 $'000	**2004 $'000**	2003 $'000	**2004 $'000**	2003 $'000	**2004 $'000**	2003 $'000
Financial assets (recognised)													
Cash at bank	7A	**6,741**	5,192							**6,741**	5,192	**3.73%**	3.50%
Cash on hand	7A							**1**	2	**1**	2	**n/a**	n/a
Fixed term investment	7C	**55,690**	53,083							**55,690**	53,083	**4.74%**	4.30%
Foreign exchange holdings	7A		232								232	**n/a**	2.25%
Receivables for goods and services	7B							**8,876**	7,094	**8,876**	7,094	**n/a**	n/a
Interest accrued	7B							**130**	178	**130**	178	**n/a**	n/a
Other	7B							**77,867**	77,909	**77,867**	77,909	**n/a**	n/a
Total financial assets (recognised)		**62,431**	58,507					**86,874**	85,183	**149,305**	143,690		
Total assets										**772,051**	712,482		
Total financial liabilities (recognised)													
Trade creditors	9E							**18,672**	14,707	**18,672**	14,707	**n/a**	n/a
Grant received in advance	9F					**57**	57			**57**	57	**n/a**	n/a
Interest bearing liablities	9A					**2,466**	2,326			**2,466**	2,326	**6%**	6%
Other	9G							**14,503**	14,210	**14,503**	14,210	**n/a**	n/a
Total financial liabilities (recognised)						**2,523**	2,383	**33,175**	28,917	**35,698**	31,300		
Total liabilities										**61,824**	60,682		
Total financial liabilities (unrecognised)								**323**		**323**			

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

22 Financial instruments (continued)

(c) Net fair values of financial assets and liabilities

		FINANCIAL YEAR			
		2004		2003	
	Note	Total carrying amount $'000	Aggregate net fair value $'000	Total carrying amount $'000	Aggregate net fair value $'000
Financial assets (recognised)					
Cash at bank	7A	**6,741**	**6,741**	5,192	5,192
Cash on hand	7A	**1**	**1**	2	2
Fixed term investments	7C	**55,690**	**55,690**	53,083	53,083
Foreign exchange holdings	7A	-	-	232	232
Receivables for goods and services	7B	**8,876**	**8,876**	7,094	7,094
Interest accrued	7B	**130**	**130**	178	178
Other	7B	**77,867**	**77,867**	77,909	77,909
Total financial assets		**149,305**	**149,305**	143,690	143,690
Financial liabilities (recognised)					
Trade creditors	9E	**18,672**	**18,672**	14,707	14,707
Grant received in advance	9F	**57**	**57**	57	57
Interest bearing liabilities	9A	**2,466**	**2,466**	2,326	2,326
Other	9G	**14,503**	**14,503**	14,210	14,210
Total financial liabilities		**35,698**	**35,698**	31,300	31,300
Financial liabilities (unrecognised)		**323**	**323**	-	-

Notes to and forming part of the Financial Statements for the year ended 30 June 2004

22 Financial instruments (continued)

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

Financial assets

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

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

Financial liabilities

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

(d) Credit risk exposures

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

ANSTO has no significant exposure to any concentrations of credit risk other than those disclosed in Note 7.

APPENDICES

APPENDIX 1
Freedom of Information

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

Arrangements for external participation

Liaison groups

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

The Local Liaison Working Party, 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 Georges River 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 ARPANSA regulations. It is chaired by an external member with extensive safety experience who works with Airservices Australia and has one other external member with wide experience in safety and environmental management 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 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, *Nuclear Matters* (formerly *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 media; plant and equipment operating manuals; maintenance, quality assurance and safety manuals; reactor operating authorisations, records and log books; radioisotope quality control procedures manuals; radioisotope catalogues and price lists; engineering service general records; nuclear material movement vouchers and accounting records; photographs; and radiographs. Health and safety documents include staff medical records; safety-related survey records; film badge and radiological records; accident reports; and emergency response procedures.

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

Facilities for access

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

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

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

The Director, Government and Public Affairs has been appointed as an authorised officer under Section 23 of the FOI Act.

APPENDIX 2
Functions and powers of the organisation under the ANSTO Act

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

Section 5: Functions of the organisation

(1) The functions of the organisation are:

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

(i) nuclear science and nuclear technology; and

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(e) to provide advice on aspects of:

(i) nuclear science and nuclear technology; and

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

(iii) other matters related to its activities; and

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

(i) providing training and management expertise; or

(ii) selling or leasing equipment; or

(iii) leasing land, buildings and facilities; or

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX 2
Functions and powers of the organisation under the ANSTO Act

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

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

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

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

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

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

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

(e) for purposes related to external affairs; and

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

Section 6: General powers of Organisation

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

(a) to enter into contracts;

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

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

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

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

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

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

(h) to design, produce, construct and operate equipment and facilities; and

(j) to do anything incidental to any of its powers.

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

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

APPENDIX 3
Replacement Research Reactor Environmental Impact Assessment Status Report

Eighth 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 2004

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 eighth report to the Minister for the Environment and Heritage on the status of ANSTO's implementation of the 29 conditions arising from the environmental approval for the replacement research reactor at Lucas Heights. This report is required by Condition 29. Subsequent reports will be completed on a six-monthly basis until such time that the Minister is satisfied that all conditions have been satisfied.

Work on the RRR building structure is proceeding quickly with the ANSTO team, INVAP and JHEDI performing well.

As previously reported, ARPANSA gave approval for completing repairs to the reactor pool liner in August 2003. After completion of those repairs, it was delivered to site on 13 December 2003. The service pool liner was delivered on 4 February 2004.

A significant milestone was achieved with the reactor pool liner being lowered into position on 23 January 2004.

Individual Conditions

The 29 approval conditions are given below, and the current status of implementation of each condition is discussed.

1. The construction and operation of the proposed reactor at the Lucas Heights Science and Technology Centre (LHSTC) must be in accordance with the undertakings and commitments provided by the Australian Nuclear Science and Technology Organisation (ANSTO) in the Final Environmental Impact Statement (Replacement Nuclear Research Reactor, 1997/98, Volumes 1, 2 and 3), and as summarised in Chapter 18 of Volume 3. If there is conflict between the ANSTO undertakings and the recommendations below, the recommendations will take precedence.

Compliance with all undertakings and commitments given by ANSTO within the EIS was a mandatory component of the tender process. INVAP demonstrated that it would comply with those EIS undertakings and commitments through all phases of the

replacement reactor project, and compliance with those EIS undertakings and commitments is now part of the contractual arrangements. Construction commitments, as documented in Chapter 18 of the EIS Volume 3, were included in the Construction Environmental Management Plan (CEMP) (see Condition 2) in the form of a checklist. This checklist provides a direct reference between the EIS commitments and the actions taken during construction to ensure compliance.

2. ANSTO must prepare a construction environmental management plan (EMP), to the satisfaction of the Minister for the Environment and Heritage, prior to construction commencing. The EMP will address all commitments and undertakings made by the proponent for environmental management during construction, and as summarised in Chapter 18 (Volume 3) of the Final Environmental Impact Statement. The following associated recommendations must also be addressed:

- *an Erosion and Sedimentation Control Plan must be prepared as part of the EMP. Measures proposed to be implemented must be referred to the NSW Environment Protection Authority (EPA) and the NSW Department of Land and Water Conservation for comment prior to their adoption in the EMP. The Plan shall conform with the principles and objectives of the following NSW EPA handbooks:*
  - *Managing Urban Stormwater: Treatment Techniques 1997;*
  - *Managing Urban Stormwater: Soils and Construction 1998; and*
  - *Managing Urban Stormwater: Source Control (draft release 1998);*
- *a Remedial Action Plan must be developed, as part of the EMP, in accordance with NSW EPA guidelines for the treatment of hydrocarbon-impacted soil. Any requirements for off-site disposal of contaminated soils must be to the satisfaction of the NSW EPA;*
- *an Air Quality Management Plan must be prepared, as part of the EMP, in consultation with the NSW EPA and the NSW Department of Land and Water Conservation. A primary objective of the Plan will be to ensure that particulate levels at the nearest residence are below 50 µg m-3 (PM10) during construction works;*
- *appropriate works must be installed to protect the identified Aboriginal shelter 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;*

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- *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 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.

As previously reported, this condition is assured through the ARPANSA authorisation with which ANSTO must comply and has therefore been met.

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 airborne emissions. As part of the ISO14001 process, ANSTO is installing improved monitoring equipment to improve characterisation of airborne emissions.

The improved monitoring equipment includes a commercially available and internationally recognised 'TC45 cartridge', commissioned for the routine monitoring of radio-iodine emissions. Calibration of the analysis technique for the new cartridge is complete, and it will be used in parallel with the existing system for a period of time in order to demonstrate the effectiveness of the equipment before it replaces the current system.

9. A review of the method of molybdenum-99 production process must be undertaken by ANSTO, in consultation with ARPANSA, to investigate means whereby the isotope can be produced and isolated with decreased releases of subsidiary radioactive waste products. This should be completed to the satisfaction of ARPANSA.

The molybdenum-99 production process project is currently undergoing internal review. This review will evaluate current progress against this condition and will advise accordingly. ARPANSA will be briefed on any changes to the project plan as appropriate.

10. A high priority must be given to the review and licensing of radioactive waste discharges to sewer by ANSTO. As part of

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this, ANSTO should be required to undertake further assessment and analysis to ensure that all possible exposure pathways and future events at the Cronulla Sewage Treatment Plant are taken into account. Monitoring and assessment of individual discharges within the LHSTC is also desirable, to enable understanding of the various sources and their relative contributions. This assessment must be prepared to the satisfaction of ARPANSA and prior to reactor operations commencing.

As previously reported, the CEO of ARPANSA advised on 11 August 2003 that bounding cases on reuse of sewage water containing effluents discharged from ANSTO have shown that radiation doses lie well below any levels of regulatory concern. Dr Loy regarded the condition of the licence to site the RRR that required preparation of studies on exposure pathways for effluent discharges to have been met, and thus this condition has been met.

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.

This condition has now been satisfied. As the condition outlines, the locations and monitoring regimes have been agreed with ARPANSA. As previously reported, the letter from Dr Loy of ARPANSA of 28 July 2003 approved the locations of the monitoring bores.

There were several requested items in Dr Loy's letter which related to the monitoring program. In abbreviated form, these were:

1. Consolidation of data related to hydrogeology and construction details in a single document;
2. That ANSTO should continue to monitor groundwater and investigate the occurrences of tritium; and
3. That ANSTO should implement the recommendations in the independent review prepared for ARPANSA by PPK P/L.

The then CEO of ANSTO wrote to Dr Loy on 2 October 2003 expressing agreement to these requests. ANSTO's agreement demonstrates that the monitoring regime has been agreed with ARPANSA and therefore completes the requirements for this condition.

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.

Condition 12 on radiological site characterisation was also included in the ARPANSA Licence to Prepare a Site as condition 5.6. In correspondence in July 2003, the CEO of ARPANSA agreed that ANSTO had

satisfied all conditions included in that Licence.

Specifically, ARPANSA's finding was:

> '…that there is adequate radiological characterisation including sampling and monitoring of soil, atmosphere, surface water and groundwater, as demonstrated in the licence holder's technical reports. Results of the radiological characterisation do not reveal any safety, regulatory or environmental concerns. The condition (5.6) has been satisfied'

ARPANSA's conclusion therefore satisfies this condition.

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, Senator Hill 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. This condition has therefore been satisfied.

15. The PSAR must demonstrate that the design of reactor components (eg reactor pool, beam tube penetrations) effectively excludes the failure of these components for earthquakes of lower frequency than the design basis earthquake, to rule out a fast loss of coolant accident as a credible incident. This will need to be demonstrated to the satisfaction of ARPANSA.

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 previously, the Chief Executive Officer of ARPANSA concluded that faulting found on the site of the RRR does not alter the seismic design basis on which the construction licence was issued. This condition has therefore been satisfied.

16. The consequences resulting from loss of off-site electricity for water supply and fire fighting purposes must be examined as part of the PSAR. If risks are significant, on-site power provisions for water pumps should be provided to the satisfaction of ARPANSA.

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. This condition has therefore been satisfied.

17. The safety implications of an inter-linked store for spent fuel elements must be assessed in detail in the PSAR, to the satisfaction of ARPANSA.

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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. This condition has therefore been satisfied.

18. The final design of the reactor should include a fixed and possibly automatic fire suppression system within the containment building, to the satisfaction of ARPANSA. The PSAR should also examine the need for a drencher system for the cooling towers.

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. This condition has therefore been satisfied.

19. The risk of a common mode failure involving both HIFAR and the replacement reactor during the commissioning period, and resourcing requirements to ensure adequate infrastructure and staffing safety, must be addressed as part of the PSAR to the satisfaction of ARPANSA. The results of the PSAR analysis should also be reflected in emergency plans.

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 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.

It should be noted that in November 2003, NSW authorities announced a change in responsibilities for emergency planning for the LHSTC, with the State Emergency Management Committee now assuming those responsibilities from Sutherland Local Emergency Management Committee. The revised emergency plans will include provision for evacuation of people up to three kilometres from the reactor in the event of a major incident – a provision not in place for any other research reactor in the world. While appreciating the important role of the NSW Government in emergency planning for the site, ANSTO notes that the new intervention level adopted by NSW is extremely conservative. An ANSTO media statement on this issue was released on 12 November.

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 and on the internet. The Local Emergency Management Committee has the responsibility for communication on the emergency plans, and has produced public information pamphlets and documents. This information will be reviewed before the application is made for an operating licence.

24. ANSTO must develop a specific program for ongoing community consultation and dissemination of information during the design, construction and commissioning phases of the reactor, to the satisfaction of the Minister for the Environment and Heritage.

In July 2001 the then Minister for the Environment and Heritage advised that he was satisfied with the draft community information program, and the results of that program have been previously reported. More recently, major stakeholder research, including surveying the community as to attitudes towards ANSTO and their understanding of ANSTO's work has been undertaken. This will impact on a revised

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approach to community communication. The results were positive overall in terms of community attitudes, however more work needs to be done to improve stakeholders' knowledge of ANSTO and an updated strategy will arise from the survey results. Major survey results can be found on ANSTO's website. It is anticipated that local community forums will be held in the near future, with an emphasis on the RRR. A new booklet celebrating ANSTO's 50th Anniversary, which featured a story on the RRR, was also recently produced.

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.

The Charter has now been finalised and made available through both the ANSTO website and local libraries. This condition has now been met.

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.

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. In his decision to grant a construction licence, the Chief Executive Officer of ARPANSA indicated that he was satisfied with the spent fuel management arrangements. Hence, this condition has been met.

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 in 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.

Following assessment of Commonwealth land around Australia, the National Store Advisory Committee, a group of experts advising the Government on the site selection, provided advice on sites for consideration. No sites were identified in South Australia as being highly suitable for the facility, and on that basis the Minister for Science, the Hon Peter McGauran, ruled out siting the store in that

state. We are advised that several sites have been short-listed and will be announced by the Minister in due course.

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 core elements of the ISO14001 requirements for establishing the ANSTO Environmental Management System (EMS) have been implemented, including:

a) Determining environmental aspects

b) Identifying significant environmental aspects

c) Environmental objectives and targets defined, developed, and in, principle agreement, by Senior Management

d) Register of ANSTO's legal and other requirements

e) Completion of environmental management plans for airborne emissions, radioactive waste, the former low-level waste site (Little Forest Burial Ground - LFBG), groundwater, surface water and resource utilisation (paper, power, water)

f) Integration of the assessment of environmental management issues into the SAC approval system

g) Development of strategies for communication, emergency response and training on environmental issues.

Training has been arranged for ANSTO staff in internal auditing for the EMS, and the internal audit system will be in operation prior to certification. In addition, further introductory EMS training has been arranged for selected staff.

Following a request for tenders for an organisation to certify the ANSTO EMS in accordance with ISO14001 and, additionally, the over-arching ANSTO ISO9001 quality system, a preferred tenderer has been selected. Several meetings have been held with the selected organisation. The schedule for the certification process is being finalised and the audit for site-wide ISO14001 certification is scheduled for May 2004.

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 eighth 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 4
Ecologically sustainable development and environmental performance

This appendix constitutes ANSTO's report on its performance in relation to ecologically sustainable development and environmental matters as required under Section 516A of the *Environment Protection and Biodiversity Conservation Act* 1999.

ANSTO's Health, Safety and Environment Policy places the 'protection of human health and safety and the environment as [ANSTO's] highest priority'. To meet this commitment, we are implementing 'processes and practices in accordance with an ISO14001 compliant Environmental Management System', which is a recognised framework for continuous improvement in environmental performance. Accreditation to this standard was achieved following a certification audit by an independent organisation in May 2004.

Under ANSTO's Health, Safety and Environment Policy, we commit to provide 'verifiable evidence' that ANSTO has fulfilled the policy's objectives. This is done through a comprehensive program of monitoring and auditing. The details of the environmental sampling and measurement program, together with its results, are published in a series of annual reports entitled *Environmental and Effluent Monitoring at ANSTO Sites*. The monitoring program covers not only the Lucas Heights Science and Technology Centre, but also the 1.6 km buffer zone and other locations that could be affected by ANSTO activities, such as the Cronulla Sewage Treatment Plant and the sea surrounding the effluent outlet at Potter Point.

An Environmental Principles and Compliance Plan that incorporates ecologically sustainable development principles has been developed and is being implemented through all stages of the replacement research reactor project. A specific Construction Environmental Management Plan has also been developed, and this is being implemented by the contractor during construction. To ensure it is complied with, we have instituted a Construction Environmental Monitoring and Testing Program.

ANSTO's commitment to ecologically sustainable development ensures that we manage our past and current waste in a manner that protects human health and the environment, now and in the future. It also means that we place special emphasis on minimising waste, and that we manage our on-site engineering services so as to reduce the consumption of electricity and water. The procedures adopted by ANSTO to achieve these commitments are documented in environmental management plans which form part of the ANSTO Environmental Management System.

Finally, ANSTO is regulated under the *Australian Radiation Protection and Nuclear Safety (ARPANS) Act* 1998, which specifically refers to the protection of the environment from the harmful effects of radiation.

APPENDIX 5
Commonwealth Disability Strategy

ANSTO's primary role under the Commonwealth Disability Strategy is as an employer, and as such we are committed to equity and fairness in the workplace and in recruitment practices.

All our job advertisements state that ANSTO is an equal opportunity employer. All new employees are made aware of our practices during induction. And our human resources policies, which include our approach to employees with a disability, are now incorporated into ANSTO's Business Management System and are available to employees on line.

Formal complaints and grievance processes are set out in ANSTO's 2002 Enterprise Agreement. It is through this Agreement that any complaints or grievances raised by people with disabilities in relation to ANSTO's employment practices may be directed. No such complaints or grievances were made in 2003-04.

We maintain a network of internal contact officers with whom difficulties may be discussed. All staff have access to an independent employee assistance program, which is publicised throughout the organisation.

ANSTO has secondary roles as a policy adviser and as a regulator.

As a policy adviser, we consider what effect our products and services may have on people with disabilities, and we provide explanatory information where required.

As a regulator, we ensure that internal policies and procedures comply with the relevant legislation and that staff are kept informed of requirements under organisational policy.

APPENDIX 6
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 2003-04 financial year.

The table below sets out where performance against these indicators is addressed in this annual report.

PBS key performance indicator	Section reference
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 (March 2003) • Construct reactor building up to 17-metre level (August 2003) • Complete auxiliary building structure (March 2004) • Commence construction of offices and visitors centre (August 2003).	Chairman's Report, Executive Director's Report, Highlights, CFOD, Corporate Governance, RRR EIS status report

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PBS key performance indicator	Section reference
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 were adhered to fully and shipments were: • on time • within budget. **Contributions of outputs to outcome** The output is directly related to the outcome. **Performance information for departmental outputs** **Output 2.1** A program of shipments in place for the reprocessing of all HIFAR spent fuel. • Shipment effected according to schedule • A sixth shipment of HIFAR spent fuel is currently scheduled for late 2003.	Chairman's Report, Highlights
Outcome 3: Science and technology solutions **Effectiveness – overall achievement of the outcome – (measures, indicators and targets used as appropriate)** ANSTO operates within a set of performance indicators agreed with government to provide insight into its overall effectiveness and success in achieving the science and technology outcome. Performance indicators are defined as part of the Triennium Funding Agreement which ANSTO has with the Department of Education, Science and Training and the Department of Finance and Administration. ANSTO will also be reporting on performance under National Research Priorities. ANSTO reports against these indicators throughout the annual report proper.	Highlights, KPIs

PBS key performance indicators	Section reference
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.	Chairman's Report, Executive Director's Report, Highlights, CFOD, AINSE, AMRFP, ASRP
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.	KPIs, Report of Operations

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PBS key performance indicators	Section reference
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. • 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. • Contribution to National Research Priority Goals.	KPIs, Report of Operations

PBS key performance indicators	Section reference
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. • Contribution to National Research Priority Goals.	Chairman's Report, Executive Director's Report, Report of Operations, AINSE, NRP
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.	Chairman's Report, SICI, Financial Statements
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.	Executive Director's Report, CFOD, NSES, SICI

APPENDIX 7
Implementing National Research Priorities

Australia's new National Research Priorities came into effect for the first time this year. ANSTO has correspondingly made solid progress in achieving outputs and outcomes that support Priority Goals and in establishing new research projects that align with the NRPs.

The strong correlation between the NRPs and ANSTO's research, facilities and services was demonstrated in ANSTO's initial NRP Implementation Plan, presented to the Minister for Science in April 2003. Following the government's introduction of new Priority Goals in November, ANSTO revised its plan accordingly.

In October 2003, ANSTO's senior management and Board met to workshop potential new ideas within the NRP framework. ANSTO divisions also held workshops and meetings to consider new project proposals, with a focus on the NRPs. Support for NRPs was introduced as one of the formal criteria by which senior management were to determine which projects – new and ongoing – would obtain funding in the 2004-05 financial year. In early 2004, to give staff a source of up-to-date information on all aspects of project planning, a webpage was created which includes links to ANSTO's NRP Implementation Plan and to NRP information on the website of the Department of Education, Science and Training.

As a result of these activities, 89 per cent of the proposed new projects reviewed by ANSTO's senior management in February 2004 were aligned with one or more Priority Goals, and only those that supported the NRPs were funded.

Looking forward, ANSTO will incorporate the NRPs into its next five-year Strategic Plan, which comes into effect in mid-2005. We will undertake activities with related organisations to improve access to nuclear science and technology facilities at ANSTO and overseas. And our guidelines for external reviewers of projects will apprise them of ANSTO's implementation of the NRPs.

Progress toward National Research Priority Goals

NRP – An Environmentally Sustainable Australia

PRIORITY GOAL **- Water – a critical resource**

HIGHLIGHTS FROM 2003-04

ANSTO has developed unique investigative tools which use gamma-emitting radioisotopes and in-situ neutron activation of elements, to investigate the hydraulic conductivity of aquifers and the rate of movement of salt and water in shallow aquifers.

See under NSES in Report of Operations.

LOOKING FORWARD TO 2004-05

The new Isotopes for Water project will develop and apply nuclear and isotopic techniques to managing water resource dynamics. This will contribute to the sustainable environmental management of critical surface and groundwater resources in catchments that supply water to densely populated urban areas. This project will build on the groundwater research project described above.

PRIORITY GOAL **- Transforming existing industries**

HIGHLIGHTS FROM 2003-04

ANSTO is developing open framework transition metal oxides that may be applied in environmental decontamination, water detoxification, radioactive waste pre-treatment, minerals processing and medical isotope production, and sensors for environmental pollutants and toxins.

ANSTO has also developed novel inorganic sorbents and new techniques that show promising results in extracting elements.

See under TMRS in Report of Operations.

LOOKING FORWARD TO 2004-05

This research has been incorporated into a new project on Advanced Materials for Environment and Energy directed towards developing materials for applications within this NRP.

PRIORITY GOAL **- Overcoming soil loss, salinity and acidity**

HIGHLIGHTS FROM 2003-04

Using technology that it developed for measuring hydraulic conductivity, ANSTO can provide valuable information for planning salt interception and assessing the risk of salt movement.

See under NSES in Report of Operations.

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LOOKING FORWARD TO 2004-05

This research will be incorporated into the new Isotopes for Water project described above.

PRIORITY GOAL - **Reducing and capturing emissions in transport and energy generation**

HIGHLIGHTS FROM 2003-04

ANSTO is applying its nuclear and advanced materials capabilities to energy storage and production, for example, and high-energy-density lithium ion batteries.

LOOKING FORWARD TO 2004-05

This research is being pursued within the new project on Advanced Materials for Environment and Energy described above.

PRIORITY GOAL - **Sustainable use of Australia's biodiversity**

HIGHLIGHTS FROM 2003-04

In its research reactor, ANSTO produces tracers for measuring the dispersion of contaminants in coastal areas. This work has been conducted over many years in collaboration with the University of NSW Water Research Laboratory. From it, we have discovered metals and radionuclide inventories in water, plankton and suspended particles; and we now understand the role of zooplankton as a pollution indicator and the role of wind in the movement of harmful algal blooms.

See under ISRN in Report of Operations.

LOOKING FORWARD TO 2004-05

This research will continue as part of a broader project.

PRIORITY GOAL - **Responding to climate change and variability**

HIGHLIGHTS FROM 2003-04

ANSTO has concluded a major five-year project that applied nuclear techniques to the study of current and future human activity and climate variability. This research involved extensive collaboration (19 Australian and many international organisations participated in 2003-04) and has made an important contribution to rural and regional environmental sustainability. Among its findings is the conclusion that the dominant cause of changes in the landscape is human activity, while climate variability acts only as a catalyst.

The project team has also developed a large, continuous data set that demonstrates the nature and source of aerosol pollution in south east Asia. This data is being used to model long-term effects on global and local climates.

See under NSES in Report of Operations.

LOOKING FORWARD TO 2004-05

A new research project on cosmogenic climate archives of the southern hemisphere will study Australia's unique records of climate and environmental change. It will use nuclear-based techniques and radionuclides created by cosmic rays to deliver geo-chronological frameworks, rates of landscape processes and insights into past cultural migrations. Having new southern hemisphere data will improve our understanding of the global climate system and the onset of future climate change in our region.

Another new project, on the movement of isotopic tracers in the atmosphere, will produce advanced representations of transport and exchange processes in the lower atmosphere over the Sydney region and the Murray-Darling Basin. This will make it possible to better predict diurnal and seasonal cycles of pollution and water.

These projects build on ANSTO's research into human activity and climate variability.

NRP – Promoting and Maintaining Good Health

PRIORITY GOAL **- Ageing well, ageing productively**

HIGHLIGHTS FROM 2003-04

ANSTO is investigating diagnostic agents for melanoma, and results so far are promising. The research is being conducted in collaboration with medical researchers in Australia and overseas, in public and private sectors.

See under SICI in Report of Operations.

LOOKING FORWARD TO 2004-05

A new project will aim to develop imaging agents for cancer, inflammation and neurodegenerative diseases. These agents have the potential to improve diagnostics and thereby patient management, to extend and improve quality of life for patients, to improve quality of life for carers, and to act as a therapeutic.

APPENDIX 7
Implementing National Research Priorities

NRP – Frontier Technologies for Building and Transforming Australian Industries

PRIORITY GOAL **- Breakthrough science**

HIGHLIGHTS FROM 2003-04

The Bragg Institute is promoting the potential of neutron scattering to contribute to the Priority Goals of 'breakthrough science' and 'frontier technologies'. It has established jointly-funded positions with three universities, held a symposium, participated in the AINSE Winter School, and increased its participation in ARC-funded projects and domestic and international neutron-scattering experiments.

See under SICI in Report of Operations.

LOOKING FORWARD TO 2004-05

A new project will develop the infrastructure for neutron and x-ray beam operations at the replacement research reactor. This infrastructure will enable Australian researchers to access unique material characterisation techniques that are currently only available overseas. Extensive interaction is under way with industry, CRCs, the Defence Science and Technology Organisation, CSIRO, universities and international researchers.

PRIORITY GOAL **- Frontier technologies**

HIGHLIGHTS FROM 2003-04

ANSTO is developing a comprehensive technology platform based on sol-gel processing, atomic layer deposition and plasma processing, to engineer nanostructured materials with potential in optics/optoelectronics, biotechnology and protective coatings. During the past year progress has been made in developing both the technology itself and its potential commercial applications through collaboration with industry. This research also supports the 'advanced materials' Priority Goal (see below).

Research on nanostructure of complex systems is being undertaken in collaboration with the CRC for Polymers, industry partners, CSIRO Molecular Sciences and the Western Australian Petroleum Research Centre. Recent highlights include the analysis of polypropylene under shear, and the development of novel ways to form nanocomposite materials.

A project on characterisation of biomolecules has, over the last year, investigated enzymes immobilised in sol-gel, and examined biogenic, templated silica in the form of diatoms.

For all these projects, see under SICI in Report of Operations.

LOOKING FORWARD TO 2004-05

This research has received a major boost with $1.2 million from the International Science & Linkages program to support collaboration between Flinders University, ANSTO and a consortium of 10 international partners to develop sol-gel technology for engineering nanostructured materials.

PRIORITY GOAL **- Advanced materials**

HIGHLIGHTS FROM 2003-04

ANSTO is developing a comprehensive technology platform incorporating sol-gel processing, atomic layer deposition and plasma processing (see above).

In February 2004, the first patent was granted for ANSTO's controlled release ceramic particles. Three major market segments have been identified: healthcare, cosmetics and speciality chemicals.

See under SICI in Report of Operations.

LOOKING FORWARD TO 2004-05

This research will be continuing.

NRP – Safeguarding Australia

PRIORITY GOAL **- Understanding our region and the world**

HIGHLIGHTS FROM 2003-04

ANSTO has conducted an extensive range of research activities that engage with other countries in the Asia-Pacific region and globally.

See under ISRN in Report of Operations.

LOOKING FORWARD TO 2004-05

ANSTO has gained financial support for a project it has designed to support the management of radiological risks in the Asia-Pacific region through regional cooperation and improving regional capacity to respond.

This project has been approved by AusAID which has assigned a budget of A$1.402 million for the next three years. ANSTO will be responsible for the project management while the IAEA will be responsible for the project implementation.

APPENDIX 7
Implementing National Research Priorities

PRIORITY GOAL **- Protecting Australia from terrorism and crime**

HIGHLIGHTS FROM 2003-04

ANSTO plays an important international role in detecting illicit nuclear activities.

LOOKING FORWARD TO 2004-05

ANSTO has set up a project to build a world-class capability in detecting illicit trafficking of nuclear and radiological materials and in conducting forensics research involving radioactive materials. This will enhance Australia's ability to respond to nuclear and radiological events and to support international programs and Australia's non-proliferation policy. It will also incorporate the environmental monitoring for illicit nuclear activity described above.

The benefits of ANSTO's regional and international relationships can be seen in a new program that was announced in the 2004-05 Federal Budget, under which ANSTO will take the lead in coordinated international initiatives to secure radioactive sources in the Asia-Pacific region. The program will provide support and training in identifying sources of radioactivity and in advising on security.

APPENDIX 8
Index of compliance with reporting guidelines

Index of compliance with reporting guidelines under various Acts, Regulations and Orders applicable to ANSTO

ANSTO Act 1987 (As amended)

Commonwealth Authorities and Companies (Report of Operations) Orders 2002 under the Commonwealth Authorities and Companies Act 1997 (As amended)

Requirements under other guidelines and legislation

GLOSSARY

ABMS	ANSTO Business Management System
AHSEC	ANSTO Health, Safety and Environment Committee
AINSE	Australian Institute of Nuclear Science and Engineering
AMRFP	Access to Major Research Facilities Program
AMS	Accelerator mass spectrometry
ANAO	Australian National Audit Office
ANSTO	Australian Nuclear Science and Technology Organisation
ARC	Australian Research Council
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASNO	Australian Safeguards and Non-proliferation Office
ASRP	Australian Synchrotron Research Program
ATO	Australian Taxation Office
CBA	Core business area
CEMP	Construction Environmental Management Plan
CFOD	Core Nuclear Facilities Operation and Development
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EFA	Escaped fly ash
EIS	Environmental impact statement
EMP	Environmental Management Plan
EMS	Environmental management systems
EPA	Environment Protection Authority
FOI	Freedom of Information
HEU	Highly enriched uranium
HIFAR	High Flux Australian Reactor
IAEA	International Atomic Energy Agency
ISO	International Organisation for Standardisation

ISRN	International Strategic Relevance of Nuclear Science
JHEDI	John Holland Evans Deakin Industries Joint Venture
LENS	Learning Environment for New Strategies
LEU	Low enriched uranium
LHSTC	Lucas Heights Science and Technology Centre
LLWP	Local Liaison Working Party
MNRF	Major National Research Facilities
mSv	millisieverts
NRP	National Research Priorities
NSES	Nuclear Science for Environment and Sustainability
OH&S	Occupational health and safety
ORDS	Organisational Development and Support
PNRI	Philippines Nuclear Research Institute
PSAR	Preliminary Safety Analysis Report
RRR	Replacement research reactor
RRRP	Replacement research reactor program
RSM	Residual stress measurement
STAR	Small tandem accelerator
TAC	Technical Advisory Committee
TMRS	Treatment and Management of Man-made and Naturally Occurring Radioactive Substances
UNSW	University of New South Wales
WT&PF	Waste Treatment and Packaging Facility

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