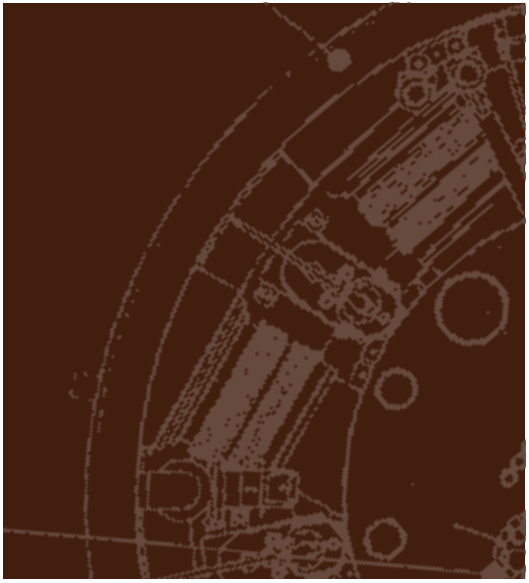
Australian Nuclear Science & Technology Organisation

Annual Report 2001–02



Cover: Plans for the Replacement Research Reactor (RRR) pool. The RRR will replace ANSTO's High Flux Australian Reactor (HIFAR) and is due for completion in 2005. Inset images are of the HIFAR research reactor.

ANSTO has a range of unique scientific facilities including:

- the 10MW HIFAR multipurpose research reactor
- the ANTARES 10MV Tandem accelerator
- the 3 MV Van der Graaff accelerator
- gamma irradiation facilities
- ceramic powder characterisation facilities
- colloidal characterisation facilities
- hot and cold isostatic presses
- transmission and scanning electron microscopes
- scanning probe microscope
- scanning laser dilatometer
- a range of x-ray diffraction facilities
- NMR spectrometers
- plasma immersion ion implantation facilities
- secondary ion mass spectrometer
- materials testing laboratory
- ore processing and waste treatment facilities, and
- a range of environmental facilities that can be utilised under service arrangements.

Australian Nuclear Science & Technology Organisation

Annual Report 2001–02

Chairman's Letter

Australian Nuclear Science and Technology Organisation
Lucas Heights Science & Technology Centre
New Illawarra Rd
Lucas Heights, NSW

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Facsimile +61 2 9543 6907

18 September 2002

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

Dear Minister

In accordance with Section 9 of the *Commonwealth Authorities and Companies (CAC) Act 1997* I am pleased to present the Annual Report of the Australian Nuclear Science and Technology Organisation for the period 1 July 2001 to 30 June 2002.

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

The organisation also operates the National Medical Cyclotron, an accelerator facility used to produce certain short-lived radioisotopes for nuclear medicine procedures. This is located in the grounds of the Royal Prince Alfred Hospital in Camperdown, close to Sydney's central business district.

ANSTO has a salaried staff of approximately 850. Its main site is located at the Lucas Heights Science and Technology Centre (LHSTC), 40 km south west of Sydney's central business district. The LHSTC occupies 70 hectares and is surrounded by a 1.6 km buffer zone.

ANSTO's general purpose is prescribed by the *Australian Nuclear Science and Technology Organisation Act 1987* and 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 consists of four components:

- to provide expert scientific and technical advice across the nuclear fuel cycle to government and to support Australia's national strategic and nuclear policy objectives
- to 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
- to undertake research on specific topics to advance the understanding of nuclear science and the nuclear fuel cycle
- to apply resulting technologies and other relevant, unique capabilities to focussed research and development and other scientific activities to increase the competitiveness of Australian industry and improve the quality of life for all Australians.

ANSTO's core values

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

- safety and quality in our operations
- excellence, creativity and innovation in our work
- commitment to cooperation and interdisciplinary responses
- understanding and meeting stakeholder needs
- integrity in the pursuit of excellence and service to Australia
- 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)

ANSTO's main site is located at the Lucas Heights Science and Technology Centre (LHSTC), 40 km south west of Sydney's central business district.

- 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 has set a number of strategic goals:

- to provide timely delivery of valued scientific advice and technical services to government and other customers and stakeholders
- to fulfil Australia's national and international nuclear obligations, advancing Australia's interests through international nuclear science and technology and its applications
- to 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
- to 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
- to focus on core business opportunities where innovative solutions can generate economic, environmental or social benefits
- to 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
- to embrace continuous improvement in business management practices.

Enabling legislation

The Australian Nuclear Science and Technology Organisation is a body corporate established by the *Australian Nuclear Science and Technology Organisation Act 1987*. The functions and general powers of ANSTO are set out in Part 2, Sections 5 and 6 of the Act. See also "Functions of the Organisation under the ANSTO Act", Appendix 4.

Responsible Ministers

The responsible Ministers during the reporting period were Senator the Hon Nick Minchin, Minister for Industry, Science and Resources, from 1 July 2001 to 26 November 2001, and the Hon Peter McGauran MP, Minister for Science, from 26 November 2001 to 30 June 2002.

Statement of Compliance

This report is written according to the reporting guidelines provided for statutory authorities in *Requirements for Departmental Annual Reports,* published by the Department of the Prime Minister and Cabinet in June 2001 and the *Commonwealth Authorities and Companies (Report of Operations) Orders 2002*. An index of compliance in provided in Appendix 8.

Organisation Chart

As at 30 June 2002

MINISTER

The Hon. Peter McGauran MP (Minister For Science)

THE BOARD

Dr Ian Blackburne (Chairman)

Professor Helen Garnett (Executive Director) – Mr Michael Eager (Deputy Chairman)
Mr Grahame Cook – Mr John Craker – Dr Carrie Hillyard – Associate Professor Fred Khafagi

CHIEF EXECUTIVE AND EXECUTIVE DIRECTOR

Professor Helen Garnett

SENIOR MANAGEMENT

Dr Ron Cameron
(Director, Safety)

Professor Ann Henderson–Sellers
(Director, Environment)

Dr Stuart Carr
(Director, Radiopharmaceuticals)

Mr Barrie Hill
(Director, Engineering)

Dr George Collins
(Director, Materials)

Mr John Rolland
(Director, Government and Public Affairs)

Mr Jack Dillich
(Director, Nuclear Technology)

Dr Brian Spies
(Director, Physics)

Dr Greg Doherty
(Director, Information Management)

Mr Robert Wilson
(Director, Corporate Services)

Mr Roger Gray
(Director, Business Collaboration)

Members of the Board

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

Chairman

Chairman since 1 July 2001.

Appointed on 1 July 2001 until 30 June 2006.

Company director, company manager, scientist.

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

Venture capital partner.

Appointed on 21 July 1999 until 21 July 2004.

Mr Michael Eager
BE (Mining), FAusIMM

Deputy Chairman

Deputy Chairman since 26 June 2002.

Appointed on 1 January 2002 until 31 December 2006.

Mr Grahame Cook
PSM BEc (ANU), AIMM

Head, Science Division, Department of Education, Science and Training.

Appointed on 13 June 2001 until 4 April 2006.

Professor Helen M Garnett
BSc (Hons) (Sydney), PhD (Wales), FTSE, FAICD

Executive Director, ANSTO

Member of the Board by virtue of Section 9 (1) of the ANSTO Act.

Reappointed on 11 May 2000 until 10 May 2005.

Associate Professor Fred Khafagi
BSc (Med), MB BS (Hons), FRACP

Nuclear medicine physician.

Reappointed on 1 January 2000 until 30 June 2002.

Mr John M Craker
BE (Chem&Met), BSc, MAusIMM, MIMM (UK)

Appointed on 2 June 1998 until 31 December 2002.

Mr Mike Codd
AC BEc (Hons)

Company director.

Deputy Chairman from 1 January 1997 to 31 December 2001.*

**Replaced by Mr Michael Eager*

Chairman's Report

Dr Ian D Blackburne

This is the 50th Annual Report of the Australian Nuclear Science and Technology Organisation and its predecessor and is my first report as its Chairman.

ANSTO is an important and unique Australian organisation. It is recognised as one of Australia's premier science organisations and operates large national science facilities such as Australia's only research reactor, the High Flux Australian Reactor, HIFAR.

Although ANSTO and its predecessor, the Australian Atomic Energy Commission, have had a long-established and highly successful presence in Australia, there is still considerable groundwork to be undertaken in relation to the public's perceptions and understanding of nuclear issues in general. This is not an Australian-only issue, but a trend reflected around the world. For instance, it is unfortunate that ANSTO's small research reactor, and its replacement, which is currently under construction, are mistakenly compared with nuclear power reactors, which are hundreds of times larger. Such comparisons with nuclear power reactors are inaccurate and inappropriate, and contribute to grossly exaggerated "risks" in the public mind. A more realistic comparison would be with the numerous other research reactors of the HIFAR scale that are commonly found in academic and research institutions worldwide.

ANSTO generates knowledge and provides products and services in support of government, business, science, education and the wider community. Its activities underpin Australia's international nuclear technical credibility and lead the way in promoting nuclear safety and the peaceful uses of nuclear science. I am encouraged by ANSTO's commitment to promoting science information and education, both as a contribution to general community understanding, and as an encouragement for young people to consider careers based on science and technology.

ANSTO's operations continue to be conducted to the highest levels of safety, conforming to standards recommended by the International Atomic Energy Agency and Australian regulatory agencies. In the past year, significant improvements have been made in encouraging individual responsibility for safety, contractor safety, lost time and emergency planning. Some 60 staff out of a total of 850 on site are dedicated to safety and risk management. All staff are trained comprehensively in safety matters, and not even the new Chairman was exempted from meeting these requirements.

The present HIFAR research reactor has operated routinely for 44 years and is to be replaced in 2005, after which time it will cease operation. The Replacement Research Reactor (RRR) will provide Australia with a world class source of "cold" neutrons for neutron scattering applications, an area of science with enormous potential to explore the very nature of matter. The RRR will also ensure Australia maintains a strong capability to meet the growing demands for diagnostic and therapeutic radiopharmaceuticals. ANSTO was granted a construction licence for the RRR by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) in April 2002. As at June 2002 an amount of $107.5m in current dollars had been expended on the project.

ANSTO's scientists have continued to make significant contributions in their fields. Many of these contributions are made possible by HIFAR, and include neutron scattering research into such areas as the nature of polymers, cement, paper, and blood. Major projects are also in progress for cancer research, measurement of the influence human activity has on our landscape, and the development of new and better materials for industry. During 2001-2002, some 393 papers were published in scientific journals or presented to conferences. ANSTO's scientific program is reviewed annually by an independent Technical Advisory Committee for quality and relevance, and its reports are particularly reassuring to the Board.

Some of ANSTO's work generates independent revenue for the organisation, enabling us to undertake more science than would otherwise be the case. A number of commercially important projects were undertaken during the year including irradiation services for silicon used in computers and semi-conductors, the irradiation of 16 000 mineral samples to provide vital information for the mining industry, and the release of two new software systems for assessing ecological risk at mine sites.

One of the most socially important aspects of ANSTO's operations is its production of radioisotopes for nuclear medicine. These isotopes, many of which are short-lived, are manufactured to requisite health standards and distributed just-in-time to hospitals Australia-wide, where they are used to provide essential diagnostic and therapeutic services. Local production provides the highest quality and most reliable service to medicine. ANSTO's radiopharmaceutical products, which number more than 400, are used in the treatment of illnesses such as lymphomas, and thyroid and bone cancers. As Australian medicine advances, ANSTO must continue to enhance its own capabilities and skills in this vital area of service.

A statement written in the first Annual Report 50 years ago has proved accurate: "*Radioactive isotopes have not only provided science with a new research tool with a wide range of fundamental applications, but have also been developed for uses which promise to revolutionise techniques in many branches of industry, medicine, biology, agriculture and other fields. In this work also the experimental stage has been passed, though it is confidently expected that present knowledge will be greatly extended by further research".*

The sale of radioactive isotopes produced by ANSTO this year was almost $20 million, included 12 export markets and benefited about 450,000 Australians.

In 2001-2002, ANSTO received a parliamentary appropriation of $158.7m (2000-2001 $140.7m). This included $59.1m for the replacement reactor (2000-2001 $50.0m), $98.9m for operational and capital expenses for science and technology activities (2000-2001 $77.2m), and $0.8m for spent fuel (2000-2001 $13.5m). ANSTO generated an additional $34.9m (2000-2001 $35.8m) from external services, representing 29.2% of total income (excluding special supplemental appropriations). Total expenditure was $128.8m (2000-2001 $126.7m), resulting in a surplus of $0.84m (2000-2001 deficit $5.3m).

The terms of Mr Michael Codd and Professor Fred Khafagi as Board Members expired during the year and the Board joins me in expressing its gratitude for their valuable contributions and service to ANSTO. The Board also welcomed Mr Michael Eager.

ANSTO is served by a great many dedicated people who contribute enormously to its success and standing as a leading science and technology organisation. In particular, the Board records its appreciation of the energetic leadership that Professor Helen Garnett provides as Executive Director.

Ian D Blackburne
Chairman

Executive Director's Report

Professor Helen Garnett

In introducing the 50th Annual Report of ANSTO and its predecessor, the AAEC, I reflect on a direct quote from the first Annual Report that states, *"In the peaceful applications of atomic energy, attention has so far attached itself primarily to the production of electric power from atomic fuels, but it has to be remembered that work is also going forward on a very large scale overseas on the development and utilisation of radioactive isotopes and on other aspects of atomic science".*

In the intervening 50 years much has changed, not only in the areas of technological advances and scientific discoveries but also in the fundamental rationale for the role and responsibilities of Australia's nuclear organisation. Today ANSTO is a vibrant science and technology organisation engaged in the development and application of new knowledge and know-how of importance to sustainability, human health, national security and the economic development of Australia.

ANSTO acts for, and on behalf of, Australia in many international activities aimed at ensuring maximum benefit from the wide range of peaceful uses of nuclear science and technology. We remain committed to maximising the benefits from our knowledge and expertise in support of Australia's international and regional non-proliferation and safety initiatives.

This is an exciting time for Australian nuclear science and technology. It is a time when ANSTO is recognised and valued for its place in the Australian economy and presented with new opportunities for greater industry partnerships, enhanced international collaboration and further product commercialisation. Such outcomes and applications of our research and development activities are demonstrated throughout this report, and provide an indication of the positive potential of the organisation.

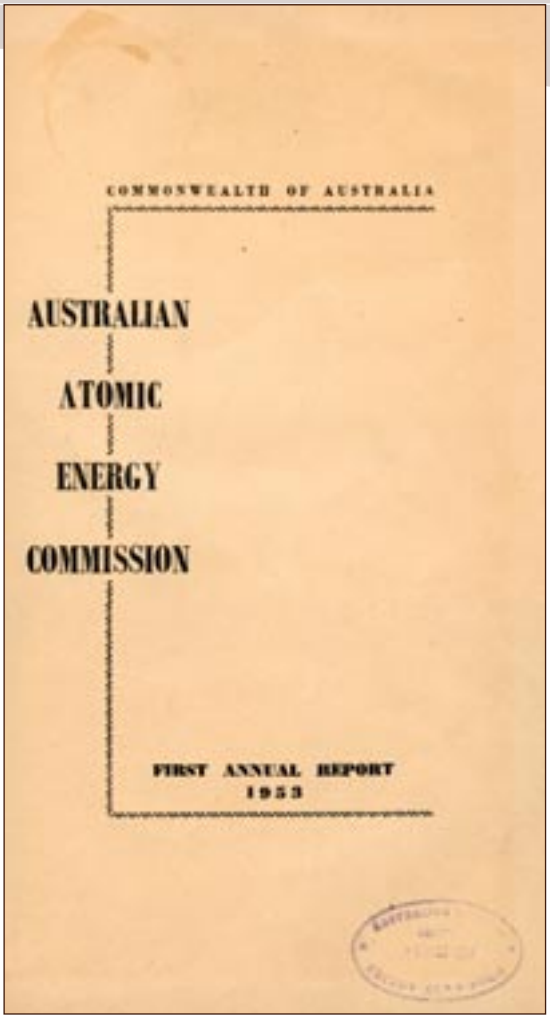
In a knowledge-based organisation such as ANSTO, staff are an important repository of corporate memory and tacit knowledge. ANSTO's staff are committed to the further development of the organisation's unique nuclear facilities and to delivering excellent outcomes from the utilisation of these facilities, often in partnership with other Australian organisations. When it comes to promoting science, our most effective ambassadors are the scientists themselves. ANSTO maintains an exceptionally high profile in the international scientific community and is increasingly playing a role in the communication of the contributions of science to Australia and, in particular, of nuclear science to the public.

This report details outcomes, achievements and work underway. It has been a year of significant advancement with the awarding by ARPANSA in April of the Licence to Construct the Replacement Research Reactor at Lucas Heights after almost 10 years of substantiation and approval processes. Achieving this licence has required much effort by the dedicated ANSTO team and an effective working relationship between ANSTO and INVAP S.E., the prime contractor for the replacement reactor.

Other operational highlights during the year included:

- the award of several facility licences by ARPANSA under their new procedures, including a licence for the ongoing operation of the HIFAR reactor and radiopharmaceutical production

The first annual report of ANSTO's predecessor, the Australian Atomic Energy Commission.



- the launch by the ANSTO business unit ARI in April 2002 of LeukoScan®, a technetium-99m labelled diagnostic radiopharmaceutical for imaging infection
- maintenance of Australia's leading role in the development of new nuclear safeguards procedures by cooperating with the International Atomic Energy Agency (IAEA) to become the first country to adopt integrated safeguards
- formal accreditation of ANSTO as a member of the IAEA's Network of Analytical Laboratories, the network that supports the international nuclear safeguards program
- construction of a purpose-built waste treatment and packaging facility to enable state-of-the-art processing for ANSTO's low level radioactive waste in preparation for removal to the national low-level radioactive waste repository.

Scientific highlights included:

- ANSTO's development of two new technologies that will lead to cleaner and more environmentally sustainable operations for uranium processors
- ANSTO's development of new methods for depositing ceramics coatings at low temperatures for applications ranging from fibre optic communications to corrosion and scratch resistance
- ANSTO sustaining its position as a world leader in carbon dating samples following the introduction of new sample preparation procedures that dramatically reduce the influence of background levels on the result
- ANSTO studies that provided information relating to the management and sustainable development of fishing and mining in the marine environment
- ANSTO scientists, in a collaborative experiment with the Japanese National Institute of Radiological Science, adding to the understanding of the long-term impact on the environment of storing radionuclides in underground repositories
- ANSTO releasing two business-related software packages: SULFIDOX, a software tool that simulates the chemical and physical processes going on inside waste rock dumps and leach heaps; and AQUARISK, an ecological risk assessment software package that has been modified to more closely align it with the approach adopted by the latest Australian and New Zealand water quality guidelines

Executive Director's Report

- Sirspheres®, a radiopharmaceutical developed by ANSTO and Australian biotechnology company Sirtex Medical, being approved in March by the US Federal Drugs Administration (FDA) for general marketing in the United States and released immediately - a significant achievement for ANSTO as few manufacturers in Australia have achieved FDA recognition.

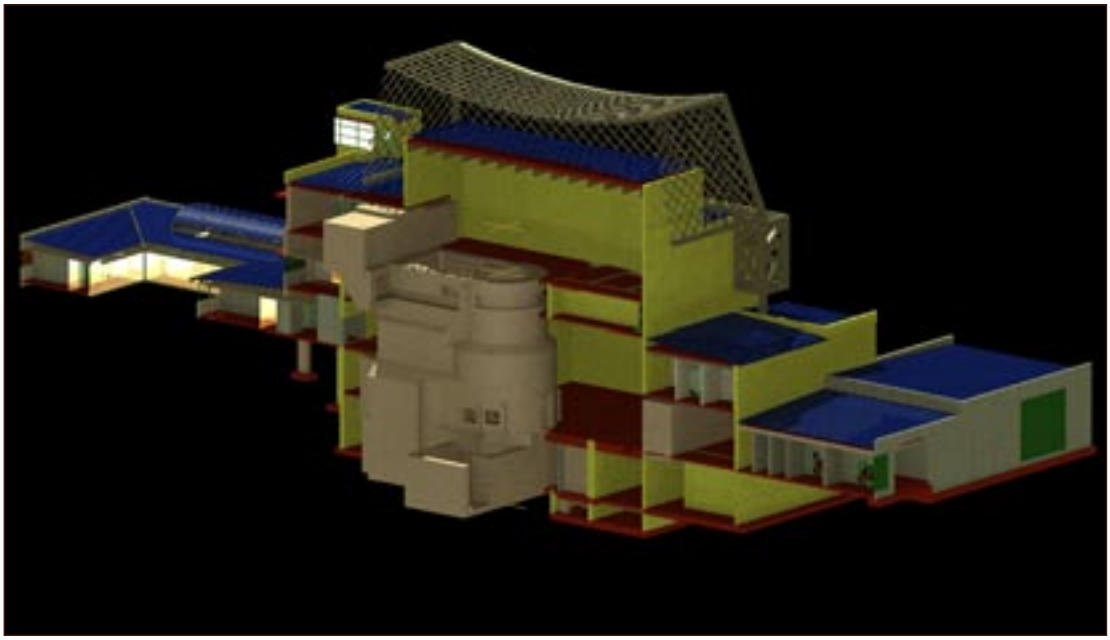
ANSTO regularly reviews not only the things it does but also how it does them. Over the past year our focus on quality has been rewarded with accreditation to the AS/NZS ISO 9001:2000 standard of Environment, Physics, Radiopharmaceuticals and Nuclear Technology (HIFAR and Waste Operations).

To enhance our capacity to manage the diversity of business activities and provide useful information to the project leaders, a new Business Information Management System was commissioned. As with all new systems, a great deal of additional effort was required for the planning and implementation. It has been pleasing to see that this planning has been rewarded with a reasonably smooth transition from the old system to the new.

During the year ANSTO largely completed work on a competency framework that will be the basis of a new single 10-band structure which defines the roles of, expected performance from and potential rewards to staff. It will be introduced from July 2002. The introduction of this band structure will be accompanied by the introduction of a new objective setting process, developed during 2001-2002. This process focuses on the value to be delivered to ANSTO through outcomes from the various projects to which an individual is assigned and the value to the individual through ongoing learning. With the introduction of these integral components of its human resource strategy, ANSTO will be in an excellent position to take full advantage of the new facilities under construction.

The foreword of the first Annual Report of the Australian Atomic Energy Commission stated *"…Australia can play a part fully commensurate with her status as a nation, and it [the AAEC] hopes that the beginnings which have been made will enable Australians to feel that the tasks that lie ahead are being undertaken with practical vision and full realisation of their importance."* With the introduction of new systems and processes, the commencement of the construction phase of the Replacement Research Reactor and the commitment to "tasks that lie ahead", ANSTO remains dedicated to making contributions and adding value for its wide range of stakeholders in government, academia, industry and the broader Australian community.

Professor Helen Garnett
Chief Executive and Executive Director



The Replacement Research Reactor, modelled here in cross section, will be a multipurpose facility for radioisotope production, neutron beam research and irradiation services.

International strategic relevance of nuclear science and technology

- Australia continued to play a leading role in demonstrating the efficacy of the strengthened international nuclear safeguards regime, which is aimed at providing assurances that nuclear material is used only for peaceful purposes. In support of these measures, ANSTO was formally accredited as a member of the International Atomic Energy Agency's Network of Analytical Laboratories (NWAL), which provides analyses of nuclear material for safeguards purposes. The accreditation was the result of a stringent audit on ANSTO's Accelerator Mass Spectrometry facility and an in-depth assessment of its capabilities. As part of the process of accreditation to NWAL, ANSTO undertook analyses using accelerator mass spectrometry of uranium-236 and iodine-129 in aerosol samples collected near a nuclear reprocessing plant. This work was aimed at ongoing efforts to develop wide-area environmental sampling for safeguards purposes.
- ANSTO was awarded the blue ribbon for best commercial exhibit at Sydney's Royal Easter Show, one of a number of trade fairs and exhibitions the organisation participated in during the year. In April ANSTO showcased both its business links and its innovative science and technology applications at the Hannover Trade Fair.

Core nuclear facilities operation and development

- ANSTO engineers began design work on three unique instruments being purpose built for the Replacement Research Reactor. Three more are expected to reach this stage by the end of 2002. In addition, seven instrument workshops were run for the national and international scientific community, attracting between 40 and 60 people to each.
- Following an international recruitment search, seven instrument scientists needed to oversee construction of the highly specialised instruments for the Replacement Research Reactor have been selected.
- Tracer technology developed by ANSTO enabled a Queensland oil shale refinery to more accurately estimate its environmental

impact. ANSTO, which has the only laboratory in the region able to provide this service, used inert perfluorocarbon gases (chemicals comprised solely of carbon and fluorine, which can be detected at extremely low levels) as an atmospheric tracer to evaluate atmospheric dispersion models of emissions from the refinery chimney stack. The models enabled the company to estimate the impact of odours on the surrounding region.

- ANSTO's Environmental Chemistry Analytical Laboratory maintained its position as one of the foremost laboratories in the world for the analysis of metals in biological tissues and sediments. ANSTO's rating, issued by the National Research Council of Canada, was again "superior".

Nuclear science for environment and sustainability

- Environmental scientist Dr Henk Heijnis was elected the Australasian coordinator for the International Geosphere Biosphere Program's new project on Human Impacts on Terrestrial Ecosystems. His appointment recognises the importance of the project's work in the region and its coordinating role. In September the project ran a workshop for 60 researchers on Archives of Human Impact, the first of its kind in the world. The archives will become the benchmarks for more accurate predictions of human impacts.
- ANSTO has proposed techniques for studying sub-surface salt that has been mapped in aerial surveys in large areas of northern Victoria and southern New South Wales. The salt at present does not affect land use but methods for assessing the future impacts are needed. Scientists demonstrated a new single borehole radiotracer technique and electrokinetic remote sensing tools that may provide substantial information about groundwater that carries salt. This approach would provide a considerable cost saving compared to alternative borehole drilling and conventional geological methods and could have application nationally.
- ANSTO research this year made the final link between lead shot swallowed by Kakadu National Park crocodiles and accumulation of lead in the laminations of the osteoderms (small bones on the crocodiles' backs). Last year, based on earlier research showing that the crocodiles ate geese downed by hunters using lead shot, the Park board banned the use of lead ammunition in the Park. Scientists working in conjunction with Crocodylus Park, Northern Territory, used an ANSTO secondary ion mass spectrometer to confirm that raised lead levels in the crocodiles' blood impaired haemoglobin synthesis (the combining of oxygen and the blood's red pigment). The levels were reflected in the back bones of the crocodiles.
  Further research will be needed to discover how crocodiles' health or reproduction may be affected. ANSTO was a finalist in the prestigious 2002 Sherman Eureka Prize for Environmental Research for its entry "Assessing the effects of lead shot ammunition on estuarine crocodiles in Kakadu National Park".

Treatment and management of man-made and naturally occurring radioactive substances

- ANSTO scientists developed two new technologies that will lead to cleaner and more environmentally sustainable operations for uranium processors. One reduces oxidant demand and cost in uranium leaching.
  The other is solvent extraction technology for uranium in the presence of high chloride concentrations. Patents for both have been approved.
- ANSTO renewed its efforts to exploit its years of experience in radioactive wasteform development following the United States's decision to cancel the immobilisation component of its plans to dispose of surplus weapons plutonium. The program would have provided the first full-scale demonstration of a synthetic rock wasteform developed by ANSTO. The US decision was due to the change of government.

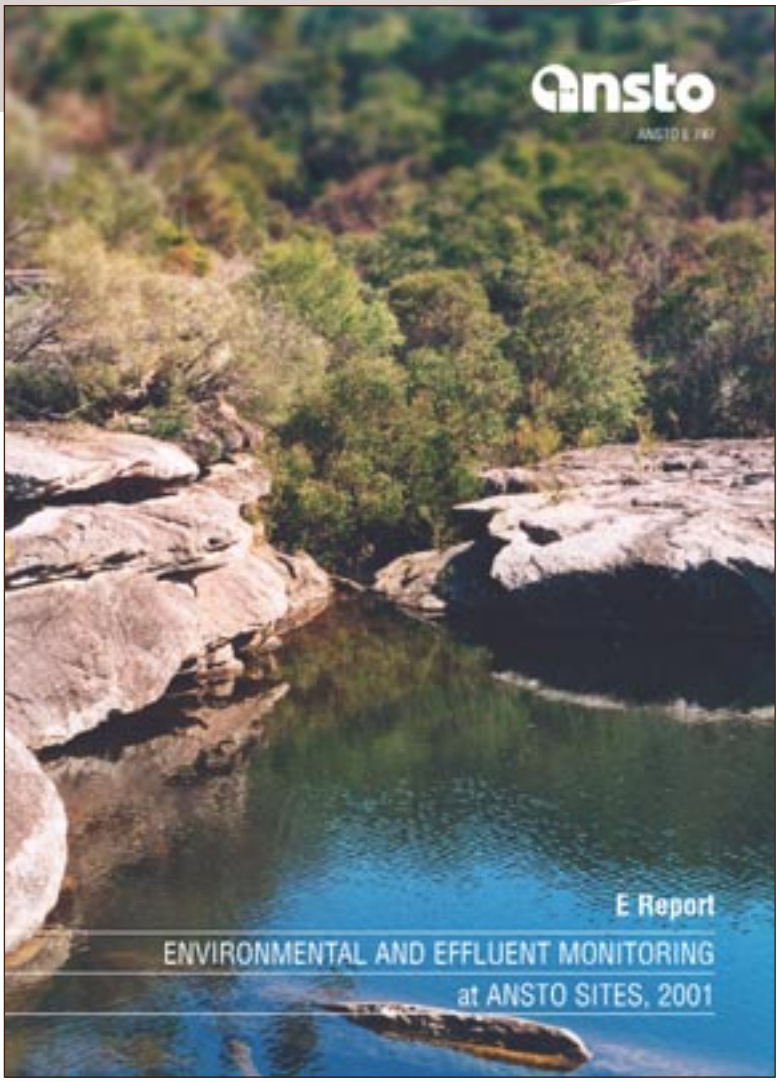
ANSTO technicians working at hot cells to process radioactive material from the HIFAR reactor into radiopharmaceuticals. ANSTO Radiopharmaceuticals and Industrials (ARI) increased production by more than 30% over the year.

Sustainability and international competitiveness of industry

- A water treatment plant to remove arsenic from water in old mine shafts was designed and is currently being commissioned in collaboration with an industrial membrane applications company, Occtech Engineering Pty Ltd. This will enable mining at greater depths with minimal environmental impact. Following the success of this project, a formal agreement is now allowing the parties to jointly pursue further mining business opportunities.
- LeukoScan®, a technetium-99m labelled diagnostic radiopharmaceutical for imaging infections, was officially launched by ANSTO Radiopharmaceuticals and Industrials (ARI) in April. Before this, in March, ARI received marketing approval for LeukoScan from the (Australian) Therapeutic Goods Administration (TGA). LeukoScan® is used in diagnostic imaging for the investigation of suspected osteomyelitis in long bones and in feet. LeukoScan® is manufactured by Immunomedics in Morris Plains, New Jersey, United States.

Organisational development and support

- New project management and general ledger systems were implemented, streamlining financial and administrative support to provide faster and more efficient financial and project management.
- A new 3-year Enterprise Agreement between management and staff was negotiated and is expected to be formalised later in 2002. The agreement embraces a new single-banded structure and replaces the multi-stranded structure of the past.



ANSTO's annual E-Report on its environmental and effluent monitoring program provided full and accountable details of the organisation's environmental performance.

Safety and environmental protection arrangements at ANSTO facilities

- ANSTO continued to maintain a safe workplace for all staff, contractors and visitors. A Comcare audit in March noted that "ANSTO has a sophisticated Occupational Health and Safety (OHS) management system, well supported by procedures of which employees are aware". Comcare renewed ANSTO's self-audit status.
- A revised "Response Plan for Accidents and Incidents at ANSTO" was approved for issue by the Local Liaison Working Party. The new plan is a combination of two previous site and off-site plans and provides one simplified document that defines responsibilities and arrangements for all incidents and accidents requiring immediate response.
- The reports *Environmental and Effluent Monitoring at ANSTO Sites 2000* and *Environmental and Effluent Monitoring at ANSTO Sites 2001,* demonstrating that ANSTO complied with discharge authorisations and relevant regulations and guidelines, were released to the public. These provide full details of environmental performance at the Lucas Heights Science and Technology Centre and at the National Medical Cyclotron at Camperdown, Sydney.

The Triennium Funding Agreement between the Government and the science agencies - ANSTO, CSIRO and the Australian Institute of Marine Science (AIMS) - was renewed in October 2000 for a further term of 3 years.

The principles of the Triennium funding agreement offer the Government and the Science Agencies a more stable financial environment and a realistic timeframe in which to plan for resources and activities that extend for much longer than annual budget cycles. The Government has developed with the science organisations the framework and operational elements of arrangements for the next three years, including performance reporting requirements containing agreed performance indicators. These indicators are used to monitor and evaluate ANSTO's performance and achievement of its objectives.

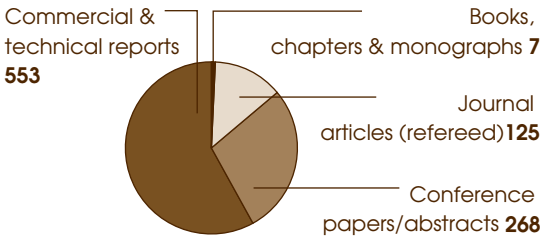
Comparative figures for prior years are shown where the same indicators were included in the previous triennial agreement.

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).

- List of distinguished awards and major prizes
  - – Finalist for Eureka Environmental Science Award
  - – Ericsson Innovation Award
  - – Australian Technology Showcase award
- Number of nominations as host agency by internationally recognised researchers
  - – 25 nominations (11 in 2001)

Publication level - 2002



2 LIAISON AND COLLABORATION

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

TABLE 1: PUBLICATION LEVEL MEASURED BY NUMBER AND CATEGORISED BY TYPE OF PUBLICATION

	1997–98	1998–99	1999–00	2000–01	2001–02
Books, chapters & monographs	6	12	4	19	7
Journal articles (refereed)	129	105	140	135	125
Conference papers/abstracts	272	272	330	194	268
Commercial & technical reports	161	120	133	391	553
Other	7	17	24	0	0
Total	**575**	**526**	**631**	**739**	**953**

TABLE 2: LEVEL OF USE OF ANSTO'S FACILITIES

	ISRN*	CFOD*	NSES*	TMRS*	SICI*	ORDS*	Total
The number of post graduate/under graduate students jointly supervised by ANSTO							
2001-2002	0	58	37	23	62	1	181
2000-2001	0	53	77	23	38	0	191
1999-2000	**	**	**	**	**	**	188
1998-1999	**	**	**	**	**	**	189
Number of post doctorals using ANSTO facilities							
2001-2002	0	15	12	1	29	0	57
2000-2001	0	11	8	9	17	0	45
Number of collaborative research projects during the year involving business, government and other parties external to ANSTO							
2001-2002	0	175	79	44	78	0	376
2000-2001	2	136	69	30	39	0	276
Others using ANSTO facilities							
2001-2002	0	39	2	1	0	0	42
2000-2001	0	28	0	0	0	0	28

** Core business area acronyms*

ISRN: International strategic relevance of nuclear science and technology

CFOD: Core nuclear facilities operation and development

NSES: Nuclear science for environment and sustainability

TMRS: Treatment and management of man-made and naturally occurring radioactive substances

SICI: Sustainability and international competitiveness of industry

ORDS: Organisational development and support

*** Not available under these headings until 2000-2001*

3 TECHNOLOGY TRANSFER AND COMMERCIALISATION

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

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

4 PROVISION OF ADVICE TO GOVERNMENT

This performance indicator measures ANSTO's performance in terms of the objective to ensure the provision of 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).

External earnings gained, 2001-02

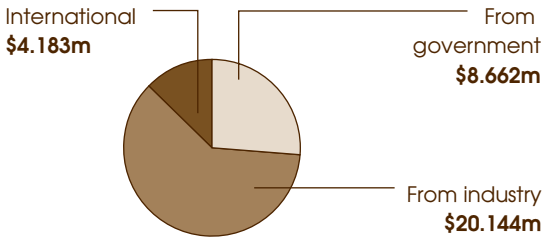


TABLE 3: EXTERNAL EARNINGS GAINED AS A PERCENTAGE OF TOTAL FUNDS

	From grants	Commercially	Other	Total
External Earnings of Projects	$m	$m	$m	$m
From governments	$0.036	$5.851	$2.775	$8.662
From industry	$0.405	$16.469	$3.270	$20.144
International	$0.298	$3.851	$0.035	$4.183
Total revenue (net of disposal of assets)	$0.738	$26.171	$6.080	$32.989
Total government revenue (excluding Capital Use Charge)			$81.035	
Total revenue received (net of disposal of assets)				$114.024
Percentage of external revenue to total revenue received		(2000: 28.0%, 2001: 29.6%)		28.9%

TABLE 4: EFFORT EXPENDED FOR, AND ON BEHALF OF, GOVERNMENT ON DOMESTIC AND INTERNATIONAL POLICY-RELATED ISSUES

	1999–00	2000–01	2001–02
Number of projects		17	16
Number of person years	27.7	28.9 years	28.6 years
Amount expended		$5.84m	$5.78m

Key Performance Indicators

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 Tables 5A and 5B).

TABLE 5A: PROPORTION OF CONTRACTS COMPLETED THROUGH MILESTONE ACHIEVEMENTS AGAINST THE NUMBER OF REPORTS DUE FOR COMPLETION IN THE FINANCIAL YEAR

	ISRN*	CFOD*	NSES*	TMRS*	SICI*	ORDS*	Total
Number of contracts due to be completed during the year 2001-2002	0	33	148	41	722	0	944
Proportion of those contracts completed during the year 2001-2002	n/a	100%	100%	88%	100%	n/a	99%
Number of continuing contracts at the end of the period 2001-2002	0	7	30	26	18	0	81
Proportion of those contracts that met their milestones 2001-2002	n/a	100%	97%	73%	83%	n/a	86%
Proportion of all contracts in 2001-2002 that were completed or met milestones	n/a	100%	99%	82%	99%	n/a	98%

* *See legend, p16*

TABLE 5B: COMPARABLE PERFORMANCE IN PREVIOUS YEARS

	ISRN*	CFOD*	NSES*	TMRS*	SICI*	ORDS*	Total
2000-2001	n/a	100%	99%	100%	99%	n/a	99%
1999-2000	n/a	100%	100%	88%	98%	100%	98%
1998-1999	93%	100%	100%	79%	85%	n/a	89%
1997-1998	86%	100%	100%	81%	80%	n/a	84%

Core Business Areas

Core Business Areas

This Report is prepared on the basis of outcomes and activities under "core business areas"

ANSTO is responsible for delivering specific scientific services and products to government, industry, academia and other research organisations. In order to achieve this, ANSTO has organised its activities in six core business areas (listed right) and focuses on the development of competencies and their application in these six areas.

The five business areas where nuclear science and technology and related capabilities can be of strategic and technical benefit to society were identified after consultation with stakeholders and current and potential customers. The sixth core business area focuses on internal support.

The core business areas are:

- International strategic relevance of nuclear science and technology
- Core nuclear facilities operation and development
- Nuclear science for environment and sustainability
- Treatment and management of man-made and naturally occurring radioactive substances
- Sustainability and international competitiveness of industry
- Organisational development and support.

ANSTO has defined 11 divisions or business units covering environment, materials, physics, radiopharmaceuticals, government and public affairs, safety, engineering, information management, nuclear technology, business collaboration and corporate services. Divisions are largely organised by scientific discipline or primary activity. Each contributes to more than one core business area and cooperatively meets performance targets within the respective core business areas.

Three layers of accountability are represented within each core business area report:

- outcomes are linked to government reporting requirements
- objectives set the long-term aim for the respective core business area
- activities and outputs provide results in the short to medium term, focusing on activities undertaken during the year.

International strategic relevance of nuclear science and technology

The International Atomic Energy Agency (IAEA), established under the auspices of the United Nations, provides an international forum for scientific and technical cooperation on the peaceful uses of nuclear technology. It also administers the international nuclear safeguards regime. Australia's Ambassador in Vienna has chaired the IAEA Board of Governors over the past year. (Photograph by Dean Calma, IAEA Division of Public Information.)

Core Business Area

This area covers government support and international collaboration. As Australia's national nuclear research institution, ANSTO participates in national, regional and international nuclear forums and provides high level technical advice to government in areas across the nuclear fuel cycle. ANSTO is internationally recognised for the calibre of its nuclear expertise. The ongoing maintenance of this expertise depends on access to specialised nuclear infrastructure and facilities such as the Replacement Research Reactor. An important aspect of ANSTO's role is the provision of informed advice on nuclear-related issues to the general community, which is coordinated through this core business area.

Research within this core business area concentrates on topics that enhance the international implementation of nuclear technology on a secure and safe basis. It includes national and international activities for research, training, information exchange and standards development.

The core business area also includes the application of safeguards to nuclear material and nuclear facilities at Lucas Heights to demonstrate they are used only for peaceful purposes, and the physical protection arrangements for the site.

OBJECTIVES

1) To make significant contributions to international research and development in selected nuclear fields commensurate with the Government's nuclear non-proliferation and other nuclear-related interests associated with the nuclear fuel cycle, and to be recognised as an international leader in the application of knowledge in these fields.

2) To provide services, for and on behalf of government, that include the provision of quality scientific and technical advice on the nuclear fuel cycle, including reactor operations, reactor safety and the safeguarding of nuclear materials, and the lead role in promoting the implementation of appropriate nuclear-related guidelines and practices nationally and internationally.

3) To ensure effective dialogue with the community on the intent and outcomes of ANSTO's activities.

OUTCOMES

- Australian nuclear policy initiatives in non-proliferation, safety and technical cooperation benefited from ANSTO's multidisciplinary technical expertise, its nuclear research facilities and scientific infrastructure. ANSTO's Executive Director, Professor Helen Garnett, and other officers took a leading role in representing Australia in the International Atomic Energy Agency (IAEA), which is the foremost agency for implementing the international nuclear non-proliferation regime and setting international nuclear safety standards. A key focus for the IAEA was the establishment of a program to combat the threat of nuclear terrorism post September 11.
- Australia became the first country in which the new integrated nuclear safeguards regime was implemented by the IAEA, and thereby maintained its role as a world leader in the development of new nuclear safeguards procedures and approaches. The integrated safeguards regime, developed following the discovery of Iraq's clandestine nuclear weapons program, involves short-notice inspections and wider access aimed at identifying any non-peaceful nuclear activities. ANSTO cooperated with the IAEA and the Australian Safeguards and Non-Proliferation Office to demonstrate this new standard for nuclear monitoring.

DRIVER: Government

Output

Expert scientific and technical advice and representation for and on behalf of government and contributions to internationally relevant research and development to underpin this advice, in support of Australia's national and strategic nuclear policy objectives.

- ANSTO's efforts in the area of nuclear verification and security expanded beyond its previous focus on environmental sampling to also encompass the detection of smuggled radioactive material. This was the subject of the first meeting in April 2002 of an IAEA research project team of which ANSTO was a member.

ACTIVITIES AND OUTPUTS

International Atomic Energy Agency – global responsibility

The International Atomic Energy Agency (IAEA), set up in 1957, is a specialised agency within the United Nations system and serves as the world's central intergovernmental forum for scientific and technical cooperation in the peaceful use of nuclear technology. The three pillars of its program are concerned with contributing to global nuclear safety, guarding against the proliferation of nuclear weapons, including strengthening the security of nuclear material and facilities, and transferring nuclear science and technology so as to contribute to sustainable development.

The Agency's Technical Cooperation Program provides the primary mechanism for the implementation of Australia's obligations under Article IV of the Nuclear Non-Proliferation Treaty. As Australia's national nuclear research institute, ANSTO provides Australia's principal technical interface with the IAEA.

In September, Australia's Ambassador to the IAEA became Chairman of its Board of Governors. ANSTO's Executive Director assumed the role of Australia's Governor and attended the three Board meetings to June this year.

ANSTO's Executive Director was one of a select group of international experts providing high-level input on priorities for the IAEA's research programs in nuclear technology through her role as a member of the IAEA Director-General's Standing Advisory Group on Nuclear Applications (SAGNA).

Scientists from ANSTO participated in six ongoing IAEA Coordinated Research Projects (CRPs) and began working on three new ones. The new projects focused on investigating the use of nuclear techniques to protect the environment in large river systems and in coastal zones, and in combating the smuggling of radioactive material. In addition, ANSTO assisted the IAEA in developing a strategic plan for research reactors and a staff member served on an IAEA consultants' panel on research reactor operation and utilisation.

Australia regularly hosts training courses and research coordination meetings and provides specialists for lecturing and expert assignments (see below). Thirty-six ANSTO officers participated in IAEA visits or missions during the year.

OECD participation and international trends

ANSTO maintained contact with the Organisation for Economic Cooperation and Development (OECD) Nuclear Energy Agency's (NEA) work on the revision of the Paris Convention on Nuclear Liability. ANSTO continued to participate in NEA projects on the safety of radioactive waste repositories.

International research and cooperation

Australia remained party to a number of bilateral cooperative arrangements involving nuclear and scientific institutes in the Asia Pacific region as well as France, Russia, the United States and the United Kingdom. These arrangements encompassed a broad range of cooperative activities, including research and development projects in radioactive waste management technologies.

As part of these arrangements, ANSTO was an invited member of the User Committee for the new Japanese project to build a 1-MW spallation neutron source in Tokai, Japan. The organisation also assisted with a formal review in Toronto of a proposal to build a Canadian beamline at the new American Spallation Neutron Source at the Oak Ridge National Laboratory in the United States.

Participation by ANSTO in the activities of the OECD's Nuclear Energy Agency (NEA) enables Australia to keep abreast of current trends in nuclear developments in this technologically advanced community. ANSTO has direct access to the OECD document database in Paris and contributes to OECD/NEA programs in a number of areas, including radioactive waste management.

ANSTO's Counsellor (Nuclear) in London participates in meetings of the NEA Steering Committee and various NEA standing technical committees. The NEA's focus is on technical issues relevant to all aspects of nuclear technology.

The peaceful uses of advanced nuclear technology were discussed in June during meetings between the Executive Director, Professor Helen Garnett, and senior officials in France concerning the extension of the Cooperation Agreement between ANSTO and the French Commissariat à l'Energie Atomique.

In the interest of facilitating cooperative research work between ANSTO and the Institute for Transuranium Elements in Karlsruhe, Germany, ANSTO signed a Framework Agreement with the European Atomic Energy Community in December. The agreement focused on projects aimed at further understanding the impact of nuclear activities on the environment, health and security.

ANSTO coordinated the placement and management of 55 IAEA fellowship holders from Argentina, Bangladesh, China, Indonesia, the Philippines and Vietnam who were undergoing training in Australia.

Specialised Australian international representation

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

During the year these posts facilitated technical contacts with the IAEA and OECD/NEA and provided essential links between ANSTO and those geographical regions most active in nuclear science and technology. The Counsellors also provided a vital component of ANSTO's services to government by reporting on nuclear developments in the international agencies and elsewhere, and representing Australia in international meetings and negotiations.

World first in international nuclear safeguards

As reported last year, Australia was the first country in the world in which the IAEA implemented integrated safeguards. Pursuant to those measures, IAEA inspectors carried out verification of ANSTO's nuclear material in an unannounced inspection (in November 2001), a complementary access visit (in January 2002) and a physical inventory verification visit (in April 2002).

During the April visit, in addition to carrying out normal safeguards procedures, IAEA inspectors verified a range of other materials which had previously not been subject to IAEA safeguards. The materials, principally arising from old AAEC operations, had not been included on Australia's initial declaration in the mid-1970s when IAEA safeguards first came into force in Australia as the material was considered to be of low safeguards significance. Although the material was not subject to IAEA safeguards, ANSTO's Nuclear Safeguards Office maintained it on separate accounts, subject to the Australian Safeguards and Non-proliferation Office (ASNO) inspection.

Strengthening international nuclear safeguards

Again, ANSTO provided research and development assistance in the continued development of technical measures to strengthen the international nuclear safeguards program delivered by the IAEA. As a result of ANSTO's expertise in ultra-sensitive detection of nuclear signatures by accelerator mass spectrometry the organisation was accredited as a member of the IAEA Network of Analytical Laboratories, which supports the international nuclear safeguards program.

International strategic relevance of nuclear science and technology

In May ANSTO, together with a number of other Australian companies, showcased its science and technology applications internationally at the Hannover Trade Fair in Germany.

Unmatched skills in detecting nuclear activities

Radionuclides such as chlorine-36, iodine-129 and uranium-236 are signatures of nuclear activities such as reprocessing of irradiated nuclear fuel. Significantly, ANSTO's capacity to detect small amounts of uranium-236 in samples taken near reprocessing plants or elsewhere is unmatched.

ANSTO has continued to pursue research into the potential of uranium-236 for environmental sampling, resulting in a much clearer understanding of this radionuclide's global distribution. Sources of uranium-236 in the environment were identified. ANSTO representatives were invited to illustrate the application of accelerator-based methods in nuclear safeguards and non-proliferation in a number of international symposia, including the Annual Meeting of the Institute of Nuclear Materials Management in the United States, the International Conference Actinides–2001 in Japan, and the International Conference on Industrial Radiation and Radioisotope Measurement Applications in Italy.

Research into radioactive smuggling

ANSTO's environmental research associated with new measures for safeguarding nuclear material has now expanded beyond the previous concentration on environmental sampling to include the investigation of technologies for the detection of smuggled radioactive material. Following September 11, ANSTO's Radiation Technology and Standards Group participated in the initial meeting of an IAEA Coordinated Research Program (CRP) intended to enhance the ability of law enforcement officials to detect smuggled nuclear and other radioactive materials. ANSTO initially will evaluate the effectiveness of existing detectors.

Maintaining site security

Physical protection of all Lucas Heights site facilities and materials, as recommended by the IAEA and as required by the Australian Safeguards and Non-Proliferation Office (ASNO), was upgraded as part of a program of continuous improvement and as a result of September 11.

Maintaining regional leadership and cooperation

Australia has been a member of the IAEA Regional Cooperative Agreement (RCA) for Research, Development and Training Related to Nuclear Science and Technology in the Asia-Pacific region since 1977. The other 16 RCA members are Bangladesh, China, India, Indonesia, Japan, the Republic of Korea, Malaysia, Mongolia, Myanmar, New Zealand, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

The objective of the RCA program is to promote and coordinate cooperative research, development and training projects in nuclear science and technology. A key aspect of Australia's participation in the RCA is to provide the benefits of nuclear science and technology to other countries, consistent with its obligations under the Nuclear Non-Proliferation Treaty.

In keeping with Australia's practice in overseas development cooperation, ANSTO continued to take a leading role in the achievement of increased self-reliance in the IAEA Regional Cooperative Agreement (RCA) for Research, Development and Training Related to Nuclear Science and Technology in the Asia-Pacific, thereby ensuring that RCA projects provided maximum benefit to recipient states. These reforms will further strengthen RCA regional management and decision-making arrangements and reflect the growing maturity of the program.

In maintaining Australia's leading role within this forum, the RCA National Representative, Mr John Rolland, ANSTO's Director of Government and Public Affairs, attended the RCA General Conference meeting and participated in the tripartite meeting for the regional agreements for Asia Pacific, Africa and Latin America held in Vienna in September 2001.

Australia was represented at the RCA Meeting of National Representatives in Seoul in March and was invited to present a paper at the RCA-30 Scientific Forum.

Regional leadership in radiation protection

ANSTO has played a major role over many years in providing leadership and technical support to radiation protection programs conducted by the IAEA under the RCA program. As a consequence, Australia is the Lead Country for the major RCA project on Enhancement and Harmonisation of Radiation Protection.

ANSTO played a significant role in coordinating the provision of assistance in radiation protection measures from the IAEA to member states. The Director, Safety, Dr Ron Cameron, is the National Project Counterpart and Chairman of the Coordination Group, which has responsibility for integrating the total IAEA technical cooperation radiation protection effort in the Asia Pacific region.

Regional nuclear cooperation in Asia

ANSTO continued to represent Australia in the Forum for Nuclear Cooperation in Asia (FNCA). The other FNCA members are China, Indonesia, Japan, the Republic of Korea, Malaysia, the Philippines, Thailand and Vietnam, all of whom are parties to the Nuclear Non-Proliferation Treaty.

Nuclear Energy in Sustainable Development and Cooperation in Utilisation of Radiation were discussed at the second meeting of the FNCA, held in Tokyo in November. Status reports on the development and utilisation of nuclear science and technology in each of the countries were discussed. The Australian delegation was led by ANSTO's Director of Government and Public Affairs.

In keeping with ANSTO's prominent profile in the Region, the organisation was a joint sponsor, with Japan, of the fifth Nuclear Safety Culture workshop, which was held in Tokyo. It was agreed that, under the FNCA program, the next phase of the program would be a self-assessment related to a research reactor in each FNCA country.

International strategic relevance of nuclear science and technology

International first in workplace health

Data collected at Lucas Heights from employees' health records between 1957 and 1998 has been assembled, checked and transmitted to the International Agency for Research on Cancer (IARC) in France. The information will be incorporated into a larger study, which for the first time will bring together data from 17 countries to estimate the risk of contracting cancer from exposure to radiation in the workforce.

The Australian-based data revealed that the workforce at the Lucas Heights Science and Technology has been found to have a lower cancer mortality rate than the general population in New South Wales as a whole. This was the finding of more than 6 years of analysis of more than 7000 past and present records spanning 5 decades, undertaken by the University of New South Wales, into the risk of contracting cancer from workplace exposure to low level radiation.

Services to the Australian Government and national stakeholders

ANSTO continued to provide information and advice on nuclear developments occurring around the world to government departments and agencies, other organisations, the media and members of the public.

ANSTO provided information covering nuclear power programs and electricity production, nuclear research and fuel cycle facilities and safety aspects of nuclear reactors. ANSTO also advised government departments on nuclear non-proliferation policy and export controls, provided technical experts in Australian delegations for bodies such as the Nuclear Suppliers Group, which deals with multilateral nuclear export controls, and assisted with AUSCONPLAN-SPRED, which deals with the possible re-entry of radioactive satellite debris in Australia. The organisation also contributed to the development of government science policy initiatives covering national research priorities and the framework for the Australian Research Council Centres of Excellence.

ANSTO's Quarterly Review of worldwide nuclear power issues was expanded to include additional topics. The Review is available on the ANSTO website.

Advice on visiting nuclear-powered warships

ANSTO provides operational health physics support and technical advice to the States and Commonwealth for visits of nuclear-powered warships to Australian ports. This involves providing radiation monitoring and a 24-hour on-call emergency response service for the duration of each visit.

Eight nuclear-powered warship visits were made without incident.

Communicating with the public and other stakeholders

The organisation's media profile continued to be high in light of the signing of the contract to construct the Replacement Research Reactor. The level of understanding about ANSTO was enhanced by the issue of 60 media releases and 23 statements to Australian media, regular media features such as "What I do at ANSTO", and by three issues of a newsletter published for the Sutherland Shire community.

External usage of ANSTO's Internet Home Page increased by 19%, with 82 500 visits to the main index page recorded over the year. ANSTO's intranet was further refined to improve staff access to documents and information.

In line with the general trend towards electronic publishing, ANSTO aimed to provide a range of materials in CD format. Last year's annual report was produced as a CD as the preferred format for distribution.

Ministerial and other VIP visits

Visitors to ANSTO during the year included the Minister for Science, the Hon Peter McGauran MP; Senator Kim Carr, Shadow Minister for Science and Research; HE Max Hughes, Ambassador to Vienna; Dr Robin Batterham, Chief Scientist; Mr Ian Biggs, Office of the Director-General IAEA; Mr Mike Smith, Ambassador for Disarmament and Ambassador and Permanent Representative to the United Nations in Geneva; Dr Peter Nygards, President of the Swedish Nuclear Fuel and Waste Management Co; representatives from the Canadian and United States governments; and senior staff from a range of Commonwealth departments.

Stakeholder education and visitation

Although not featured in any tourism commercials, Australia's only operating nuclear research reactor can claim to be one of Sydney's fastest growing tourism attractions, with some 15 000 visitors to ANSTO's Lucas Heights site during the 2001 calendar year, a four-fold increase over the previous year. While the main increase was due to unprecedented attendance of more than 10 000 during the Open Day program in August and September, numbers of visitors taking routine tours were up nearly 40%, also a record.

A record number of more than 10 000 people visited ANSTO's Lucas Heights site during its Open Days program in August and September.

Core nuclear facilities operation and development

Core Business Areas

Core Business Area

This area covers the operation of specialised nuclear core facilities in Australia and overseas for the benefit of the Australian research and development community and for industry. It also covers enhancements to the efficiency and effectiveness of such core facilities and improvements to the yield of high quality products and services.

ANSTO's nuclear scientific, technical and engineering skills are the unique and key strengths of the organisation. Its multidisciplinary research and development enables the organisation to take tried and tested science and technology and apply it to the environment, business opportunities, education and industry. Critical to success is ready access to major items of nuclear infrastructure, particularly a nuclear research reactor.

OBJECTIVES

1) To operate national nuclear facilities and associated infrastructure in Australia and overseas for the benefit of the Australian research and development community and industry.

2) To enhance and improve the efficiency and effectiveness of these facilities in order to yield high quality research, products and services.

3) To provide effective access by Australian scientists to synchrotron facilities.

DRIVER: Government, universities (through the Australian Institute of Nuclear Science and Engineering), other external customers and ANSTO.

OUTCOMES

- ANSTO met the stringent licensing requirements of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and was issued a facility licence, allowing the organisation to continue to operate the HIFAR reactor.
- The irradiation of silicon in the HIFAR research reactor for the semiconductor and electrical industries generated revenue of approximately $2.7 million.
- A total of 16 000 mineral samples were irradiated in the HIFAR research reactor for the Australian mining industry during the year, some 4000 more than last year. Irradiation provides information about the composition and quality of the samples.
- ANSTO's expertise in the characterisation of air pollution using its particle accelerator facilities was used to provide unique data for local councils and State Environment Protection Authorities for State of the Environment Reporting to governments.
- ANSTO's accelerator-based ion beam analysis (IBA) facilities continued to be the national facilities of choice for micron resolution heavy ion microprobe studies in materials, environmental and biological research, with a 50% increase in demand over the past 12 months.
- ANSTO has become a world leader in carbon dating very small and very old samples following the introduction of new sample preparation procedures that dramatically reduce background levels. The organisation is now able to provide reliable dates from samples containing as little as 20 micrograms of carbon and with ages of up to 50 000 years.

Output

Operation, development and maintenance of core nuclear facilities in Australia and overseas, providing timely access against demand for socio-economic benefits to flow to Australia, the research and development community and industry.

ACTIVITIES AND OUTPUTS

THE HIFAR RESEARCH REACTOR

ANSTO operates Australia's only nuclear reactor, the High Flux Australian Reactor (HIFAR). The reactor is used to produce radioactive products for use in medicine and industry. It is also used extensively as a source of neutron beams for scientific research, research into new materials, to irradiate silicon used in computer chips and to produce isotopes used in environmental management, agriculture, industry and minerals exploration.

HIFAR continued to be operated safely and efficiently during the year. It operated for approximately 7588 hours, which was 96.7% of its scheduled available time, at a nominal power of 10 megawatts. During this time there were 11 scheduled shutdowns (45 days in total) for routine maintenance. Improvements were implemented to enhance HIFAR's performance, including the extension of the operating program to five weeks.

ANSTO continued to be one of the world's major suppliers of irradiated silicon. Uniformly doped silicon (silicon that has even electrical properties throughout) is sought worldwide for use in devices such as video cameras, fax machines, control units, and computer DRAM (Dynamic Random Access Memory). It is also used in electrical components for power transmission. HIFAR, recognised internationally for its quality product, reliability and efficient supply, was used to irradiate 850 batches of silicon ingots for overseas customers.

Demand for reactor-based products remained high overall, with HIFAR used to irradiate approximately 1900 targets to produce medical and industrial isotopes, 500 environmental and geological samples and 16 000 mineral samples.

NEUTRON SCATTERING

HIFAR provides scientists and researchers with research facilities unique in Australia. These neutron scattering facilities, which are attached to or positioned around HIFAR, are used by ANSTO, by students and researchers from universities around Australia and New Zealand and by other groups from research and industrial organisations.

ANSTO maintained its high profile in the neutron science arena, largely as a result of national and international interest in the Replacement Research Reactor and the neutron science team's world-class modelling work.

ANSTO's neutron powder diffraction work, just one technique that uses neutrons from the HIFAR reactor, attracted international attention, with papers published in high-profile journals such as *Europhys. Letters*. Altogether 22 refereed papers were published during the year. ANSTO also provided administrative support for the Australian Neutron Beam Users Group, which, as of June 2002, reached a membership of 207 individuals from Australia, New Zealand and seven other countries.

Neutron beams reveal secrets of cement

Although cement is the most widely used building material in the world, very little is known about its detailed composition and chemistry. Its properties can vary considerably between manufacturers and even between batches from a single producer, causing substantial variations in performance. To solve this problem, ANSTO is using its neutron expertise to develop a better understanding of the composition of cement.

Further education and facility access

During the year a range of instruments were used for research into the structure and composition of materials. ANSTO provided university access through the Australian Institute of Nuclear Science and Engineering (AINSE). For example, ANSTO's neutron scattering group provided time on HIFAR neutron beam instruments to holders of 43 AINSE research and training grants, involving 21 PhD and honours students and six post doctoral award holders, and assisted with data processing and

interpretation. The university projects funded by AINSE used 389 instrument days, and internal ANSTO researchers used 242 instrument days. ANSTO research involving collaboration with international research organisations, university groups and training of other PhD students used a further 351 instrument days. Work of a direct commercial or industrial nature accounted for 3% of the usage. Other areas of study included the magnetic properties of rare earths, the physical chemistry of the solution inside red blood cells, the use of neutron scattering in crystal analysis, nanostructure studies (p53), and studies of functional materials (p55), and the composition of cement (p31).

Neutron scattering awards and conferences

University of Technology, Sydney, PhD student Vanessa Peterson was awarded a Young Scientist's prize at the International Conference on Neutron Scattering, held in September in Munich, for her work at ANSTO using neutron diffraction to profile the composition of cement.

ANSTO scientists attended the 5-yearly International Conference on Neutron Scattering, held in Munich, Germany, in 2001 and, in collaboration with AINSE and the Australian Neutron Beam Users Group, secured the next conference for Sydney in November 2005.

HIFAR QUALITY CERTIFICATION AND LICENSING

The HIFAR Quality System continued to maintain certification to the AS/NZS-ISO 9001 International Standard. The external accreditation body, Quality Assurance Services Pty Ltd (the commercial arm of Standards Australia), undertook surveillance audits in December 2001 and June 2002 and found no non-conformances. During the June audit the Quality System was certified to AS/NZS-ISO 9001:2000, a significant achievement. The auditors were satisfied that additional requirements for the 2000 standard had been met fully by the HIFAR system.

During this year ARPANSA granted a facility licence to ANSTO to possess, control and operate HIFAR subject to conditions set out in the licence. It includes details of the HIFAR facility and the radioactive sources held therein, along with a number of conditions pertaining to the operation of HIFAR and the development of further related information.

HIFAR NUCLEAR FUEL MANAGEMENT

ANSTO has contracted for the supply of a stock of low-enriched uranium (LEU) fuel elements from RISØ, Denmark, following the shutdown of a reactor in that country. Engineering and nuclear analysis work to permit use of this LEU fuel in HIFAR is progressing well. In addition to supporting non-proliferation objectives, the project is expected to produce significant savings for ANSTO in nuclear fuel costs.

NUCLEAR ANALYSIS

One of ANSTO's major capabilities is its ability to perform nuclear analysis: neutronics, thermal hydraulics, criticality and shielding calculations using powerful numerical codes.

Nuclear analysis staff continued to use ANSTO's large-scale experimental water tunnel to assess the flow characteristics of prototype design models of isotope production targets. The targets will be used to produce medical isotopes for the remaining life of HIFAR and for the replacement reactor, once commissioned. The water tunnel facility was also used to undertake assessments to enhance operational safety during irradiation of the targets and to investigate ways of increasing the isotope production capability for the remaining life of HIFAR.

AUSTRALIA'S REPLACEMENT RESEARCH REACTOR

Project management for the Replacement Research Reactor (RRR) is being undertaken in three phases.

Phase 1 involved the environmental assessment of the project and Phase 2 involved the selection of a tenderer to build the reactor. Phase 2 culminated in July 2000 with the contract being awarded to INVAP, S.E., an Argentine company, working with an Australian joint venture subcontractor comprising John Holland Construction and Engineering Pty Ltd and Evans Deakin Industries Ltd. Phase 3, currently underway, involves the detailed engineering, construction, commissioning and demonstration of performance of the reactor.

The status of implementation of conditions arising from the environmental impact assessment of the replacement reactor project is provided in Appendix 4 and on the ANSTO website at www.ansto.gov.au.

ANSTO's replacement reactor project, arguably Australia's most important science infrastructure undertaking in decades, is scheduled for completion in 2005 and proceeded to plan and within budget until June 2002, when a geological feature identified during site excavation slowed progress. The main focus throughout the year was on maintaining progress on the detailed design of the reactor and preparing to start construction of the facility, originally scheduled for February 2002.

During the year ANSTO provided responses to numerous questions raised by ARPANSA on the licence application and participated in an international peer review in July and a public forum in December.

The facility licence construction authorisation was issued by ARPANSA in April 2002. This allowed ANSTO to start the bulk excavation, construction and "cold commissioning" of the Replacement Research Reactor. Cold commissioning involves testing plant systems before the fuel is loaded. The Regulatory Assessment Report that accompanied the licence contained 106 recommendations that ANSTO must consider in making applications for approval to construct items important to safety under Regulation 54 of the ARPANS Regulations 1999. A further licence application will be needed before fuel can be loaded and operation begin.

The agreed technology transfer program between construction company INVAP and ANSTO proceeded effectively throughout the year in concert with the design process, and is expected to continue throughout the construction of the facility.

Details of expenditure to date are explained in Note 14 of the Financial Statements that accompany this report.

Developing the detailed engineering documentation

ANSTO worked closely with INVAP during the year to finalise detailed design issues in preparation for the applications to ARPANSA for Regulation 54 approval to construct items important to safety. These applications could be submitted to ARPANSA only after the Construction Authorisation was issued in early April 2002.

Transition into construction

In preparation for construction, documents and drawings associated with the applications for approval to construct items under Regulation 54 of the ARPANS Act were prepared by INVAP and reviewed for acceptance by ANSTO. The volume of this work required the development of procedures for processing applications to ARPANSA and resolving the related recommendations in the Regulatory Assessment Report.

Construction on the facility site officially started on 11 April 2002 with excavation work. Excavation was completed by late May and installation of rock anchors to fasten the building to the underlying rock commenced immediately.

Quarterly reports were provided to ARPANSA on the actions to address the site licence conditions and six monthly reports were provided to the Minister for the Environment on the actions to address the EIS conditions (see Appendix 4).

Construction on the Replacement Research Reactor site began on 11 April 2002. Construction staff from ANSTO, INVAP, S.E., and John Holland Construction and Engineering Pty Ltd and Evans Deakin Industries Ltd gathered to celebrate the event.

Testing of core materials

A comprehensive program to monitor the effects of radiation on the core materials of the type to be used in the Replacement Research Reactor commenced. Such programs have become features of modern research reactor design and provide additional confidence that the materials used in the high radiation areas will behave predictably. The program involves placing test samples as near to HIFAR's core as possible so they receive a neutron fluence (time-integrated neutron flux) equal to or greater than the fluence they will receive in the new reactor. The results will be compared with an analogue of radiation-induced mechanical property changes.

PARTICLE ACCELERATORS* - FOR RESEARCH

The Australian National Tandem Accelerator for Applied Research (ANTARES) provides ultra-sensitive radioisotope analysis for environmental studies, atmospheric research, oceanography, archaeology, quaternary studies, biomedicine and nuclear safeguards. It is also used in new materials technology, materials characterisation, occupational health and ion beam irradiation.

ANSTO's "Van de Graaff" accelerator has applications for a diverse range of activities in the fields of materials analysis, biological and environmental studies and basic nuclear physics. It is primarily used for detailed studies of structures and regions from several centimetres to 50 micrometres.

** The outputs of ANSTO's National Medical Cyclotron, another accelerator, are described on page 58 under the core business area "Sustainability and international competitiveness of industry".*

Its applications include surface and bulk analysis of materials, environmental pollution monitoring and archaeological artefact elemental determinations.

The Australian National Tandem Accelerator for Applied Research (ANTARES) and the smaller Van de Graaff accelerator continued to operate safely and reliably, meeting the needs of ANSTO and external users. Both accelerators are licenced for operation under the regulator, ARPANSA.

Meanwhile work began on installing a small tandem accelerator to replace the Van de Graaff. The new facility, which will satisfy the increasing demand for ion-beam analysis and carbon-14 age dating, should be operational in 2003.

Accelerator mass spectrometry

ANSTO's Accelerator Mass Spectrometry (AMS) facility, located on the ANTARES accelerator, is used to provide analyses of carbon-14 and other long-lived radioisotopes for scientific research projects in environmental and earth sciences, archaeology, heritage studies and nuclear safeguards. The user community includes researchers at Australian universities, other Australian and overseas research organisations, and ANSTO scientists.

International collaboration – understanding the Copper Age. Radiocarbon dating of bones from archaeological sites in Northern Italy contributed to a better understanding of the early Copper Age in this region. As part of a continuing collaboration with Italian archaeologists, this work enabled researchers to link changes of burial rituals to different cross-cultural contacts such as Indo-European migrations and interactions with neighbouring civilisations.

New information on global warming – a collaborative approach. A study of tree ring samples produced new information on atmospheric circulation and regional air-sea exchange of carbon dioxide, vital for understanding the carbon cycle and its role in global climate change. In a collaboration with the University of Sydney, tree rings from three different locations, covering the period AD 1952-1975, were cross-dated using carbon-14 AMS measurements and dendrochronological techniques. The tree ring samples were from north-western Thailand, northern New South Wales and north-western Tasmania.

With the increasing demand for dating very small samples, new methods and equipment have been developed to expand the capability of the ANSTO AMS facility in handling samples containing less than 20 micrograms of carbon. Currently, small mass samples account for one third of all the samples radiocarbon-dated at ANSTO. Further development is under way to enable measurement of samples with mass less than 10 micrograms.

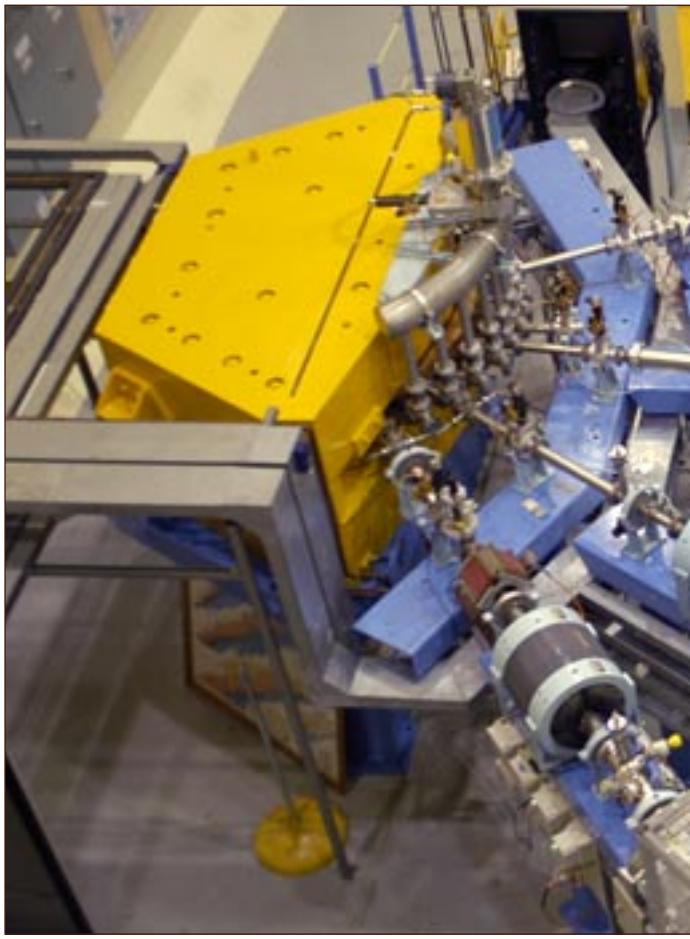
Ancient charcoal rock-art and social change. One application of ANSTO's unique capability in dating very small samples was in a study of Pacific rock art. Fifty-seven cave paintings and stencils from 14 sites on the island of Malakula, Vanuatu, were systematically radiocarbon-dated. Temporal trends reveal a marked, rapid and sustained increase in the incidence of charcoal marking from 1500 years ago. The data from Malakula has implications for understanding broader Pacific transformations in a period when inter-island social interchange appears to have waned.

Glaciers in PNG 15 000 years ago. Exposure age dating of sequences of glacial retreat moraines in alpine valleys in Papua New Guinea, New Zealand and Tasmania indicated that these glaciers disappeared earlier than 15 000 years ago, supporting the controversial idea that the Southern Hemisphere may have warmed faster than the Northern Hemisphere as the last Ice Age drew to a close. This work was expanded with support from an Australian Research Council grant to the universities of Newcastle and Melbourne.

Looking back 3 million years in beechwood fossils. The East Antarctic Ice Sheet is believed to be permanently stable and unchanging in the presence of climate warming. However, the discovery of marine and beechwood fossils in the TransAntarctic Mountains points to an ice sheet collapse about 3 million years ago. ANSTO scientists are using cosmogenic exposure dating in the Northern and Southern Prince Charles Mountains of Lambert Glacier, which drains 15% of the ice sheet, to determine when these mountains protruded through the ice.

Beryllium-10 and beryllium-7 are naturally occurring radioisotopes that are produced by cosmic rays in the atmosphere. The large difference in their half-lives (1.5 million years and 53 days respectively) means that their concentration ratio is a sensitive chronometer of transport time from formation.

The long lived beryllium-10 record in ice cores provides information on the past production rates of cosmogenic radionuclides and on variations in the Earth's magnetic field, and is used as a proxy for past snow accumulation rates. Such information is used in studies of palaeo-climate change, which in turn lead to improved predictive models for future climate change.



Studying past climates in Antarctica. In a collaboration with CSIRO and the Australian Antarctic Division, measurements were made of the beryllium-10 concentrations of ice core samples from three separate locations on Law Dome in Antarctica. Additionally, pilot beryllium-7 measurements were undertaken. This study is revealing the relationship between the snow accumulation rate, beryllium concentration in the ice core, and local meteorology at this site.

Ion beam analysis

Over 5300 samples were analysed for elemental composition by ion beam methods using ANSTO's 3 MV Van de Graaff and 10 MV Tandem accelerator facilities. This nuclear analysis service is provided across a range of disciplines and for a wide range of external users, with samples originating from fields as diverse as materials, environmental and geological sciences and archaeology and the arts.

During the year ANSTO provided access to its ion beam accelerators to holders of 34 Australian Institute of Nuclear Science and Engineering (AINSE) research and training grants representing researchers from the majority of universities across Australia. Training in nuclear techniques related to accelerator science was provided for Australian graduate and postgraduate as well as international researchers through the International Atomic Energy Agency (IAEA).

A pilot study carried out in collaboration with the CSIRO and funded by the Australian Mining and Industry Research Association of innovative methods of gold exploration was successfully completed. The study used fast neutrons from ANSTO's 3 MV Van de Graaff accelerator to calibrate mining instruments used to detect trace quantities of gold in rock.

The first phase of a project characterising air pollution from power stations in New York State in the United States was completed and agreement

Core nuclear facilities operation and development

ANTARES, the Australian National Tandem Accelerator for Applied Research, is used in projects ranging from past climate analysis to precise dating of precious artefacts and archaeological specimens, analysis of samples from nuclear sites and building the history of a glacier in Antarctica.

reached to proceed with the next phase. Collaborators on this project include Clarkson University at Potsdam in the United States and power generators in New York State.

ANSTO also continued to provide unique air quality data to local councils and State Environment Protection Authorities for state-of-the-environment reporting to governments.

The capabilities of the heavy ion, time-of-flight recoil spectrometer on the ANTARES accelerator continued to be enhanced with new applications to in-situ sample measurement and processing. These developments enable scientists to better understand important chemical transformations of oxide-ceramics at high temperatures using stable isotopic tracers.

The heavy ion microprobe on ANTARES was used to test and develop dosimeters with micron spatial resolution. These micro-dosimeters are used to quantify radiation doses given in hadron therapy, a form of cancer treatment that uses high-energy nuclear particle beams rather than x-rays.

AUSTRALIAN SYNCHROTRON RESEARCH PROGRAM

ANSTO manages the Australian Synchrotron Research Program (ASRP), which provides access to a comprehensive range of synchrotron x-ray research capabilities for Australian science in the fields of physics, chemistry, materials science, structural biology, polymer research, environmental science and geophysics. The other members of the ASRP are the Australian National University, Curtin University of Technology, the University of Sydney, the University of Canberra, the University of NSW, the University of Melbourne, Monash University, the University of Newcastle, the University of Queensland, the University of South Australia, the University of Western Australia, the Cooperative Research Centre for Microtechnology, CSIRO and the State Governments of NSW, Queensland and Victoria.

The ASRP operates synchrotron radiation research facilities at two overseas laboratories: the Photon Factory in Japan and the Advanced Photon Source (APS) in the United States. ANSTO maintains specialist scientific staff at these facilities to assist visiting Australian research teams.

The Australian synchrotron user community has grown steadily since the ASRP was established in 1996. It currently supports visits to the overseas synchrotron facilities by more than a hundred Australian research teams a year, with a total user community of more than three hundred. Scientists from twenty-two universities, four government laboratories including ANSTO, and five CRCs have used ASRP beamlines in the past 5 years. ANSTO continues to be a significant user of ASRP facilities; funding and beamtime were awarded to eight teams from ANSTO Environment, Materials and Physics during the year.

The ASRP was initially funded for a 5-year period by the Major National Research Facilities (MNRF) program in 1996. A proposal for funding for an additional 5 years was submitted with the 2001 MNRF program in May, with ANSTO again acting as the principal proponent and managing agent. This proposal was successful, with the ASRP being awarded $14.8 million to operate until mid-2007. Included in this grant are new funds to expand access to soft x-ray beamline facilities, an area that was under-resourced in the original ASRP operation.

Nuclear science for environment and sustainability

Core Business Areas

Core Business Area

Recognition of the need for broader understanding of natural processes and of the impact of human activity on the environment is growing within all levels of government, the private sector and industry as these organisations look to identify strategies for environmental sustainability.

ANSTO's activities in this area have evolved significantly from research focussed on measuring, monitoring and managing any environmental impacts associated with the operation of ANSTO's nuclear facilities and with uranium mining in Australia. The nuclear science and technology expertise the organisation has developed since that time now enables it to address a range of environmental concerns and contribute technical advice on issues of public importance. Excellence in environmental performance, and in applying nuclear-based techniques to predicting and solving environmental impacts, is an integral part of its operation.

OBJECTIVE

To apply nuclear-based techniques in research projects that are integral to national and international programs on understanding natural processes and the impact of human activities on the environment.

Drivers: Government, other science organisations such as the Australian Antarctic Division, the Bureau of Meteorology, Geoscience Australia, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), universities and industry.

OUTCOMES

- ANSTO's Groundwater Project located a groundwater source for a water supply for a housing development at Bungendore in the Southern Highlands of New South Wales. The ANSTO consultants located the water using a geophysical technique that proved quicker and more accurate than borehole drilling and conventional geological methods.
- Another consultancy at Nabiac near Foster-Tuncurry was able to assure the NSW State Government that an aquifer could be tapped without affecting surrounding creeks and wetlands. When the detailed aquifer structure was revealed, it was found that a higher aquifer fed these waterways, leaving a lower unconnected aquifer available to tap for a new water supply.
- Accelerator-based facilities were used in an international experiment being carried out in East Asia to add to scientists' understanding of the role of aerosols (minute airborne particles) in producing the "greenhouse" effect and of project members' ability to better predict the role of aerosols in climate change. It was found that aerosol concentrations are driven largely by climate and weather events, with peaks in concentrations occurring early in spring and originating from China's north-western semi-arid zone.
- A study at MacMasters Beach, New South Wales, has contributed to understanding the effects of mega-rips on beach erosion along Australia's east coast and the impact that more extreme weather resulting from future climate change could have. The project applied a radiotracer technique to measure the impact of storms on sand movement. It was conducted by ANSTO in association with the Coastal Studies Unit of the University of Sydney and the NSW Department of Land and Water Conservation.

Output

A better understanding of natural processes and in particular the impact of human activities on the environment and sustainability.

ACTIVITIES AND OUTPUTS

MAJOR STUDY INTO RADIONUCLIDE ENVIRONMENTAL PATHWAYS

The Radionuclide Environmental Pathways Project is a study of the biogeochemical processes that affect the migration and accumulation of radionuclides in the environment. The project focuses on the processes and pathways involved in ecological sustainable development, sediment dynamics and coastal sand movement, and on processes that are important for assessing the environmental impact of nuclear facilities in Australia and the Asia Pacific Region.

Understanding natural processes in oceans

A number of ANSTO studies provided information about poorly understood natural processes in the oceans and address issues relating to the management and sustainable development of fishing and mining activities in the marine environment. In one such study, ANSTO and the Institut de Recherche pour le Dévelopement (IRD), Noumea, are investigating the processes that affect radionuclides and trace elements in a tropical marine environment. During the year the team used coastal and oceanic samples to determine the transfer rates and pathways of natural uranium series radionuclides and heavy metals (such as copper and nickel) through successive trophic levels of the oceanic food web. The research revealed that below a certain level of plankton activity these potentially toxic substances can accumulate in the seawater and concentrate through the food web, and may constitute a risk to the environment and human health.

Understanding underground waste storage

ANSTO scientists, in a collaborative experiment with the Japanese National Institute of Radiological Science, have increased understanding of underground radioactive waste storage. Studies have indicated that technetium stored in an underground repository may be taken up by plants in the long term (tens-of-thousands of years) more slowly than previously thought. The suggestion comes from a study of how rhenium is transferred from soil to plants. Rhenium, which has occurred naturally in soil over many millenia, has a similar chemistry to technetium, the most commonly used radionuclide in nuclear medicine and produced only in the past forty-or-so years. The study showed that natural rhenium transfers much more slowly than recently deposited technetium.

Sorption is the uptake of a dissolved radionuclide on a mineral surface. Sorption models enable better management and prediction of environmental impact of uranium mines and nuclear waste repositories. Creating accurate predictive models of sorption is difficult because the process is strongly affected by local geochemical conditions and the properties of the surface.

ANSTO scientists joined teams from 14 countries around the world in testing various sorption process models on several critically reviewed experimental data-sets. The work was part of a major international OECD Nuclear Energy Agency led project aimed at developing a consensus on the most appropriate types of models than can be used around the world to predict the movement of radionuclides in groundwater and soils. The results are applicable anywhere in the world.

TRACKING AND PREDICTING EFFECTS OF HUMANS ON CLIMATE

The Human Activity and Climate Variability project is utilising ANSTO's nuclear capabilities in a collaborative international study of the influence humans and climate variability have had and will have on our landscape. The collaboration of national and international organisations is in its third year.

ANSTO is contributing significant groundbreaking data to international research programs and databases in three particular areas:

Using natural archives to determine past impact of human activity

Naturally preserved climate "archives" in Australia have been obtained by ANSTO from five sites. These have given up sediment records from lakes, swamps and bogs that represent pristine to highly human impacted areas. Radioactive dating techniques were used and evidence taken from microfossils, trace elements, stable isotopes and charcoal in order to assess the nature and scale of human activity and climate variability in the past. Further areas are being investigated.

Discovering how and where air is polluted

ANSTO is assisting with an international Aerosol Characterisation Experiment (ACE-ASIA) being conducted in East Asia. Using ANSTO's accelerator-based facilities, team members have set out to measure changes in air quality globally and regionally, also locally when sources of pollutants need to be identified. By characterising the physical and chemical properties of airborne fine particles collected from both highly human impacted and pristine sites and by measuring the radon concentrations in the samples, ANSTO determines the sources of the soil, dust and pollutants present and the track taken by the air mass being sampled.

Generating more predictive power

ANSTO is providing data to improve land-surface parameterisation schemes: computer models that predict heat and moisture transfer between the land surface and the atmosphere. These are crucial components of global climate models. Researchers investigated the potential of isotopes to monitor regional changes in hydrology and quantified the impact of land use and land-use change on weather and climate. A major goal is to evaluate the performance of current atmospheric models in simulating land-surface climates. This research forms part of the international "Project for the intercomparison of land-surface parameterisation schemes" (PILPS). Overall, the project is on target, with a significant output of data, student research and publications.

WATER RESOURCES: MEASURING AND TRACKING

Tracking river water

ANSTO gained research funding from the Natural Heritage Trust fund to use isotopes and electrokinetics to calculate the rate of water loss from the Macquarie River near Narromine, New South Wales, to a palaeo channel (an ancient underground water channel). The grant, awarded to ANSTO and the NSW Department of Land and Water Conservation, will also provide funds for a trial of a single borehole radiotracer technique. The research could influence regulation of water drawn from rivers and underground for rural pursuits.

Dune aquifers scrutinised

ANSTO's participation in a study with the University of New South Wales into the effect of tides on the movement of groundwater in an estuarine system at Hat Head, New South Wales, has implications for the management of shallow sand dune aquifers on the Australian east coast. Such aquifers are commonly used for water supply but have been subject to contamination from surface land use, disposal of effluent and septic tank leakage. Recently, proposals by some local councils to inject treated sewage effluent into the aquifers as an alternative to ocean outfalls has heightened the need for knowledge. The question is whether the aquifers always flow to the ocean or whether wave conditions can turn the net flow inland towards coastal lakes and estuaries, thus possibly introducing human-sourced viruses and pathogens. The ANSTO collaboration from this year has included introducing a radiotracer, bromine-82, to track groundwater movement at Hat Head under conditions that are difficult to define using conventional techniques.

Finding water for the fruit industry

Local water users around the fruit-growing town of Araluen in southern New South Wales were delighted that a potential new source of groundwater was found as a result of a collaborative study involving ANSTO, the

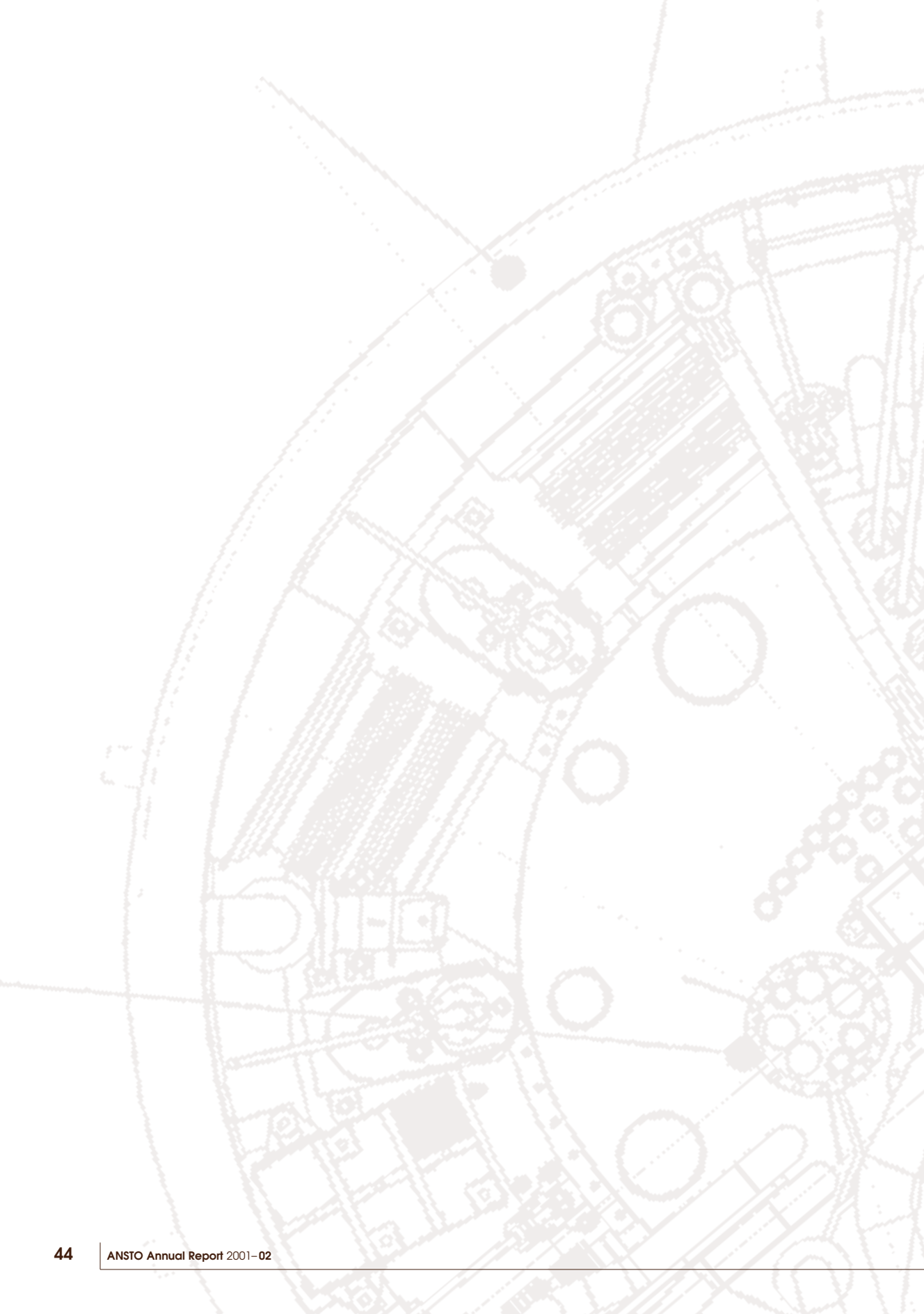
Environmental scientist Dr Henk Heijnis (right) and personnel from the Thai Office of Atomic Energy for Peace take samples from a sediment core from the bottom of the Lam Phra Phleong reservoir, Thailand, during an expert mission for the IAEA. Nuclear techniques were used to determine the origin and fate of the sediment as part of a project to estimate sedimentation arising from land clearance.

University of Wollongong and the NSW Department of Land and Water Conservation. The study used isotopes to determine the age and sources of the water. An intellectual property review of the project conducted with the assistance of ANSTO patent attorneys led to the identification of patentable technology from the project.

SECONDARY ION MASS SPECTROMETRY

ANSTO's SIMS facility was used in an International Atomic Energy Agency (IAEA) round-robin exercise investigating the sensitivity of SIMS for the isotopic analysis of uranium particles for safeguards applications. The SIMS facility was also used by 25 university researchers to complete projects supported by the Australian Institute of Nuclear Science and Engineering (AINSE). Five students were supported by AINSE post-graduate scholarships.

Secondary Ion Mass Spectrometry (SIMS) is a technique that assesses the surface composition and impurity content of minerals, shells, layered structures and metallic components. It is used widely by university and industry researchers working at the forefront of technological advances in their fields. At ANSTO it is used to determine naturally occurring isotopic variation within environmental samples, which are then used as indicators of ancient natural processes, and as aids in the prediction of future processes.



Treatment and management of man-made and naturally occurring radioactive substances

Core Business Areas

Core Business Area

ANSTO places a high priority on the safe management of radioactive wastes and spent fuel from its nuclear facilities. Wastes arise from the operation of the HIFAR research reactor and the associated facilities used to produce radioisotopes for medical and industrial use. ANSTO continues to develop new approaches and processes, and refine existing ones, for the management of man-made and naturally occurring radioactive substances. Removal of naturally occurring radionuclides from ore products and minerals is proving important to maintaining Australia's competitive edge internationally in the mining industry.

Management of radioactive waste, including conditioning of waste for safe storage and disposal, will continue to be an important focus for this core business area. However, service to the general mining industry is growing as more and more applications relevant to mine waste management are developed.

OBJECTIVES

1) To refine, develop and implement new approaches to safely immobilise and dispose of radioactive waste and to minimise the environmental impacts from the nuclear and mining industries.

2) To provide government with expert scientific and technical advice on radioactive waste management, including environmental impacts of uranium mining.

3) To provide environmentally sensitive and cost-effective waste management in accordance with relevant standards and appropriate risk management strategies.

OUTCOMES

- ANSTO completed a collaborative project with Energy Resources of Australia, Rio Tinto Technical Services and Occtech Engineering to develop a process for the treatment and release of process water generated at the Ranger Mine site in the Northern Territory. The process was demonstrated in a 3-month pilot scale operation at the Ranger site and a full-scale plant is being planned. A joint paper with industry on this project was presented at the third International Water Association World Water Congress.
- A facility licence was issued by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) for ANSTO's Waste Operations Facility.
- A purpose-built waste treatment and packaging facility was constructed for processing ANSTO's low level radioactive wastes into a suitable form for transport to the national low level radioactive waste repository. The facility provides ANSTO with a comprehensive, integrated waste management system to safely process and prepare waste packages for off-site disposal.
- Radiation monitoring systems for the clearance of off-site wastes were installed and commissioned. The new systems provide ANSTO with a state-of-the-art monitoring and clearance system.

Drivers: Government, ANSTO and industry.

Output

New technological approaches to immobilise and dispose of radioactive waste, and environmentally sensitive and cost-effective waste management.

Treatment and management of man-made and naturally occurring radioactive substances

ACTIVITIES AND OUTPUTS

Radioactive waste can be classified in a number of ways. The physical form of the waste – solid, liquid or airborne – is important because it affects its mobility in the environment. Radioactive wastes are also classified as 'low', 'intermediate' or 'high', depending on their level of radioactivity and heat production.

INTERNATIONAL COLLABORATION AND NUCLEAR WASTE IMMOBILISATION

For some years ANSTO has been developing ceramic-based materials for immobilising radioactive waste that have been derived from the original synroc technology, the synthetic rock concept proposed by Professor Ringwood and his colleagues at the Australian National University, Canberra, in 1978 for immobilising high level wastes from irradiated fuel reprocessing. Since then, ANSTO has built a strong international reputation with its ability to incorporate a wide range of radioactive materials into very stable mineral structures, mostly based on titanates.

Over the past 10 years ANSTO has developed collaborative agreements with major international organisations working in radioactive waste management in the United States and Europe. ANSTO continued to collaborate with these groups to develop solutions for specific waste streams and to bid for particular projects in the emerging radioactive waste remediation market.

Russia

In February 2001 a protocol with Russia was signed to develop a proposal to immobilise Russian high level radioactive wastes in synroc-based matrices at a facility in the Russian Federation. The first meeting of the ANSTO-Russian Joint Working Group was held in St Petersburgh in July 2001. It identified the issues to be considered to develop a mutually rewarding program. A second meeting, involving officials from a number of Russian nuclear organisations, was held at Lucas Heights in July 2002 and a number of milestones and deliverables planned.

The United Kingdom

Following last year's signing of a Memorandum of Understanding with British Nuclear Fuels Ltd, contract work was initiated to assess wasteforms and processes for immobilisation of wastes and residues containing plutonium and other actinides. The technical base of the agreement was also broadened to include some strategic research into inert matrix fuels.

France

ANSTO continued to collaborate with the French Atomic Energy Commission (CEA) to develop and evaluate new titanate/glass composite wasteforms for use with the CEA's cold-crucible technology, used to melt radioactive wasteforms. The work focused on the immobilisation of caesium and minor actinides separated from high level radioactive waste streams. Both ANSTO and the CEA have recently filed patent applications relating to caesium immobilisation.

Durability of titanate wasteforms

Regulatory acceptance of titanate wasteforms (that is, ceramics designed to immobilise high level radioactive waste) requires a detailed scientific understanding of their long-term durability, possible only through the study of natural analogues.

Collaborative studies on radiation damage in natural analogue titanate minerals were concluded with the publication of a series of journal papers and invited presentations by ANSTO scientists at a number of international meetings. The most important finding was that these titanate minerals are highly durable in natural systems, often surviving the complete destruction of the host rock during weathering. For example, pyrochlores from Adamello, Italy, which have compositions close to those of the materials proposed for use in titanate waste forms, have retained uranium and thorium for more than 40 million years.

MANAGING WASTE IN MINING AND MILLING INDUSTRIES

Interest in the concentration and characteristics of radioactivity in mineral products is steadily increasing as companies recognise potential risks to their operations from naturally occurring radioactive materials (NORM) in their processes, wastes and marketable commodities.

ANSTO carried out mine site surveys and analysed samples from a range of potential projects and existing operations as part of its commitment to supporting industry in their management of NORM in raw materials. ANSTO environmental scientists carried out a number of studies for two potential rare earth projects in Australia. They also reviewed available data on the radioactivity contained in red mud produced from alumina production and the effect that existing and future trends in regulations might have on risks that operators face in its storage and downstream uses.

Another study looked at the deportment of radioactivity in metallurgical processing. This work was carried out for an independent body, Healthy Cities Illawarra, as part of a broader study by ANSTO of the Illawarra region. ANSTO scientists also began researching the use of new ion exchange materials to separate radioactivity from solutions. Certain radionuclides can be a problem in copper concentrates and in high temperature metallurgical processes. Separating these radionuclides out would enable the manufacturer to improve the management of radioactivity in plant and products and in the disposal of wastes.

Inorganic ion exchangers

Work continued on developing selective inorganic sorbents for removing radionuclides such as caesium-137 and strontium-90 from acidic, radioactive waste streams, including those arising from molybdenum-99 production at ANSTO. The discovery that these materials also display excellent selectivity for radioactive heavy metals such as lead-210 and polonium-210 suggested that they might be useful for removing these species from minerals processing streams where other commercially available inorganic sorbent materials are ineffective. Work began on investigating the performance of the materials under the conditions that exist in the Australian minerals processing industry, with excellent results.

WASTE OPERATIONS AND TECHNOLOGY DEVELOPMENT

Most of ANSTO's wastes are low level but small quantities of intermediate level wastes are also generated. ANSTO has no high level wastes. The quantities of radioactive waste currently at the Lucas Heights Science and Technology Centre are very small compared to the amounts at many other nuclear facilities overseas, particularly those in countries with nuclear power programs.

ISO waste standard upgraded

Certification of ANSTO's Waste Operations and Technology Development Quality Assurance System to the AS/NZS ISO 9001:2000 standard was achieved, an upgrade from the previous ISO 9001:1994 accreditation.

Safe low-level waste management

Solid wastes containing lo w levels of radioactivity are produced in ANSTO laboratories where radioisotopes are handled. They include a variety of items such as tissues, disposable gloves and plastic tubing. All low-level solid waste generated during the year was transferred safely to ANSTO's gamma scanning and storage facility. (Low-level waste does not require shielding for protection of workers or the public during normal handling and transportation.)

The ANSTO gamma scanning system identifies the radionuclides present in the waste and provides a precise inventory of waste materials destined for the national low level radioactive waste repository. Staff made significant progress in the ongoing program to strengthen management arrangements for historical solid radioactive wastes. The next phase of this project will be closely linked with the establishment of defined criteria for the treatment and packaging of intermediate-level waste destined for the national store.

Treatment and management of man-made and naturally occurring radioactive substances

A pilot membrane plant is currently being operated in liquid waste streams at the Lucas Heights site to detrmine the feasibility of using such technology to remove trace levels of radionuclides.

Stocks of beryllium materials held on site and no longer required for research purposes have been repackaged and returned to the suppliers in the United States as part of ANSTO's policy of returning such materials that are no longer required.

First-class off-site waste clearance

A new Waste Clearance Centre was established for radiological checking of waste in a defined low-level background radiation environment before removal from site. Additionally, a gate monitoring system was installed to check vehicles carrying solid wastes being transported for recycling or disposal. Together, these systems make ANSTO's management of wastes for off-site clearance and disposal equal to the best in the world.

Immobilisation of intermediate-level waste

Intermediate level waste requires radiation shielding for personal protection; however, it generates only a negligible amount of (thermal) heat. There is an ongoing program to solidify the

liquid waste from molybdenum-99 production at ANSTO and during the year, work began on the design of a process plant to immobilise this waste in preparation for long-term storage. This plant will also provide an opportunity to apply and demonstrate ANSTO's own wasteform technology.

Wastewater

Most of the wastewater from the Lucas Heights Science and Technology Centre comes from non-radioactive work areas. Only a small fraction, typically about 7%, requires treatment before discharge. The treatment process involves absorption of radioactivity onto a solid, followed by centrifuging to separate the solids from the liquid. The solids, which are slightly radioactive and dried by solar evaporation, are placed in storage.

A new Trade Waste Agreement was signed with Sydney Water, effective from 1 July 2002. The new agreement resulted from the release of the new Sydney Water 2001 Trade Waste Policy and Management Policy document. ARPANSA endorsed the discharge limits for radioactivity specified in the new agreement.

ANSTO's liquid effluent treatment plant met all Sydney Water trade waste discharge limits for the year. Upgrading of the plant continued.

A pilot membrane plant is currently being operated to determine the feasibility of using membrane technology to remove trace levels of radionuclides from low-level radioactive liquid waste streams.

INVENTORY AND DATABASE FOR TRACKING WASTE

A system for a comprehensive database for ANSTO's radioactive waste inventory, established last year, is being progressively installed and commissioned on the various categories of radioactive wastes. The system will allow for all waste packages to be tracked from generation through to processing, pre-disposal packaging and storage, and will result in greater control over waste products and improved collation of data. The initial categories for which the system has been installed are low level solid waste, intermediate level solid waste and low level liquid wastes.

Sustainability and international competitiveness of industry

Core Business Areas

Core Business Area

ANSTO recognises the important link between science and business in building Australia's economic strength. The balance between our role as a scientific research organisation and the commercialisation of our work will continue to be a major challenge. Through our activities, ANSTO will continue to develop a strong research base for Australia, extend opportunities for further collaboration with the world's best and enhance our local expertise and skills.

An important part of ANSTO's activities is the manufacture and distribution of radioisotopes, both for medical applications in diagnosing and treating life-threatening diseases and for environmental and industrial applications. This is providing a significant community benefit.

This area is concerned with utilising ANSTO's broad nuclear expertise to refine or develop new approaches to enhancing the efficiency and ecological sustainability of diverse industry sectors. It could involve determining the remaining life of materials used by the power producing industry, or assessing the risk and reliability of a planned industrial activity. It embraces studies of material composition and structure at microscopic levels.

OBJECTIVES

1) To contribute to the development of critical technologies aimed at enhancing the global competitiveness and sustainability of those Australian industry sectors that can benefit through application of nuclear science and technology and ANSTO's unique mix of technical capabilities.

2) To provide scientific and technical advice and services to government and industry in applications of ANSTO's nuclear capabilities and technologies.

3) To supply internationally competitive radiopharmaceuticals and other radioisotopes for medical, industrial and environmental use in Australia and the Asia/Pacific region.

Drivers: Government and industry.

OUTCOMES

- Sirspheres®, a radiopharmaceutical developed by ANSTO and the Australian biotechnology company Sirtex Medical, was approved in March by the US Federal Drugs Administration (FDA) for general marketing in the United States and released immediately. This is a substantial achievement for ANSTO as few manufacturers in Australia have FDA approval. ANSTO is currently exploring ways of increasing production to meet the high market demand for this product, which is used to treat secondary liver cancer.
- Mining companies will be better equipped to predict pollution from their mine sites and quantify the possible ecological risks following the release of two software packages by ANSTO business unit Sulfide Solutions: SULFIDOX, a software tool that simulates the chemical and physical processes occurring inside waste rock dumps and leach heaps; and AQUARISK, an ecological risk assessment software package that has been modified to more closely align it with the approach adopted by the latest Australian and New Zealand water quality guidelines.
- ANSTO's expertise in safety and reliability analysis was utilised in an arbitration case involving several hundred million dollars. The organisation prepared two expert reports, its representatives were cross-examined as witnesses and were used to cross-examine other witnesses. This was a significant acknowledgment of the level of expertise at ANSTO in this specialised area.

Output

The application of technologies and capabilities developed by ANSTO to focussed research and development, process improvements and provision of goods and services that will increase the competitiveness of Australian industry and improve the quality of life for all Australians.

- Measurements by ANSTO's Secondary Standard Dosimetry Laboratory (SSDL) were found to be well within the international primary standard for accuracy required by the IAEA. ANSTO participated in an IAEA thermoluminescent dosimeter postal dose audit in November 2001, held biannually to compare the accuracy of absorbed dose measurements for member states of the IAEA/World Health Organisation SSDL network. ANSTO measurements were within 1% of the absolute target.

ACTIVITIES AND OUTPUTS

COMMERCIALISATION AND COLLABORATION

Removal of arsenic from groundwater

The reliability of ANSTO-developed ultraviolet-sulfite technology for removing arsenic from ground water used for drinking was independently verified during collaborative bench scale testing at the University of Houston in the United States. The work was carried out as the first part of a project funded by the Awwa Research Foundation. Pilot scale trials in Maine are scheduled for the northern summer. The completion of these milestones is one of a number of steps for commercialisation of the technology, some of which is the subject of patents and patent applications filed jointly with the Cooperative Research Centre for Waste Management and Pollution Control. Discussions also began with potential licensees with international exposure.

Wear-resistant surfaces in metals

Demand for ANSTO's Plasma Immersion Ion Implantation (PI^3) technology, used to produce wear-resistant surfaces in metal components at low temperatures, continued to grow. Sales passed the $1 million mark with the supply of a high voltage pulser to Chiang Mai University in Thailand. The pulser will be used in experiments on the PI^3 process. Similar equipment is now in use in laboratories in the United Kingdom, Germany, Hungary, Thailand, Singapore and Australia.

Industry collaboration in nanostructure studies

In collaboration with Australian industry and other research organisations, ANSTO scientists explored the nanostructure of complex systems. The systems varied from the absorbed sulphur contamination in nickel briquettes and surfactants used in foods and cosmetics to new types of plastics known as nanocomposites. ANSTO's skills and facilities used in such studies include small angle neutron scattering and neutron reflectometry, x-ray scattering and electron microscopy.

Collaborations were established to gain a detailed knowledge of the structure of selected nanocomposites, inorganic-organic composites (which have potential applications in many fields including automotive and aeronautical components) chemical sensing and non-linear optics, and as passive components in microelectronics.

ADVICE AND SUPPORT TO INDUSTRY

Mining industry solution to waste management

The core business of Sulfide Solutions is the management of mine waste rock dumps that generate acid mine drainage. Sulfide Solutions is the vehicle for the delivery of tools and technologies developed within the Solutions Research Project (SSRP).

The SSRP continued to develop innovative technologies that will assist mining companies in their pursuit of sustainability. Recent developments in the bio-oxidation heap leach environment allow the same instrumentation used in the waste rock environment to be deployed for heap performance monitoring. Since the physical oxidation processes are similar, modelling tools developed for effluent prediction can be applied to the challenge of optimising heap oxidation conditions that, in the longer term, should reduce heap closure costs.

The team was awarded a research contract by the International Network for Acid Prevention (INAP), an industry-based initiative aimed at coordinating research globally into the management of sulfidic mine wastes and promoting responsible

Gene Davidson from ANSTO's Sulfide Solutions team monitors data from an oxygen analyser at a coal mine in Queensland. The analyser extracts air samples from mine waste heaps and produces a computer analysis of oxygen concentrations, enabling Gene to determine the amount of pollutants being generated inside the sulfidic waste heap.

environmental management. ANSTO's task was to undertake a review of data held by mining companies around the world and to increase understanding of how information obtained from laboratory test work can be scaled up and then used to predict the effect on the environment of large piles of sulfidic waste rock at opencut mine sites.

Reviews are underway to assess which business partners can enhance the returns from the establishment of the Sulfide Solutions business unit's infrastructure.

Advice to industry for sustainability

ANSTO, in collaboration with the Office of the Supervising Scientist (Environment Australia), provided advice to the Department of Industry, Science and Resources on the current state of the Rum Jungle mine site and technical aspects of land use options. ANSTO also began a project to determine why the earthen covers placed on the waste rock dumps at the site in the early 1980s to control water infiltration rates are not performing as well as they did previously. The work, funded by the Australian Centre for Mining Environmental Research, is being carried out in collaboration with CSIRO Land and Water.

Value-adding to industrial recycling

ANSTO is a core participant in the Cooperative Research Centre (CRC) for Polymers and continued to work with research and industry collaborators.

A notable highlight of this work was a study, using ANSTO's small angle neutron scattering facilities, of how and why polymer chains of different chemical composition entangle.

This information is vital to the expanding polymer recycling industry where grading of recycled polymers is important for use in higher-value products.

The CRC for Polymers has developed the technology to enhance the properties of low-cost "bottle grade" polyethylene terephthalate (PET). To enable the successful transfer of the technology to a commercial environment, ANSTO scientists used small angle neutron scattering facilities to assist with a detailed study of the development of the overall structure of the polymer chain and specifically how and when segments of the chain crystallise. The aim was to tailor the structure of the post-processing polymer chain to meet the strength and clarity requirements of the final product.

Essential assistance for oil, gas and electricity industries

ANSTO played a major role in developing and promoting a new program of six research projects for the electrical power generation industry and is a major research provider to three of the projects. The program has already produced results that will help to extend the life of critical power plant components and reduce the cost and time for maintenance shutdowns. The program, which commenced in July 2001, is a collaborative effort between several partners within the CRC for Welded Structures and has attracted sponsorship from 10 electricity power generating companies across four States.

The organisation used its expertise in miniaturised creep testing to assist a Queensland electrical power industry customer to assess the remaining life of several of their large, high cost components. This involved taking small samples from the components and testing the deformation rate at high temperatures under steady load. The tests showed that the service life of the components could be safely extended.

ANSTO is also leading a project for the Australian gas pipeline industry aimed at increasing the productivity of the large gas transmission pipelines that span the country. The project combines detailed mechanical testing of pipeline steels with complex finite element modelling of the behaviour of pipes at very high pressures. A fullscale pipe-bursting test verified the modelling work. It is expected that the results will be used to produce a modified Australian Standard, allowing the gas pipeline industry to utilise the outputs of the research.

Underpinning successful plant operation

An assessment of a critical high temperature plant for a large mining industry customer was completed following a series of unplanned shutdowns due to plant failures. Using finite element stress analysis, an assessment of the current design and operating conditions was performed. The causes of the failures were identified and advice given on how operating practices should be modified to avoid these problems.

Ceramic coatings a boost to industry

The advanced thin film engineering project begun in July 2000 is building on ANSTO's skills in solgel processing, plasma surface conditioning and atomic layer deposition for engineering oxide-ceramic and organically-modified ceramic thin films used in optics, photonics and nanotechnology. A particular emphasis of the project is to optimise ANSTO's thin film deposition capabilities for various applications relevant to Australian industry, in collaboration with selected CRC, industrial, academic and other partners.

Research during the year focused on the development of new methods for depositing ceramics coatings at low temperatures for applications ranging from fibre optic communications to corrosion and scratch resistance. The processing temperature for atomic layer deposition was successfully decreased from 300° to 50°C, allowing the deposition of uniform and homogeneous films on a wide range of polymers that would have been damaged by higher temperatures. The project team is also developing

novel nano-sized building blocks and hybrid materials, opening up new avenues for the deposition of scratch-resistant ceramic coatings on plastics.

Collaboration continued with the Centre National de la Recherche Scientifique (CNRS-France) to develop new methods of investigating the mechanical properties of thin films, a critical issue for the industrial applications of these coatings. The project team is collaborating with the Commissariat a l'Energie Atomique (CEA-France) to develop expertise in further probing the nano-structure of organic/inorganic hybrid films.

INDUSTRY APPLICATIONS OF NUCLEAR TECHNOLOGY

Neutrons for engineering

Neutron diffraction is an ideal way to measure residual stress in engineering components because of the ability of neutrons to penetrate deeply into most engineering materials and give a 3D picture of the stresses without damaging the component being studied.

The benefits of these measurements have been recognised internationally by industry and there is strong demand for them, to the extent that there are currently at least four new purpose-built instruments under construction around the world and two others recently competed.

ANSTO's Replacement Research Reactor will have a state-of the-art instrument that uses neutrons to measure residual stress, a common cause of premature failure of engineering components. Residual stress is most often introduced by the manufacturing process, for example through cooling after welding, casting, forging or heat treatment, or from bending or other cold work.

A series of five workshops run by ANSTO with the support of the Welding Technology Institute of Australia showed that there is a strong demand from Australian industry for residual stress measurements. In order to initiate work in this area, staff will use a modified instrument on the HIFAR reactor and overseas neutron and x-ray facilities.

Radiation technology used across industry

Australian horticultural, agricultural and manufacturing industries and the medical community continued to benefit from ANSTO's unique capability within Australia to irradiate material to precise doses at a range of temperatures and dose rates. ANSTO's gamma irradiation facilities were used to process such materials as medical devices, human tissue grafts, microbiological test kits, tropical fruit, polymers and Queensland fruit fly pupae. Fruit fly is a serious problem in the fruit-growing industry. Fruit fly pupae are irradiated to sterilise them so they cannot fertilise females, and are then released. Up to 15 million were irradiated each week, totalling some 410 million for the year. Commercial radiation processing in Australia and the Asia-Pacific region was supported through ANSTO's provision of a traceable high-dose dosimeter supply, measurement and calibration service for users and suppliers of commercial radiation services. Services were provided to clients in Australia, Sri Lanka, Malaysia, Hong Kong and New Zealand.

Optimising medical drug effectiveness through nanoparticles

ANSTO is studying the use of solgel technology for the encapsulation and controlled release of a wide range of biologically active substances in nanoparticle matrices. These substances range from small drug molecules to proteins, enzymes and even whole cells. The properties of the nanostructured matrices can be precisely tailored to provide release rates that can be controlled from milligrams per hour to complete retention of the encapsulated species. Effort at present is directed towards developing the technology for delivery of oncology drugs.

Research focussed on optimising the quantities of selected drugs encapsulated within the solgel matrices and on assessing the suitability of the technology as a targeted delivery system for the

treatment of tumours (thus avoiding the accumulation of toxic drugs at the wrong site within the body). In vivo biodistribution studies were begun. These will be followed by preclinical trials of the technology with suitable tumour models, leading ultimately to full clinical trials with appropriate commercial partners.

Collaboration continued with Chimie de la Matière Condensée, Université Pierre et Marie Curie/CNRS, France, on the use of advanced spectroscopic techniques for investigating interactions between encapsulated molecules and solgel matrix. This collaboration, together with work currently underway within ANSTO, will lead to better insights into the complex physical processes controlling the release of biologically active molecules from inorganic matrices.

Maintaining standards for medical radioisotopes

ANSTO maintains Australia's national primary and secondary standards for radioactivity. Primary standards of radioactivity are used to provide an absolute standard against which secondary standards can be generated. Secondary standards are used to validate the measurement of radioactivity for medical radioisotopes. ANSTO also operates the Secondary Standards of Dosimetry Laboratory, which is used to calibrate equipment used in radiation therapy and oncology.

As well as providing quality control and traceability for the Australian nuclear medicine community, ANSTO's standards group calibrated the National Medical Cyclotron and provided gold-based neutron activation standards for HIFAR.

Accurate measurement of radioactivity for industry

Digital Coincidence Counting (DCC) is a means of determining the activity of radioactive samples. Developed by ANSTO in collaboration with the National Physical Laboratory in the United Kingdom, DCC provides faster and more reliable results than can be achieved with the older analogue technologies.

Following installation of a DCC system at the Bureau International des Poids et Mesures (BIPM) in Paris, and further software refinement, a plan was developed to market the system to selected radioactivity standards laboratories worldwide. In addition, a series of meetings, seminars and DCC equipment demonstrations were hosted in South Africa, Malaysia, Singapore, and China and the system was featured at ANSTO's stand at the Hannover Trade Fair in April.

Radiation protection and instrument calibration

ANSTO's radiation protection instrument calibration facility provided a commercial calibration service for external organisations in sectors such as mining, engineering, emergency services, hospitals and research organisations. Some 140 instruments were calibrated for these organisations. These included a range of gamma dose rate meters, neutron dose rate meters, personal electronic dosimeters and contamination monitors. In addition, 'wipe tests' from 55 industrial gauges were counted for external organisations.

Radiation protection advice and training

ANSTO provided 16 commercial radiation protection training courses for external organisations in sectors such as local government, mining, engineering, healthcare, education and research and development.

The courses ranged from general radiation protection training, often as part of a regulatory accreditation process for Radiation Safety Officers, to specialist training for users of specific equipment such as moisture gauges and density gauges. A total of 164 personnel from 33 organisations were trained either at ANSTO or in the workplace. The table on page 58 summarises the types of training courses provided, the number held in the year and the number of commercial clients. ANSTO personnel as well as the commercial clients attended many of the courses held at ANSTO.

Technical advice on radiation protection

Radiation protection consultancies were provided to external organisations on topics such as safe transport and storage of radioactive materials, waste management, and the provision of radiation protection advice. For example, radiation protection consultancy services were contracted by Thiess Pty Ltd to work on the radioactive remediation of a site at Prospect, New South Wales. This involved a feasibility study to consider remediation options and the collection and analysis of samples.

Work continued on the Healthy Cities Illawarra Project concerning the emission of naturally occurring radionuclides from the BHP sinter plant. Services provided include a survey of the sinter plant and a community-based survey. The community-based survey involved air sampling and collection and analysis of soil, rainwater and vegetation samples.

DEVELOPING AND SUPPLYING RADIOPHARMACEUTICALS AND RADIOISOTOPES

ANSTO Radiopharmaceuticals and Industrials (ARI), an ANSTO business unit, previously named Australian Radioisotopes, supplies radiopharmaceuticals to radiopharmacies and nuclear medicine centres throughout Australia, New Zealand and Asia. It also supplies industrial radioisotopes to customers in Australia, New Zealand and United Kingdom. The radionuclides used in these medical and industrial products are produced in the complementary facilities of the HIFAR research reactor and the National Medical Cyclotron (NMC).

The new name of ANSTO's radioisotope production business unit, ANSTO Radiopharmaceuticals and Industrials (ARI), previously Australian

SUMMARY OF COMMERCIAL RADIATION PROTECTION TRAINING

Type of Course	Number	Participants
General Radiation Safety Officer	3	47
Advanced Radiation Safety Officer	1	15
Industrial Radiation Safety Officer	1	7
Safe Use of Nuclear-type Soil Moisture and Density Gauges	3	28
Safe Use of Industrial Radiation Gauges	2	17
Radiation Safety for X-ray Analysis Operators	2	11
Radiation Safety with X-ray Equipment	1	7
Radiation Safety for X-ray Imaging Operators in Industry	1	4
Radiation Safety for Laboratory Workers	1	12
Radiation Safety for Firefighters and Emergency Personnel	1	14

Radioisotopes (also ARI), and new logo were developed and launched to more closely reflect ARI's position as a business unit of ANSTO. ARI supplied a wide range of radioisotope products and services to nuclear medicine and industry throughout Australia, New Zealand and Asia.

Radiopharmaceuticals are produced by both reactors and cyclotrons, but each produces a different type of material. Reactors are used to produce neutron-rich materials such as technetium-99m, while cyclotrons are used to make neutron-deficient materials such as gallium and thallium. Neither type of material can be made efficiently in the other facility.

The National Medical Cyclotron (NMC) provides isotopes for routine nuclear medicine procedures and basic and clinical research. It is owned and operated by ANSTO and located in Camperdown, Sydney. The main isotopes produced are fluorine-18 fluorodeoxyglucose (FDG), gallium-67, thallium-201, and iodine-123. The NMC can also produce research isotopes such as copper-64 and fluorine-18.

A change in the cyclotron production schedule resulted in increased output and better alignment of production with customer requirements. Modifications were also made to the FDG production process, resulting in further production improvements. Across the ARI product range, production increased by an average of more than 30 per cent.

ANSTO Radiopharmaceuticals and Industrials puts considerable time and energy into meeting customer demands and ensuring quality of supply. During the year ARI's quality accreditation was upgraded to AS/NZS ISO 9001/2000. The auditor particularly complimented the customer feedback and management processes.

Recognition for Gentech®

ANSTO's Gentech®, a portable technetium generator supplied to nuclear imaging practices, was included in the Australian Technology Showcase, a forum that highlights technology innovation with export potential. ANSTO also entered Gentech® in the Ericsson Innovation Awards and was selected as a finalist. In response to customers' requests, the products gallium-67 citrate, the Gentech® generator and iodine-131 capsules were marketed in more convenient sizes. Additionally a number of products were registered in Asian countries.

Industry collaboration to boost public awareness

The Public Image Alliance (PIA), of which ANSTO is a member, is a new public awareness group made up of companies and professional as well as educational organisations from the nuclear medicine industry. The PIA has been formed to help ensure optimal patient care through education and awareness about the value of nuclear medicine in diagnosis and treatment. The initial focus is on investigating ways of working together more collaboratively to raise the profile of nuclear medicine in the community.

BUSINESS DEVELOPMENT AND COLLABORATION

Retaining the competitive edge in radiopharmaceutical R&D

Molybdenum-99 is the parent radionuclide of technetium-99m, the workhorse of nuclear medicine. A major strategic project is being carried out in collaboration with the Argonne National Laboratory in the United States to develop a new process for molybdenum-99 production that takes advantage of the greater production capacity of the Replacement Research Reactor. New foil targets developed for the project were successfully processed and tested.

In April, 11 French scientists and commercial representatives met in Sydney with 65 colleagues from all over Australia for the highly successful France-Australia Symposium on Nuclear Medicine Methodology, Clinical Applications and Pharmacology. The symposium, sponsored by

ANSTO, the Embassy of France and the Department of Education, Science and Training, led to Embassy-sponsored visits to Australia shortly afterwards by representatives of five French companies who established links with Australian companies and researchers. Plans were made to hold a follow-up symposium in France in 2003.

Business principles and best practice

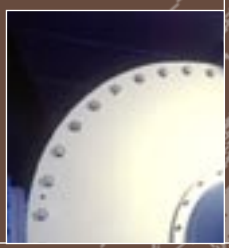
ANSTO solely or jointly held 153 patents and other legally protected intellectual property (including registered designs, trademarks and business names) at the close of the financial year. These stem from 32 separate inventions that are being commercialised through collaborative projects, licence agreements or development as spin-off businesses.

During the year, considerable attention was placed on developing intellectual property principles and guidelines in order for ANSTO to retain rightful ownership of scientific innovation and outputs across the organisation. Workshops were held to raise project leaders' awareness of patent and intellectual property issues, as well as the value of research and services to the customer. ANSTO participated in several intellectual property surveys conducted by Australian and overseas service providers.

In addition, a new trade mark and business name procedure was issued and the ANSTO pricing procedures and costing procedures were both updated.

Commercial return from leased ANSTO property

ANSTO has a number of high technology tenants on site at the ANSTO Technology Park. A list of tenants and their activities is provided in Appendix 5.



Core Business Areas

Core Business Area

Organisational support activities (where the benefits may assist a number of core business areas) have been set up to provide best practice corporate and engineering support, information management and human resource management within the organisation.

OBJECTIVE

To have best practice business processes, safety systems, information services and human resource management.

OUTCOMES

- Enhanced value of the outputs ANSTO provides to its stakeholders will result from the complete adoption of Quality Systems for ANSTO's organisational processes and operations. Total accreditation will be completed in 2003, complementing the quality certification already attained by most parts of ANSTO.
- In its pursuit of value outcomes, ANSTO introduced an asset look-up facility to provide information on all instruments and equipment on site and will use its new Business Information System to manage the maintenance and tracking of all fixed assets.
- Additional funding was allocated to maintain ANSTO's fixed asset infrastructure and equipment at standards of best practice.

ACTIVITIES AND OUTPUTS

OUR PEOPLE

ANSTO is essentially a knowledge-worker organisation; its employees are its principal resource. Its people are selected for the specialised skills and knowledge that they bring to the organisation and for their ability to maintain and enhance its value and reputation. It is appropriate therefore, especially in our rapidly changing technological environment, that organisational activities are directed towards the development of our people and dealing with knowledge-worker issues.

DRIVER: Government

Management and development of our people

The focus on implementing ANSTO's Human Resource Strategy and integrating people management practices continued. Development work on the Competency Framework, a flagship project, was largely completed. This included documenting most of the competencies required to fulfil the knowledge, skill and experience needs of ANSTO.

Role profiles, used for all recruitment activity for the past 2 years, were developed for each existing employee or group of employees to document expectations and indicate the level and mix of competency standards required for each role. A new single 10-band salary structure was developed for implementation in July 2002 under the new Enterprise Agreement. The new structure contains agreed role characteristics and provides clear criteria and standards for each band. It is designed to encourage delivery of value to ANSTO as well as continuous development and achievement as the basis for progression. All role profiles were evaluated against the new band structure and these will be reviewed in the first three months of the new financial year.

Major enhancements were introduced in the objective setting and review cycle, which emphasise the value that should be contributed to ANSTO's stakeholders. Staff from each division were selected as Workplace Advisers and given extensive training to enable them to help others to use the new system. Training sessions introduced all staff to this approach.

The Learning Environments for New Strategies (LENS) Program, introduced 2 years ago, continued as a crucial program in developing tools and techniques for effective project teams and for ongoing staff development throughout the organisation

Output

This core business area supports the five other areas. Activities are driven by the internal needs of ANSTO and by government policy.

ANSTO TRAINING DURING 2001–02

	Number of courses	Attendance
LENS program	42	770
Quality assurance courses	14	79
Health and safety courses	324	1843
Science and engineering courses and seminars (including HIFAR-specific training)	133	241
All other management and competency-based courses	163	1218

A Frontline Management Program was introduced with two groups of participants, drawn from new project leaders and supervisors, working towards a competency-based certificate. A working party analysed the nuclear knowledge development needs and made recommendations that will guide the approach to staff development in this important area over the next few years.

Work experience for young Australians

The Vacation Employment Program, valued at $120 000, provided employment for 20 university students over the 2001-2002 summer break. The Year-in-Industry Scholarship Program, which is run by calendar year, has provided learning opportunities for 20 students since January 2002. The Year-in-Industry Scholarship Program is providing scholarships worth $525 000 in the 2002 calendar year.

In addition, 22 secondary school students were provided with work experience at ANSTO during the year.

NEW BUSINESS INFORMATION SYSTEM

Phase 1 of the Business Information System (BIS) introduced last year has enabled first class information systems and new standards of financial management to be provided. The supply and installation of the system will take 3 years in total and is being carried out by SAP Australia Ltd in conjunction with KPMG Consulting. The software is known as SAP R/3.

The first phase consisted largely of installing the project, general ledger, payroll and materials modules. The second phase, comprising manufacturing, sales and distribution and asset management, is expected to be completed during the next financial year. Subsequent phases will include human resources and occupational health and safety.

In terms of ANSTO's financial arrangements, the conversion to the new system involved many additional hours of effort but the finance team was rewarded with a smooth transition and a financial system that is arguably the world's best. Reports are being developed that will reduce the manual costs and increase the standard of performance reporting.

Faster and more efficient financial management for ANSTO will also be possible as a result of initiatives taken with regard to budgetary systems and professional accountancy processes. These improvements will flow on to the financial services provided by ANSTO to the Australian Institute of Nuclear Science and Engineering (AINSE) and the Australian Synchrotron Research Program.

PROCUREMENT PROJECT

ANSTO began a review of its supply arrangements with the aim of achieving maximum efficiency and cost-effectiveness. Strategic suppliers – those where security, safety or fail-safe issues are important – were identified so supply relationships could be restructured. This project will be the forerunner to full business-to-business electronic transactions.

Core Business Area

REVENUE

ANSTO is funded both by income earned from external sources and by Government appropriation. In 2002, ANSTO generated income of $33m from external services in research and related operational services and $2m from miscellaneous sources. Together with Government appropriation of $ 94.7m*, total revenue for 2002 was $129.6m*. Included in that figure are special supplemental appropriations amounting to $11.6m resulting from the Pricing Review of ANSTO's outputs, undertaken with the Department of Finance and Administration in 2000. ANSTO is a signatory to the Triennium Funding Agreement between Government and the science agencies: ANSTO, the Commonwealth Science and Research Organisation (CSIRO) and the Australian Institute of Marine Science. The agreement sets a ratio of external earnings to total revenue as one of the performance indicators. After elimination of special supplemental items, the ratio in 2002 was 28.9% (2001: 29.6%).

EXPENDITURE

ANSTO's research operations are managed within projects. Planned expenditure is closely monitored through a number of reporting processes and by the appropriate core business area committee. The financial accounts indicate that the level of expenditure was 1.9% above that of last year. After allowing for the cost of spent fuel shipments in 2001 and the additional supplemented expenditure on depreciation on revalued assets and reassessed maintenance programs in 2002, the expenditure performance in both years is comparable.

BUDGET 2003

ANSTO is a Commonwealth authority and complies with the budget provisions of the *Commonwealth Authorities and Companies (CAC) Act 1997*. Its scientific and technology research and other operations are funded through government appropriation in accord with the terms of the Triennium Funding Agreement referred to above.

In 1997 Government decided to replace the HIFAR research reactor. The capital cost of this major project is funded by way of equity injection until completion in 2006.

Government also provides appropriation funds to meet the costs of the overseas disposition of spent fuel from the HIFAR reactor.

Total parliamentary appropriation, excluding capital use charges, for 2002 was:

- departmental appropriations $152.4m
- equity injections $97.7m.

The amounts comprised:

- equity injection of $92.7m for the Replacement Research Reactor project
- appropriation of $0.8m to fund the overseas disposition of HIFAR spent fuel
- equity injection of $5m and appropriation of $93.9m for funding of science and technology research activities and services
- capital use charge by government $57.7.

ENGINEERING SERVICES

Engineering staff continued to provide a total engineering service to ANSTO's projects and infrastructure. This included ensuring that buildings and facilities were kept in good condition. To this end, a new 3-year program of review, maintenance, refurbishment and upgrade was begun. Other major projects included the manufacture and installation of new silicon processing facilities for HIFAR and a major building ventilation refurbishment for ANSTO Radiopharmaceuticals and Industrials.

RISK MANAGEMENT

Risk management is a cross-organisational function involving all ANSTO staff. The risk management structure is embedded in ANSTO's day-to-day operational processes, ranging from good occupational health and safety practices to financial checking processes. An independent internal auditor reviews these processes, maintaining close communication with senior management, and reports formally each quarter to

** excluding capital use charge by government.*

Training sessions were held to familiarise staff with the new Business Information System, which is being introduced over 3 years. The system allows faster and more comprehensive financial and information management.

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

QUALITY MANAGEMENT SYSTEM

A quality management project team was established to oversee and maintain continuous improvement with a strong customer focus, and to ensure this is externally validated through organisation-wide accreditation to the International Standards Organisation 9001-2000 standard in 2003. Under Phase II of the project, business process reviews will continue to improve the efficiency of ANSTO's business management system by ensuring that processes are integrated.

INFORMATION MANAGEMENT AND INFORMATION TECHNOLOGY

Data network and telephony enhancements

A contract was let to update ANSTO's PABX telephony network. The ANSTO data network was enhanced by the addition of further gigabit ethernet links, and planning was begun to reorganise the network to accommodate the replacement reactor, additional security requirements, and requirements to make the data generated by beamline instruments available remotely to scientists.

Computer services

Three hundred new personal computers were installed and a similar number had memory upgrades, achieving substantial standardisation of the ANSTO personal computer inventory and enabling a smooth rollout of SAP to the desktop. Dual processor computers running the *linux* operating system were deployed to support scientific computing. A transition from a user-

centric data storage to a project-centric structure that will facilitate better data management and archiving was substantially completed. Ongoing SAP support is being handled by a combination of in-house resources and external consultants.

Information technology service agreements

The upgrade and standardisation work reported above was a necessary precursor to the development of meaningful services agreements. Computing helpdesk software was upgraded to enhance the efficiency of the service. Work continued on defining supported products and appropriate service levels in preparation for market testing of desktop support and servers. Many desktop personal computers are running both standard corporate software and specialised scientific software.

Library services

ANSTO library continued to participate in the development of the International Nuclear Information System (INIS) database of the IAEA. The INIS group in Vienna scanned past ANSTO scientific reports as a trial of new technology and the resulting electronic files were made available for ANSTO to publish on its web page. ANSTO's library participated with CSIRO in further agreements covering electronic delivery of scientific literature, providing ANSTO scientists with access to a wider range of information.

Safety and Environmental Protection

Safety and Environmental Protection

ANSTO is committed to ensuring a safe and healthy environment at its facilities for employees, visitors and contractors and to ensuring its activities do not adversely impact on the external community or environment.

OBJECTIVES

1) Ensure protection of human health and safety and the environment as the organisation's highest priority.

2) Promote a positive safety culture and environmental awareness.

3) Provide and maintain safety systems and assessment procedures that are in accordance with national and international standards.

4) Strive for continual improvement in safe work practices and prevention of pollution to ensure that risk to staff and the public associated with ANSTO's operations is kept as low as is reasonably achievable.

OUTCOMES

- All 15 special licence conditions issued as a condition of licensing by ARPANSA for ANSTO's Safety Division were satisfactorily resolved during the year.
- Control of radiation exposure for employees again ensured that the highest dose to any employee, at only 8.7 mSv*, was less than half the occupational dose limit.
- Annual radiation doses to the public from ANSTO discharges remained less than 0.01 mSv*, which is only 1% of the annual limit of radiation recommended by the National Health & Medical Research Council for any person to receive over and above 'background radiation' (radiation from the environment to which all people are exposed) and radiation from medical doses.
- All discharges for radioactive and non-radioactive substances were below the regulatory compliance levels. The results for all liquid waste discharges to trade waste again demonstrated the effectiveness of ANSTO's liquid waste treatment facilities.
- ANSTO Safety gained AS/NZS ISO 9001:2000 certification for all parts of its Quality Management System.

** An explanation of mSv appears on page 69 in the section on Radiation Protection.*

ACTIVITIES AND OUTPUTS

ARPANSA LICENSING AND REGULATION

Applications are being assessed or licences have been issued by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) for all ANSTO's nuclear installations, prescribed radiation facilities and sources needing such licences under the ARPANS Act 1998 and Regulations 1999.

The process of issuing licences has taken longer than expected because of the extent of expert and public review of submissions. ANSTO continues to comply with the conditions issued by ARPANSA on these licences and quarterly reports were provided, as required, to ARPANSA. A separate quarterly report is produced on the site licence conditions for the Replacement Research Reactor. Information on these conditions can be found on the ARPANSA website.

SAFETY MANAGEMENT

The ANSTO Safety Management System has, as its top level document, the ANSTO Health, Safety and Environment Policy. A revised version of this, setting out safety and environmental principles, values and commitments was issued during the year. A new Safety Strategy was also issued. This states ANSTO's safety goals of:

- continual improvement of the efficiency and effectiveness of safety systems
- regular promotion of safety initiatives and safety awareness programs
- continual improvement in radiation protection
- ensuring that staff are appropriately trained for all potentially hazardous activities
- production of quality documentation of safety processes and procedures and communication of these to staff.

The strategies for achieving these goals have been developed and are being implemented through project activities.

The ANSTO Health, Safety and Environment Committee (AHSEC) advises the Executive Director on the workings of the ANSTO safety management system and the licensing process. It also reviews any incidents with licensed sources and facilities and subsequent follow-up actions. AHSEC is chaired by an external member from 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.

AHSEC met four times during the year. The Committee reviewed regular reports from the managers of HIFAR, the Facilities Safety Unit, the Environmental Monitoring Committee, the Environmental Management Action Project, the Licensing and Regulation project and the leader of Waste Operations and Technology Development. It also reviewed the minutes of the Safety Assessment Committee, the quarterly airborne emissions reports, the quarterly and annual reports from ARPANSA, the summaries of meetings of the ARPANSA Radiation Health and Safety Advisory Council and Committees and the minutes of the meetings of the Local Liaison Working Party (LLWP, see p73).

The Safety Assessment Committee provides internal review of all potentially hazardous activities involving ANSTO staff. One hundred and seventy submissions were assessed and approved during the year.

The Facilities Safety Unit (FSU), which comprises technical experts in risk and reliability engineering, continued to support the operation of AHSEC and the Safety Assessment Committee.

RADIATION PROTECTION

Radiation protection services are provided by the operational health physics and the radiation monitoring groups to all ANSTO sites.
The operational health physics group provides monitoring of radiological conditions, advice and assistance in developing procedures for work in controlled areas. Routine health physics monitoring of work areas ensures that radiological hazards are controlled and a high standard of safe work conditions is maintained. The radiation monitoring group provides radiation protection instrument calibration services, facilitates the measuring of airborne discharges, and monitors any doses that may be received by workers to their bodies, externally and internally, as part of the assurance of safety at work for all staff. ANSTO also provides calibration services commercially to other organisations.

ANSTO's Personal Dosimetry Service monitored 828 workers during the year. Seventy-nine per cent of these workers received less than 1 mSv and no worker received more than 9 mSv. The highest effective dose, 8.7 mSv, which was received by a radioisotopes production worker in ANSTO Radiopharmaceuticals, was well below the relevant regulatory annual dose limit of 20 mSv (averaged over 5 years) for radiation workers. Nineteen of the 25 workers with doses between 5 and 10 mSv had been involved with radiopharmaceutical production on the Lucas Heights site or at the National Medical Cyclotron. Table 1 shows the maximum, average and collective effective doses for the past 4 financial years A comparison of the maximum and average effective doses for the past 4 years is shown in Figure 1.

The unit of measurement of radiation dose is joules per kilogram, termed the sievert (Sv). Measures are usually expressed in thousandths of one sievert, the millisievert (mSv). They are used to assess the effects of ionizing radiation on living cells; they take into account the greater or lesser effects on different body organs. Everyone in the world receives ionizing radiation from natural sources. In Australia the average dose received from natural background radiation (from environmental sources) is 2mSv per year.

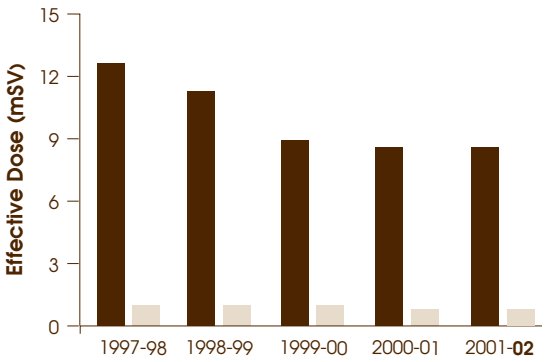
Safety and Environmental Protection

TABLE 1: EFFECTIVE DOSE					
		1998–99	1999–00	2000–01	2001–02
Maximum effective dose	mSv	11.3	8.9	8.6	8.7
Average effective dose	mSv	1.0	0.8	0.8	0.9
Collective effective dose	Person mSv	772	617	630	749

TABLE 2: DISTRIBUTION OF INDIVIDUAL EFFECTIVE DOSE					
Individual effective dose ranges (mSV)	1997–98	1998–99	1999–00	2000–01	2001–02
≤2	670	665	669	700	726
>2 to 5	80	81	67	65	77
>5 to 10	29	25	26	23	25
>10 to 15	3	1	0	0	0
>15 to 20	0	0	0	0	0
>20	0	0	0	0	0

Table 1 shows the maximum, average and collective effective doses for the past four financial years, while Table 2 shows the distribution of the individual doses.

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



In measuring shallow doses (skin doses) of all monitored workers, the highest for the year to any individual was 34 mSv, a small fraction of the national and international annual dose limit of 500 mSv.

Doses to workers' extremities such as hands and fingers are also monitored for those who handle radioisotopes and are likely to receive a dose to their extremities significantly different from the dose to their body. The highest extremity dose to any individual for the year was 247 mSv, which is less than half the annual dose limit of 500 mSv.

In routinely monitoring internal exposures of staff working with unsealed sources, methods include bioassay and whole body and thyroid counting. Any significant doses are added to those from external radiation and are included in the effective doses reported above.

Safety and environmental protection arrangements at ANSTO facilities

OCCUPATIONAL HEALTH AND SAFETY

Accidents and incidents

The mechanism used to capture details of actual and potential accidents and incidents, including near misses and issues that could be related to the natural and man-made environments surrounding the Lucas Heights site, is the ANSTO Event Response System.

All reportable incidents are categorised using Comcare classifications. Comcare has an additional reporting requirement relating to Legionnaires Disease. When the heterotrophic bacteria (which feed on other dead or living organisms) count exceeds 100 000 cfu/ml there is a requirement to notify Comcare

Nine notifications to Comcare of reportable incidents were made during the year, three of which were related to heterotrophic bacteria counts in cooling water systems. Action was taken to reduce the bacteria levels. Legionnella sp. was not identified.

Two "serious personal injury" reports were made. These were:

- a burn to a foot that occurred when molten aluminium filler wire dropped into a worker's boot. Use of workshop personal protective equipment was reviewed in order to prevent a recurrence
- a deep laceration to an electrician's hand while he was working with cabling in a substation. A change to a work practice has been made to prevent a recurrence.

One "incapacity" was reported as a result of a person losing more than 30 consecutive working days. This is currently being assessed by Comcare.

The remaining three reports were "dangerous occurrence" reports and were unrelated:

- A staff member driving a fork lift truck hit a fence while distracted by using a mobile phone. The person was counselled about the inappropriate use of mobile phones.
- A walker within the site boundary reported a bullet passing near him, apparently fired from an off-site firing range. A complete safety and liability review of the nearby pistol range has resulted in limitations on the use of the range.
- A heavy door that came off its lower runner was recognised as a potential hazard for staff. A redesign is being considered.

Safety Training

Implementation of a contractor safety system requiring all contractors on site to undergo induction and an increase in major projects at LHSTC in the past 12 months resulted in an increased need for induction training of contractors. Several new courses were introduced and a total of 916 contractors were inducted in some 300 sessions.

Safety training on site continued at a high level and some 1878 people participated in 314 courses, covering 37 different safety topics

ENVIRONMENTAL PROTECTION ARRANGEMENTS

Environmental Management Action Project

The Environmental Management Action Project (EMAP) was initiated in 1999 to introduce an environmental management system at ANSTO that is consistent with emerging environmental practices and appropriate for future operations. The plan addresses issues of best practice in management and minimisation of potential environmental impacts. Areas covered include airborne and liquid discharges from the site, transport of materials through the environment, and monitoring of radionuclide concentrations in the environment and of their effects on the public and general environment. ANSTO is required to have certification to the ISO 14001 environmental management system standard prior to commissioning of the Replacement Research Reactor, scheduled for 2005.

Technical improvements such as the introduction of real-time monitoring have resulted in reduced airborne emissions. This program of ongoing improvement ensured that annual doses from ANSTO's emissions continued to be below relevant international guidelines.

Safety and Environmental Protection

Small gaseous emissions

In the course of their normal operations, some facilities produce small gaseous emissions. The effect on the surrounding environment is too small to detect directly, so an atmospheric dispersion model is used to estimate the doses to the surrounding region and the public. Emissions are minimised by treatment and filtration before discharge and all are constantly monitored.

The maximum potential public dose determined by the atmospheric dispersion model, PC-CREAM, was 0.007 mSv for the 2001 calender year. Details of the dose calculation and quarterly dose results are provided in the report, *Environmental and Effluent Monitoring at ANSTO Sites 2001.*

The doses are a fraction of the average dose of 2 mSv per year that Australians receive from natural background radiation (from environmental sources) and less than 1% of the annual limit* recommended by the National Health and Medical Research Council (1% is 0.01 mSv, which corresponds to the dose a passenger would receive on a return commercial airline flight between Sydney and Melbourne).

Liquid effluent discharges within limits

Effluent discharged from ANSTO into the Sydney Water sewer met all limits for radioactive discharges in accordance with the Trade Waste Agreement with Sydney Water. These limits ensure compliance at the Cronulla Sewage Treatment Plant with World Health Organisation (WHO) drinking water standards for radioactivity. For non-radioactive materials, all discharges were in compliance with the Trade Waste Agreement. ARPANSA continued to validate the measurements taken.

Monitoring of ground water movement around the Lucas Heights site revealed mildly acidic groundwater at depths greater than 6 m in the sampling boreholes. This was most likely due to site construction in the 1950s. The only human-made contaminant measured in the ground water was very low levels of tritium.

An analysis was carried out to assess which groups of people might potentially be affected by radiological doses from airborne and liquid effluents released from ANSTO. The analysis considered all potential exposure pathways including ingestion of fish caught near the sewage discharge off Cronulla, ingestion of food fertilised by recycled sewage sludge from the Cronulla sewage treatment plant and exposure to airborne emissions near the Lucas Heights site. All such doses were extremely small.

Regular water sampling is carried out as part of ANSTO's environmental monitoring program.

** The annual radiation limit refers to radiation over and above that received by people from environment and medical doses.*

Safety and environmental protection arrangements at ANSTO facilities

EMERGENCY PREPAREDNESS AND EFFECTIVE RESPONSES

Planning for emergencies at the Lucas Heights Science and Technology Centre is conducted under the provisions of the *NSW State Emergency and Management Act 1989 as amended 2000*. This Act requires that there be a range of plans to allow for emergencies to be controlled at the lowest appropriate level, with assistance to be provided, as and when it is required, from local, district and State services.

A 24-hour emergency response capability is maintained at the Lucas Heights Science and Technology Centre and through arrangements with State emergency agencies to deal with incidents on site and off site.

Membership of the Local Liaison Working Party (LLWP) consists of representatives of ANSTO, NSW emergency services organisations and local government. ARPANSA is an observer. The LLWP met four times during the year with a continuing high level of participation by the emergency service organisations.

The ANSTO LLWP was responsible for preparing a single plan for dealing with emergencies, based on two previous complementary plans. A consultant

In May an exercise confirmed the capability of key internal and external emergency agencies to respond to a hypothetical accident at the HIFAR reactor.

engaged by Sutherland Council from the University of Western Sydney worked with the LLWP.

The plan, entitled Response Plan for Accidents and Incidents at the ANSTO/Lucas Heights Science and Technology Centre covers arrangements to coordinate the response by ANSTO and emergency services organisations to on-site incidents while providing for ANSTO to give advice and technical and practical support to emergency services organisations for incidents with off-site consequences. The details of how the emergency services organisations and ANSTO respond are contained in Standing Operating Procedures, which are owned by, and the responsibility of, individual organisations. These responses are tested through regular exercises.

Accidents, incidents or emergencies with off-site consequences are covered by escalating arrangements consisting of the Sutherland Shire Local Disaster Plan, the Georges River District Disaster Plan and the NSW State Disaster Plan.

In April 2002, an exercise of the evacuation of the HIFAR fenced area was conducted. A major exercise, Possum, combining many components of the emergency arrangements took place in May 2002. This exercised the key internal ANSTO and External Emergency Services Organisations involved in the response to a hypothesised accident at the HIFAR reactor. Around 65 people participated in this large scale exercise, including 24 from external agencies. Lessons were learned and these are informing the continued improvement of emergency procedures.

A program of visits through the year to the LHSTC by all local NSW Fire Brigades, Ambulance and Ambulance Rescue personnel was highly successful and the invitations to the services will continue.

Corporate Governance

Corporate Governance

ANSTO is governed by a Board appointed by Government and consisting of the Executive Director and up to six additional members with broad experience in science, industry, management and strategic issues. The Board ensures the proper and efficient performance of the functions of ANSTO and determines the policy of the organisation.

Economic dependency

ANSTO is economically dependent on the Commonwealth Government, requiring appropriation of money by Parliament to carry out the majority of its activities.

Compliance

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

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

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

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

The functions of the Board

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

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

- ensure the proper and efficient performance of the functions of the organisation, and
- determine the policy of the organisation with respect to any matter having regard to the current policies of the Commonwealth Government.

In particular it has responsibility for:

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

The CAC Act requires the Board to comply with certain accountability and corporate governance principles, including:

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

All CAC Act requirements are currently being met.

The Board has established an Audit Committee. All matters considered by that Committee are submitted to the Board for information and, where appropriate, ratification. Details of the Audit Committee are provided on page 79. The Board is also supported in its role by other committees or mechanisms relating to safety and environmental management and to technical assessment. These are also described in the following pages.

Board membership

During the 2001-2002 financial year the Board comprised six non-executive members, drawn from the broader community, who are not involved in the day-to-day running of the Organisation, and an Executive Director. The Executive Director, who is appointed by the Board, cannot be the Chair. The non-executive members are appointed by the Governor-General for specified periods.

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

Each member brings complementary skills and experience to the Board. Its members during the 2001-2002 financial year had experience in areas that included public service, industry, mining, scientific research, medicine, and the commercialisation of research.

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

Six Board meetings were held during the 2001-2002 financial year. Details of the number of Board meetings attended by each member during the period in which each member held office during the financial year are provided below.

BOARD MEETINGS 2001–2002 FINANCIAL YEAR

Member	Held	Attended
Dr I D Blackburne (Chair)	6	6
M H Codd AC (Term concluded 31 December 2001)	3	3
G Cook	6	5
J M Craker	6	6
M A Eager (Term commenced 1 January 2002)	3	3
Professor H M Garnett (Executive Director)	6	6
Dr C J Hillyard	6	5
Professor F A Khafagi	6	6

Remuneration and allowances

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

Remuneration of Board members is disclosed in the Financial Statements.

Disclosure of interests

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

All these requirements were met during the year.

Independent professional advice

The Board has established procedures by which members, in the interests of their duties, may seek independent professional advice.

Report of operations

Section 9, Schedule 1 of the CAC Act requires that this Annual Report include a report of operations. The Commonwealth Authorities and Companies (Report of Operations) Orders 2002 set out the requirements. The format and content of the 2001-2002 Annual Report, including the financial statements, addresses these requirements in general. In particular the Board reports that:

- ANSTO's mission and strategic plan have not changed from that reported for the previous financial year and continue to be managed through six core business areas
- each core business area is reported against in terms of its outputs, strategies for achieving and contribution to outcomes and future performance
- actual performance is reported against approved performance indicators
- there were no significant events requiring disclosure in terms of Section 15 of the CAC Act
- there have been no significant changes in ANSTO's state of affairs or principal activities during the year
- ANSTO has continued to manage both the risks and opportunities it faces.

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

Safety

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

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) have issued licences for all ANSTO's radioactive sources and nuclear installations. Licences for the remaining controlled facilities are expected to be issued towards the end of 2002. The Board continued to attach priority to both the achievement of safety and formal demonstration to ARPANSA that due diligence is paid to safety and that effective control of hazards is being maintained.

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

The Board receives regular reports on health and safety issues. ANSTO was granted occupational health and safety self audit status for 2 years by Comcare in 1999. This self audit status was renewed by Comcare for a further 2 years to 2003. The audit programme for 2001-2002 was successfully completed. Comcare conducted its own audit of ANSTO's self audit activities with positive results reported to the Executive Director, Board Audit Committee and the Board.

Audit Committee

The Audit Committee, a formal sub-committee of the Board, comprised during the year Mr M H Codd (Chairman to 31 December 2001), Mr M A Eager (Chairman from 1 January 2002), Mr J M Craker and a member external to ANSTO, formerly Mr J Bergman (resigned 13 August 2001), currently Mr W Wilton (appointed 26 November 2001). The ANSTO Chairman attends all meetings by right as a Board member. The Executive Director, the Director, Corporate Services, and the Chief Internal Auditor attend all meetings or relevant parts of all meetings by invitation. Others, including representatives of the Australian National Audit Office (ANAO), attend meetings, as appropriate, at the invitation of the Committee.

This Committee was established by the Board to oversee the organisation's risk management policies, practices and controls in relation to its business, including financial and commercial activities, legislative and regulatory conformance, and asset protection.

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

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

The Committee scrutinises the annual financial statements of ANSTO and considers the appropriateness of accounting practices reflected therein.

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

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

Technical Advisory Committee

The Technical Advisory Committee, which was formally established in accordance with a Board decision, comprises four members, all of whom are external to ANSTO. Members are chosen on the basis of internationally recognised scientific expertise and experience. The current members (as at 30 June 2002) of the committee are Professor Joan Dawes (Australia), Professor Alan Leadbetter (United Kingdom) and Dr Dan Shochat (United States), with the term of Dr John Zillman having been completed on 27 March 2002.

This Committee was established by the Board to advise on:

- whether the projects are nationally or internationally important
- the quality of the science and whether it is appropriately focussed and achievable

AUDIT COMMITTEE MEETINGS 2001–2002 FINANCIAL YEAR

Member	Held	Attended
M H Codd AC (Former Chair) Term concluded 31 December 2001	2	2
M A Eager (Chair) Term commenced 1 January 2002	2	2
J M Craker	4	4
W Wilton (External Member) Term commenced 26 November 2001	3	3
J Bergman (Former External Member) Term concluded 13 August 2001	1	1

- 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 other ways whereby ANSTO research can be fully recognised and the value captured.

The Committee was constituted formally in October 1996 and is required to meet at least once per year. It met from 25 to 27 March 2002 and presented a formal report to the Board.

Risk management

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

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

The Board has endorsed a risk management framework introduced by management in 1997. As part of this framework, ANSTO's Internal Audit function undertakes a systematic program of risk assessments designed to identify, evaluate and prioritise high and significant risks, utilising a methodology consistent with the Australian Risk Management Standard AS/NZS–4360/1999. The Audit Committee and the ANAO receive summaries of all risk assessment reports.

ANSTO has a risk management policy setting out that it is the responsibility of the operational management of ANSTO to develop and implement risk mitigation strategies. The overall risk framework is actively applied in ANSTO's operations and to new initiatives in particular. Project risk management remains a significant area of focus in the Replacement Research Reactor project and the business information system and market testing of information technology projects.

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

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

Ethical standards

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

Fraud control

The Organisation has an established fraud control policy and plan, in line with the *Fraud Control Policy of the Commonwealth* and guidelines set out by the Attorney General's Department, Criminal Justice Division.

External audit

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

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

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

Other than the report on the financial statements for 2000-2001 and 2001-2002, the Auditor General has not issued any reports on the operations of ANSTO specifically.

Internal audit

The ANSTO Internal Audit function has a dual reporting line to the Audit Committee and the Executive Director. Its responsibility is to provide an independent, risk-based review function as set out in a formal charter endorsed and periodically reviewed by the Audit Committee. The Audit

Committee reviews the annual Internal Audit plan and receives regular reports on progress against that plan.

Internal control

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

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

Information technology services market testing

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

A project to undertake this market testing exercise was begun in 2001 and is proceeding against a defined plan in which the market testing of desktops and servers is scheduled for April 2003.

Service Charter

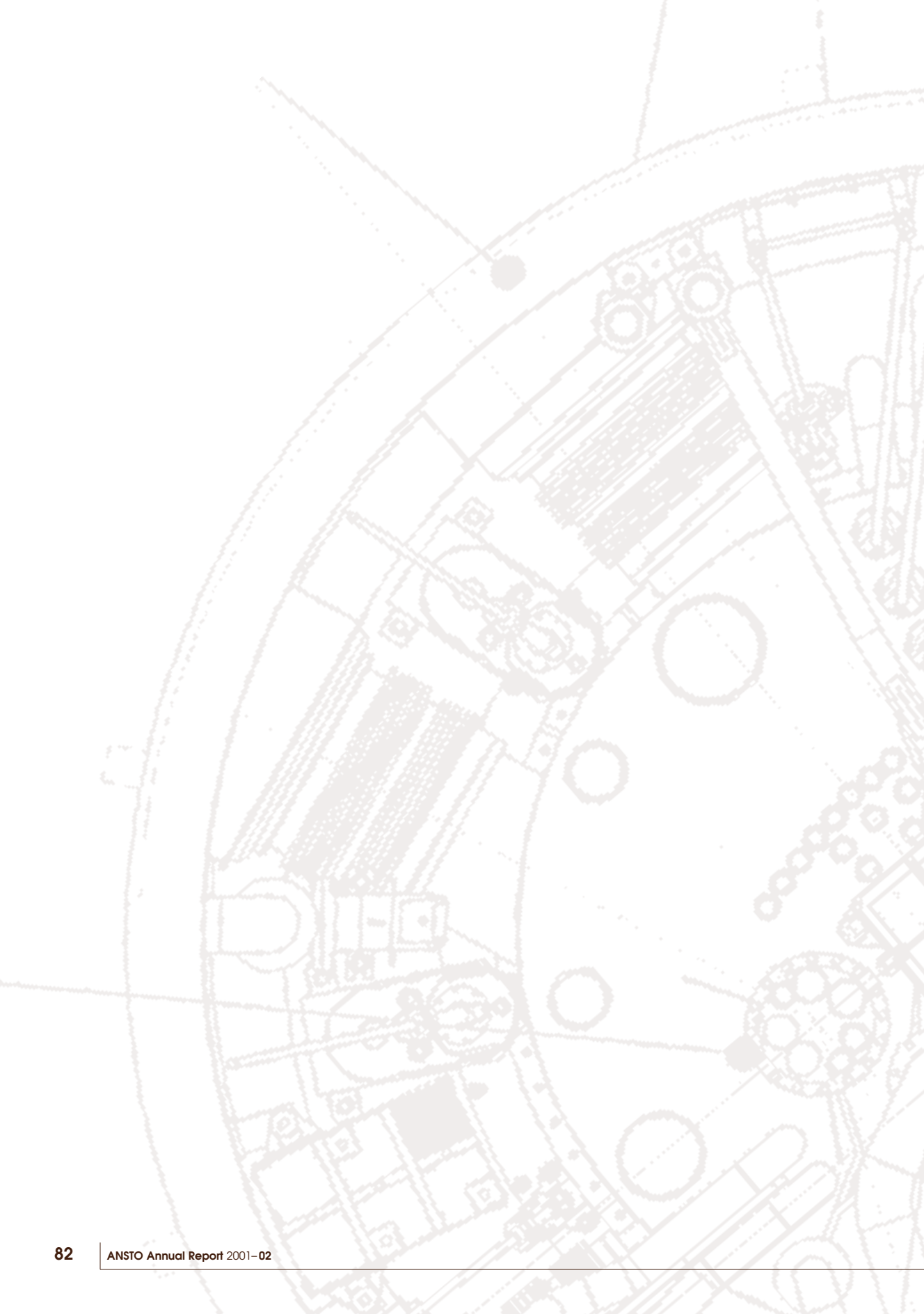
ANSTO's Service Charter sets out a statement of what ANSTO does and the standards of product and service that customers, stakeholders and the community can expect from the organisation. The Service Charter was released in June 1999 and adheres closely to the Customer Service Charter Principles developed by the Department of Finance and Administration. Customer feedback is fundamental to improving customer service and is an integral part of all service charters.

ANSTO's quality principles support and align themselves with the service charter standards and are the mechanism by which our high standards of customer service are maintained and continuously improved upon. To this end the Charter is to be reviewed on a regular basis to ensure that any changes or improvements to the ANSTO quality system in relation to customer feedback are incorporated in the charter document.

During the year, ANSTO recorded 278 complaints, pertaining mainly to the supply of radiopharmaceuticals. Most of the non-technical complaints were resolved within 48 hours. ANSTO also received a number of positive calls and letters from both customers and the community.

External scrutiny

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



Associated Organisations

Associated Organisations

Australian Institute of Nuclear Science and Engineering Incorporated (AINSE)

The Australian Institute of Nuclear Science and Engineering Incorporated (AINSE) is a consortium of 36 Australian universities and the University of Auckland in partnership with ANSTO. It is a non-profit-making institute incorporated under the *NSW Associations Incorporation Act 1984*, established by the Commonwealth Government in 1958 and located with ANSTO at the Lucas Heights Science and Technology Centre.

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

AINSE's Governing Council consists of a representative of each member university, the Executive Director of ANSTO and five Directors from ANSTO's scientific and technical staff. AINSE itself has four full-time staff.

The objectives of AINSE are to:

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

AINSE reports by calendar year. Between 1 January and 31 December 2001 income of $2 587 622 was made up of $1 253 206 from ANSTO, $792 650 from university subscriptions, $250 292 from external grants, $276 748 from interest on investments and $14 726 from other sources, mainly conference registrations.

Core activities

Funds received by AINSE are used primarily to provide access to the nuclear and other facilities at ANSTO and other AINSE-supported facilities. During 2001, AINSE supported 203 university projects and awarded 34 postgraduate research student supplements at a total cost of $1 805 375. Some 20% of these researchers had not previously had access to ANSTO's facilities, and for 12 of the postgraduates, their award was the first they had received from AINSE.

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

AINSE organised one workshop and supported one national conference and one international conference during the year. It also supported six workshops on six different areas of neutron scattering. Two more are planned for 2002. The purpose of these workshops was to ascertain the future requirements of university researchers and to disseminate information about the capability of neutron research in a diverse range of scientific and technological applications. There were 393 participants at conferences and 222 at workshops.

The 5th AINSE Winter School was held in July. A scholarship was offered to every member university to enable a nominated third-year student to participate, and 37 attended. Feedback judged this program to be an outstanding success and it will be held again in 2002. It significantly contributes to the public profile of AINSE and ANSTO and is especially effective as an opportunity for potential users to see ANSTO's facilities in operation.

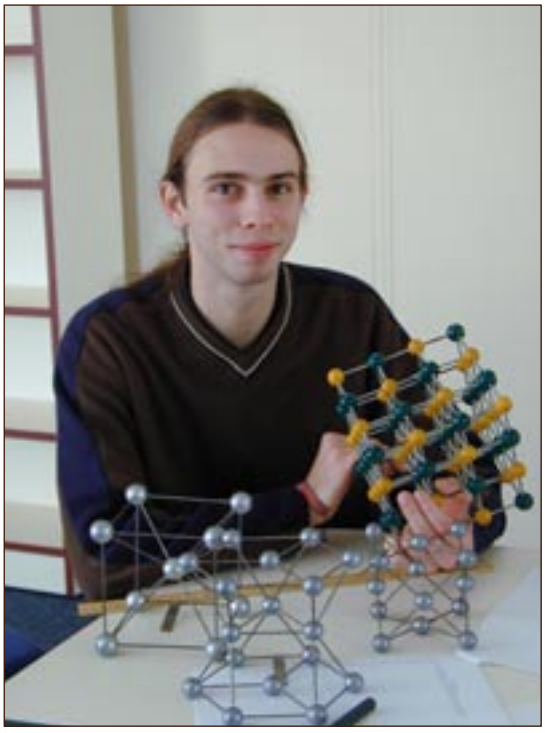
Australian Institute of Nuclear Science and Engineering Incorporated (AINSE)

Additional projects

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

A new accelerator, being purchased with funding from an Australian Research Council Linkage-Infrastructure Grant, 27 universities, ANSTO and AINSE, is due for delivery in August 2002.

AINSE also funded an elemental analyser/isotope ratio mass spectrometer, worth about $264 000, to be delivered in November 2002, in order to reduce the turnaround time for accelerator mass spectrometry analyses.



Joshua Combes (left) and Melissa Sutcliffe (above) were among 37 third-year university students who attended the 5th AINSE Winter School, held in July 2001.

Associated Organisations

Member organisations of AINSE

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

Further information on AINSE can be found at its website: http://www.ainse.edu.au.

Financial Statements

Australian Nuclear Science and Technology Organisation

STATEMENT BY DIRECTORS

In our opinion, the attached financial statements for the year ended 30 June 2002 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*.

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

Ian D Blackburne
Chairman

23 August 2002
Sydney

Professor Helen Garnett
Chief Executive and Executive Director

23 August 2002
Sydney

Australian National
Audit Office

INDEPENDENT AUDIT REPORT

To the Minister for Science

Scope

I have audited the financial statements of the Australian Nuclear Science and Technology Organisation for the year ended 30 June 2002. The financial statements include the consolidated financial statements of the consolidated entity comprising the Australian Nuclear Science and Technology Organisation and the entities it controlled at the year's end or from time to time during the financial year. 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.

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

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

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

GPO Box 707 CANBERRA ACT 2601
Centenary House 19 National Circuit
BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

Audit Opinion

In my opinion the financial statements:

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

(ii) give a true and fair view, in accordance with applicable Accounting Standards and other mandatory professional reporting requirements in Australia and the Finance Minister's Orders, of the financial position of the Australian Nuclear Science and Technology Organisation and the consolidated entity as at 30 June 2002, and their financial performance and cash flows for the year then ended.

Australian National Audit Office

David Crossley
Executive Director

Delegate of the Auditor-General

Canberra
26 August 2002

Statement of Financial Performance

		Consolidated		Parent	
	Note	**2002**	2001	**2002**	2001
		$'000	$'000	**$'000**	$'000
Revenues from ordinary activities					
Revenues from government	2(p), 4A	152,364	125,946	152,364	125,946
Sales of goods and services	4B	32,251	31,834	32,251	31,834
Grants	4B	738	600	738	600
Interest on deposits	4B	1,255	2,530	1,255	2,530
Net gains from sales of assets	4C, 4F	574	497	574	497
Net foreign exchange gains - non speculative	4D	6	–	6	–
Other	4E	151	198	151	198
Total revenues from ordinary activities		187,339	161,605	187,339	161,605
Operating expenses					
Employees	5A	53,563	50,833	53,552	50,783
Suppliers	5B	47,342	51,333	47,335	51,197
Depreciation and amortisation	5C	24,672	21,494	24,672	21,494
Write down of assets	5D	1,179	691	1,179	691
Grants	5E	1,964	1,937	1,964	1,937
Total expenses from ordinary activities		128,720	126,288	128,702	126,102
Borrowing cost expense	5F, (b)	124	383	124	383
Net operating surplus from ordinary activities	(a)	58,495	34,934	58,513	35,120
Net surplus attributable to the Commonwealth	9	58,495	34,934	58,513	35,120
Net credit to asset revaluation reserve	9	–	99,529	–	99,529
Total revenues, expenses and valuation adjustments attributable to the Commonwealth and recognised directly in equity	–		99,529	–	99,529
Total changes in equity other than those resulting from transactions with owners as owners		58,495	134,463	58,513	134,649

Notes:

(a) The net surplus, after allowance for payment of the capital use charge to Government of $57.7 million (2001: $40.2 million) represents an operating surplus from ordinary activities of $0.840 million (2001: operating deficit $5.279 million).

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

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

Financial Statements

Statement of Financial Position

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
ASSETS					
Financial assets					
Cash assets	6A	34,523	39,008	34,523	39,008
Receivables	6B	10,108	6,186	10,107	6,185
Investments	6C	17,953	–	17,953	–
Total financial assets		62,584	45,194	62,583	45,193
Non-financial assets					
Land and buildings	7A	138,533	157,291	138,533	157,291
Infrastructure, plant and equipment and major facilities	7B	314,639	247,168	314,639	247,168
Inventories	7C	5,189	6,328	5,189	6,328
Intangibles	7D	4,473	1,307	4,473	1,307
Other	7E	5,502	1,049	5,502	1,049
Total non-financial assets		468,336	413,143	468,336	413,143
Total assets		530,920	458,337	530,919	458,336
LIABILITIES	8				
Interest bearing liabilities					
Other	8A	2,194	2,070	2,194	2,070
Total interest bearing liabilities		2,194	2,070	2,194	2,070
Provisions					
Capital use charge	8B	1,355	1,355	1,355	1,355
Employees	8C	21,788	19,934	21,788	19,934
Total provisions		23,143	21,289	23,143	21,289
Payables					
Suppliers	8D	8,679	6,453	8,474	6,266
Grants	8E	76	33	76	33
Other	8F	7,592	4,135	7,592	4,135
Total provisions and payables		16,347	10,621	16,142	10,434
Total liabilities		41,684	33,980	41,479	33,793

Statement of Financial Position

		Consolidated		Parent	
	Note	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000
EQUITY	9				
Capital		128,056	64,017	128,056	64,017
Reserves		284,259	284,259	284,259	284,259
Accumulated surpluses		76,921	76,081	77,125	76,267
Total equity		489,236	424,357	489,440	424,543
Total liabilities and equity		530,920	458,337	530,919	458,336
Current liabilities		30,346	20,455	30,140	20,268
Non-current liabilities		11,339	13,525	11,339	13,525
Current assets		62,584	48,219	62,583	48,218
Non-current assets		468,336	410,118	468,336	410,118

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

Statement of Cash Flow

	Note	Consolidated 2002 $'000 Inflows (Outflows)	Consolidated 2001 $'000 Inflows (Outflows)	Parent 2002 $'000 Inflows (Outflows)	Parent 2001 $'000 Inflows (Outflows)
OPERATING ACTIVITIES					
Cash received					
Sales of goods and services		28,598	35,595	28,598	35,595
Interest received		1,306	2,456	1,306	2,456
GST received from ATO		7,569	5,896	7,569	5,896
Parliamentary appropriations	4A	152,364	125,946	152,364	125,946
Total cash received		189,837	169,893	189,837	169,893
Cash used					
Employees		(52,138)	(56,547)	(52,138)	(56,547)
Suppliers		(53,642)	(46,057)	(53,642)	(46,057)
Grants		(735)	(756)	(735)	(756)
Total cash used		(106,515)	(103,360)	(106,515)	(103,360)
Net cash from operating activities	10	83,322	66,533	83,322	66,533
INVESTING ACTIVITIES					
Cash received					
Proceeds from sales of property, plant and equipment		861	633	861	633
Proceeds from sales/maturity of fixed term investments		13,831	–	13,831	–
Proceeds from foreign currency disposals		55,523	33,686	55,523	33,686
Total cash received		70,215	34,319	70,215	34,319
Cash used					
Purchase of property, plant and equipment	*	(77,099)	(60,127)	(77,099)	(60,127)
Purchase of fixed term investments		(31,784)	–	(31,784)	–
Purchase of foreign currency for future construction progress payments		(52,750)	(19,132)	(52,750)	(19,132)
Purchase of foreign currency for future supplier payments		(29,744)	(26,532)	(29,744)	(26,532)
Total cash used		(191,377)	(105,791)	(191,377)	(105,791)
Net cash used in investing activities		(121,162)	(71,472)	(121,162)	(71,472)

	Note	Consolidated 2002 $'000 Inflows (Outflows)	Consolidated 2001 $'000 Inflows (Outflows)	Parent 2002 $'000 Inflows (Outflows)	Parent 2001 $'000 Inflows (Outflows)
FINANCING ACTIVITIES					
Cash received					
Equity appropriation		64,039	55,017	64,039	55,017
Total cash received		64,039	55,017	64,039	55,017
Cash used					
Capital use charge paid		(57,655)	(39,197)	(57,655)	(39,197)
Total cash used		(57,655)	(39,197)	(57,655)	(39,197)
Net cash from financing activities		6,384	15,820	6,384	15,820
Net increase in cash held		(31,456)	10,881	(31,456)	10,881
Cash at 1 July		39,008	16,149	39,008	16,149
Cash at 30 June		7,552	27,030	7,552	27,030
Cash assets	6A	34,523	39,008	34,523	39,008
Less cash not used in the daily cash management function					
Foreign currency held as forward cover for future construction progress payments	6A	24,267	9,566	24,267	9,566
Foreign currency held as forward cover for future supplier payments	6A	2,704	2,412	2,704	2,412
		7,552	27,030	7,552	27,030

* The major portion of the figure in 2002 relates to the cash flow impact of the Replacement Research Reactor of $52.8 million (in 2001: $44.319 million).

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

Statement of Commitments

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
By type					
CAPITAL COMMITMENTS					
Property, plant and equipment		4,850	7,452	4,850	7,452
Waste treatment and disposal project		4,300	4,318	4,300	4,318
Fuel elements purchase		3,945	1,885	3,945	1,885
Total capital commitments		13,095	13,655	13,095	13,655
By maturity					
Capital commitments payable					
One year or less		8,795	8,137	8,795	8,137
From one to five years		4,300	5,518	4,300	5,518
Over five years	–	–	–	–	
		13,095	13,655	13,095	13,655
OTHER COMMITMENTS					
Replacement Research Reactor Project	(b)	257,500	301,347	257,500	301,347
Disposition of spent fuel	(a)	59,916	54,919	59,916	54,919
Operating lease	(c)	2,661	2,780	2,661	2,780
Total other commitments		320,077	359,046	320,077	359,046
Total commitments payable		333,172	372,701	333,172	372,701
Commitments receivable					
Replacement Research Reactor Project	(b)	257,500	301,347	257,500	301,347
Disposition of spent fuel	(a)	59,916	54,919	59,916	54,919
Total commitments receivable		317,416	356,266	317,416	356,266
Net other commitments payable		2,661	2,780	2,661	2,780

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
By maturity - operating lease - minimum payments					
One year or less		118	118	118	118
From one to five years		591	591	591	591
Over five years		1,952	2,071	1,952	2,071
		2,661	2,780	2,661	2,780

(a) In 1997-1998 the Government determined to provide $97.5 million in 2002 dollars ($86.4 million in 1997 dollars) to remove spent fuel rods from the Lucas Heights Science and Technology Centre and meet the costs of reprocessing offshore. An amount of $37.6 million has been received as at 30 June 2002. The remaining $59.9 million will be drawn down by year 2020 in accordance with a schedule agreed with Government. The amount of $59.9 million is not included in the commitment by maturity figures as the commitment payable is fully offset by the commitment receivable.

(b) A contract was executed on 13 July 2000 between ANSTO and INVAP SE for the design, construction and commissioning of a replacement research reactor at Lucas Heights. The amount of $257.5 million is not included in the commitment by maturity figures as the commitment payable is fully offset by the commitment receivable

(c) ANSTO has a lease over land on which the National Medical Cyclotron is built that expires on 29th January 2025. There is an option to renew for a further period of 20 years. Annual rental is currently $118,142 subject to review each three years.

The amounts shown in notes above exclude GST.

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

Schedule of Contingencies

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
CONTINGENT LOSSES					
		–	–	–	–
Total contingent losses		–	–	–	–
CONTINGENT GAINS					
		–	–	–	–
Total contingent gains		–	–	–	–
Net contingencies		–	–	–	–

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

Notes to and forming part of the Financial Statements

1 ECONOMIC DEPENDENCY

ANSTO is dependent on appropriations from the Parliament of the Commonwealth Government to carry out its activities.

2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

(a) Basis of accounting

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

They have been prepared:

i. having regard to the provisions of the Australian Nuclear Science and Technology Organisation (ANSTO) Act 1987 and the ANSTO Amendment Act 1992

ii. in accordance with:
- Finance Minister's Orders (being of the Commonwealth Authorities and Companies (Financial Statements 2001-2002) Orders);
- Australian Accounting Standards and Accounting Interpretations issued by the Australian Standards Board;
- other authoritative pronouncements of the Boards; and consensus views of the Urgent Issues Group.

The statements have been prepared having regard to:

- the Explanatory Notes to Schedule 1 issued by the Department of Finance and Administration; and
- Finance Briefs issued by the Department of Finance and Administration..

The Financial Statements have been prepared on an accrual basis and are in accordance with the historical cost convention, except for certain assets which, as noted, are at valuation. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

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

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

(b) Changes in accounting policies

Changes in accounting policies have been identified in this note under their appropriate headings - refer 2(m).

(c) Reporting by outcomes

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

(d) Revenue recognition

Parliamentary appropriations

From 1 July 1999, the Commonwealth Budget has been prepared under an accruals framework. Under this framework, Parliament appropriates money to ANSTO as revenue appropriations and as equity injections (refer Notes 4 and 9).

Revenue appropriations

Revenues from Government are revenues of the core activities of ANSTO and are recognised as revenue to the extent that they have been received or are entitled to be received at year end (refer Note 4).

Non-revenue appropriations

Appropriations for capital items are recognised directly into equity, to the extent that the appropriations have been received or are entitled to be received by the end of the year (refer Note 9).

Operating revenue from independent sources

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

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

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

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

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

Core operations
All material revenues described in this note are revenues relating to the core operating activities of ANSTO. Details of revenue amounts are given in Note 4.

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

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

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

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

(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 2002 were 0.0% of salary (CSS) and 6.2% of salary (PSS). An additional 3% is contributed for employer productivity benefits. The vast majority of staff are covered by one of these two schemes. For those staff who do not contribute to either of these two schemes, ANSTO contributes 8% 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 8% where the employee chooses not to make a personal contribution, or 11% where the employee chooses also to contribute. Contributions during the year are detailed in Note 5A. No liability is shown for superannuation in the Balance Sheet as the employer contributions fully extinguish the accruing liability which is assumed by the Commonwealth.

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

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

(i) Financial instruments
Accounting policies for financial instruments are stated at Note 20.

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

(k) Buildings, infrastructure, plant and equipment and major facilities
Acquisition
Items of buildings, infrastructure, plant and equipment and major facilities are recorded at cost 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 (Financial Statements 2001-2002) Orders requires that buildings, infrastructure, plant and equipment be revalued progressively in accordance with the deprival method of valuation in successive three year cycles. Land is also valued in successive three year cycles on the basis of its highest and best use, unless disposal is restricted by legislation, zoning or government policy.

The requirements of Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2001-2002) Orders are being implemented as follows:

- Freehold land was revalued as at 30 June 2000.
- Buildings on freehold land were revalued at 30 June 2001
- Plant and equipment were revalued at 30 June 2001.
- Infrastructure was revalued at 30 June 2001.
- The major national facility, HIFAR reactor including instrumentation, was revalued at 30 June 2001.

- Other national and major facilities were revalued at 30 June 2001.

The current revaluation cycle commenced in 2001 for each of the following classes of assets: buildings, infrastructure, and plant and equipment including national and other major facilities. Each class will be revalued over the three year revaluation cycle. Assets acquired during the same financial year of revaluation are reported at cost.

Application of the deprival method of valuation values land at current market buying price and buildings, infrastructure, plant and equipment including national and major facilities are recognised at replacement value.

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

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

The valuation of land was conducted by an independent qualified valuer, Mr John Starr (registered Valuer No. 2388) of the Australian Valuation Office.

The valuation of buildings, infrastructure, plant and equipment including national and other major facilities was performed by independent quantity surveyors, Currie & Brown (Australia) Pty Ltd and adopted by the Directors.

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 useful lives as shown in the table below.

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

The aggregate amount of depreciation allocated for each class of asset during the reporting period is disclosed in Note 5C.

Recoverable amount test

The carrying amounts of assets are reviewed to determine whether the values are 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, including the expected cashflows from future appropriations by the Parliament, have been discounted to their present value.

(l) Inventories

Stores are valued at cost. Provision is made for obsolete inventory which is reviewed annually.

Uranium and Cobalt-60 inventories of 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.

Work in progress is valued at cost, which includes both direct costs and an appropriate allocation of overhead expenses.

(m) Intangibles

Software

Items of software are recorded at cost and depreciated as outlined below. Items with a cost of less than $3,000 are expensed in the year of acquisition. In previous years software was included in plant and equipment and was revalued with other plant and equipment.

There is no material internal software development.

This is a change in the Finance Minister's Orders from previous reporting periods where either "cost" or "valuation" amount was permitted by the FMOs. A change of policy arises for a reporting entity if its own previous policy was valuation or involved assets recognised initially at valuation to bring them onto the books.

While the FMOs only refer to internally developed software, for internal consistency, entities have been encouraged, as from 1 July 2001, to carry both internally developed and externally acquired computer software for internal use at cost.

On first applying this policy, to revert to the cost basis for measuring software that was carried at a revalued amount at 30 June 2001, the carrying amount of the software at 30 June 2001 may be deemed as cost as per AASB 1041 paragraph 8.7(a).

DEPRECIATION AND AMORTISATION RATES APPLYING TO EACH CLASS OF DEPRECIABLE ASSET

	2002	2001
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

Licences
Licences were revalued in 1999.

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

Amortisation rates applying to intangibles are shown in the table below.

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

The aggregate amount of amortisation allocated for each class of asset during the reporting period is disclosed in Note 5C.

Recoverable amount test
The carrying amount of each intangible asset is reviewed to determine whether it is in excess of the asset's 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, including the expected cashflows from future appropriations by the Parliament, 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 2002 there were 153 patents, trademarks, design and applications (174 at 30 June 2001) registered to ANSTO and no associated costs are recognised as an asset (nil at 30 June 2001).

(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 Operating Statement.

(p) Capital use charge
Included in revenues from Government is a capital use charge of 11% imposed by the Commonwealth on the budgeted estimate of net assets of ANSTO for the 2001/2002 financial year (Note 4A). Any adjustment based on the calculation of actual net assets, excluding asset revaluations during the financial year, is recognised as an asset or liability as appropriate in the balance sheet (refer Note 8B).

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

(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
The consolidated financial statements are those of the economic entity, comprising ANSTO (the parent entity) and ANSTO Inc. The accounts of ANSTO Inc are prepared for the period 1 July 2001 to 30 June 2002 using accounting policies which are consistent with those of ANSTO. The effects of transactions and balances between the entities have been eliminated in full.

(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

AMORTISATION RATES APPLYING TO INTANGIBLES

	2002	2001
Purchased software	2–7 years	2–7 years
Licenses	3 years	3 years

3 SEGMENT AND OUTCOMES REPORTING

Reporting by segments

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

Reporting by outcomes:

ANSTO has three outcomes:

Outcome 1: Replacement Research Reactor Project

Outcome 2: Disposal of spent fuel

Outcome 3: Core business: science and technology

Total Cost/Contribution of Outcomes (Whole of Government)

	Outcome 1		Outcome 2		Outcome 3		Total	
	2002 Actual $'000	2002 Budget $'000	**2002 Actual $'000**	2002 Budget $'000	**2002 Actual $'000**	2002 Budget $'000	**2002 Actual $'000**	2002 Budget $'000
Net cost of departmental outputs	16,689	15,954	807	786	169,843	147,085	187,339	163,825
Extraordinary items								0
Net cost to Budget outcome	16,689	15,954	807	786	169,843	147,085	187,339	163,825

Major Departmental Revenues and Expenses by Output Group

	Output group 1		Output group 2		Output group 3		Total	
	2002 $'000	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000
Operating revenues								
Revenue from Government			778		93,931	85,733	94,709	85,733
Sale of goods and services					32,251	31,834	32,251	31,834
Interest					1,255	2,530	1,255	2,530
Dividends and CUC	16,689	7,082	29	–111	40,937	33,242	57,655	40,213
Net gains from sale of assets					574	633	574	633
Other		3			895	795	895	798
Total operating revenues	16,689	7,085	807	–111	169,843	154,767	187,339	161,741
Operating expenses								
Employees			107	258	53,456	50,575	53,563	50,833
Suppliers			104	12,844	47,239	81,330	47,343	94,174
Depreciation and amortisation					24,671	21,494	24,671	21,494
Other					3,267	136	3,267	136
Total operating expenses	0	0	211	13,102	128,633	153,535	128,844	166,637

Major Classes of Departmental Assets and Liabilities by Output Group

	Output group 1		Output group 2		Output group 3		Non-specific		Total	
	2002 $'000	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000
Output specific departmental assets										
Cash									0	0
Receivables									0	0
Investments									0	0
Accrued revenue									0	0
Land									0	0
Land & Buildings					138,533	157,291			138,533	157,291
Infrastructure, plant and equipment					155,155	193,534			155,155	193,534
Inventories					5,190	6,328			5,190	6,328
Intangibles					4,473	1,307			4,473	1,307
National facilities	106,301	53,634			53,183				159,484	53,634
Other					5,502	1,049			5,502	1,049
Total specific departmental assets	106,301	53,634	0	0	362,036	359,509	0	0	468,337	413,143

Major Classes of Departmental Assets and Liabilities by Output Group (continued)

	Output group 1		Output group 2		Output group 3		Non-specific		Total	
	2002 $'000	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000
Other departmental assets										
Cash	12,000				22,523	39,008			34,523	39,008
Receivables					10,108	61,856			10,108	61,856
Investments			1,000		16,953				17,953	0
Accrued revenue									0	0
Land									0	0
Buildings									0	0
Infrastructure, plant and equipment									0	0
Inventories									0	0
Intangibles									0	0
National facilities									0	0
Other									0	0
Total other departmental assets	12,000	0	1,000	0	49,584	100,864	0	0	62,584	100,864
Output specific departmental liabilities										
Employees					21,788	19,934			21,788	19,934
Suppliers					8,679	6,453			8,679	6,453
Other					11,217	7,593			11,217	7,593
Total specific departmental liabilities	0	0	0	0	41,684	33,980	0	0	41,684	33,980
Other departmental liabilities										
Employees									0	0
Suppliers									0	0
Other									0	0
Total other departmental liabilities	0	0	0	0	0	0	0	0	0	0

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
4 REVENUE					
4A Revenues from Government					
Appropriation Act No.1 Operating		152,364	105,798	152,364	105,798
Appropriation Act No.3 Operating		–	20,148	–	20,148
		152,364	125,946	152,364	125,946
4B Operating revenue from independent sources					
Sales of goods and services:					
Radioisotope sales		19,578	17,910	19,578	17,910
Services and contract research		4,529	4,923	4,529	4,923
Silicon irradiation		2,688	3,745	2,688	3,745
CSIRO site support		936	968	936	968
Training courses		122	68	122	68
Land management		2,295	2,314	2,295	2,314
Synchrotron project		774	809	774	809
AINSE interactions		1,329	1,097	1,329	1,097
Total sales of goods and services		32,251	31,834	32,251	31,834
Grants		738	600	738	600
Interest on deposits		1,255	2,530	1,255	2,530
4C Net gain from sales of assets	4F	574	497	574	497
4D Net foreign exchange gains - non speculative	20	6	–	6	–
4E Other revenue:					
Sundry materials		151	190	151	190
Other		–	8	–	8
Total other revenue		151	198	151	198
Total operating revenue from independent sources		34,975	35,659	34,975	35,659
Total revenues from ordinary activities		187,339	161,605	187,339	161,605
4F Net gain from sales of assets		–	–	–	–
Revenue from sales of assets		861	633	861	633
Expense from sales of assets		(287)	(136)	(287)	(136)
Net gain from sales of assets		574	497	574	497

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
4G Sales of goods and services	4B				
Goods		19,578	17,910	19,578	17,910
Services		12,673	13,924	12,673	13,924
		32,251	31,834	32,251	31,834
Goods and services were sold to:					
Government		936	968	936	968
Non-Government		31,315	30,866	31,315	30,866
		32,251	31,834	32,251	31,834
Cost of goods sold		19,090	17,450	19,090	17,450
5 OPERATING EXPENSES					
The breakdown of operating expenses is:					
5A Employee expenses:					
Salaries		42,594	37,508	42,584	37,467
Superannuation		5,333	7,371	5,332	7,362
Annual leave		2,804	3,609	2,804	3,609
Long service leave		2,742	2,159	2,742	2,159
Separation and redundancy		90	186	90	186
Total employee expenses		53,563	50,833	53,552	50,783
5B Supplier expenses:					
Operating expenses		17,801	17,242	17,797	17,125
Stores		5,517	5,275	5,517	5,275
Maintenance and external services		16,411	9,686	16,408	9,667
Power and water		1,725	1,675	1,725	1,675
Reactor supplies		834	1,246	834	1,246
Disposition of spent fuel rods		14	12,409	14	12,409
Variable production costs		5,009	3,756	5,009	3,756
Operating lease rentals		31	44	31	44
Total supplier expenses		47,342	51,333	47,335	51,197

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
5C Depreciation and amortisation:					
Depreciation of property, plant and equipment (a)	7B	24,229	21,276	24,229	21,276
Amortisation of intangible assets - licence	7D	191	126	191	126
Amortisation of intangible assets - software	7D	252	92	252	92
Total depreciation and amortisation		24,672	21,494	24,672	21,494
5D Writedown of assets					
Financial assets:					
Receivables for goods and services		75	500	75	500
Unrealised foreign exchange loss	20	10	72	10	72
Non financial assets:					
Loss on disposal of plant and equipment		36	111	36	111
Materials - write off obsolete stock		297	–	297	–
Nuclear material stock devaluation		761	8	761	8
Total writedown of assets		1,179	691	1,179	691
5E Grants		1,964	1,937	1,964	1,937
Total operating expenses		128,720	126,288	128,702	126,102
5F Borrowing costs expense	8A	124	383	124	383
(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		4,575	5,216	4,575	5,216
Plant and equipment		12,996	6,971	12,996	6,971
Infrastructure		2,055	3,313	2,055	3,313
National and major facilities		4,603	5,776	4,603	5,776
Total allocated		24,229	21,276	24,229	21,276

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
6 FINANCIAL ASSETS					
6A Cash assets					
Cash at bank for operating needs		7,552	27,030	7,552	27,030
Foreign currency held as forward cover for future construction progress payments		24,267	9,566	24,267	9,566
Foreign currency held as forward cover for future supplier payments		2,704	2,412	2,704	2,412
Total cash assets		34,523	39,008	34,523	39,008
The value of the account at year end is intended to meet working capital requirements together with impending progress payments on the Replacement Research Reactor and other projects described at the foot of Note 9.					
6B Receivables					
Goods and services	(a)	5,355	4,722	5,355	4,722
Less provision for doubtful debts		376	302	376	302
		4,979	4,420	4,979	4,420
Advance held by Dept of Education, Science and Tourism		20	20	20	20
Interest accrued		69	119	69	119
Reimburseable foreign exchange loss		1,451	–	1,451	–
Other		78	14	77	13
GST receivable		3,511	1,613	3,511	1,613
		10,108	6,186	10,107	6,185
(a) Goods and services (trade debtors)					
Age analysis of trade debtors					
Current		3,037	2,445	3,037	2,445
Overdue:					
Less than 30 days		1,418	1,516	1,418	1,516
30 to 60 days		471	403	471	403
60 to 90 days		268	156	268	156
More than 90 days		161	202	161	202
		5,355	4,722	5,355	4,722

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
6C Investments					
Fixed term investments		17,953	–	17,953	–
6D Investment in subsidiary					
ANSTO Inc. was incorporated in Delaware, USA, on 27 October 1999. At 30 June 2002, US$100 (2001, US$100) of capital has been invested in this wholly owned subsidiary. At 30 June 2002, the contribution of ANSTO Inc. to consolidated net surplus is a loss of $A17,778 (2001 loss of A$185,856).					
7 NON-FINANCIAL ASSETS					
7A Land and buildings					
Land - at independent valuation - 30 June 2000	(b)	52,180	52,180	52,180	52,180
Buildings - at cost		280	–	280	–
Less accumulated depreciation		–	–	–	–
		280	–	280	–
Buildings - at Directors valuation - 30 June 2001	(a), (d)	109,634	133,201	109,634	133,201
Less accumulated depreciation	(c)	23,561	28,090	23,561	28,090
		86,073	105,111	86,073	105,111
Total buildings		86,353	105,111	86,353	105,111
Total land and buildings		138,533	157,291	138,533	157,291
7B Infrastructure, plant, equipment and major facilities					
7B (i) Plant and equipment					
Plant and equipment - at cost		7,262	217	7,262	217
Less accumulated depreciation		1,226	–	1,226	–
		6,036	217	6,036	217
Additions - at cost		5,748	7,045	5,748	7,045
Less accumulated depreciation		1,191	1,226	1,191	1,226
		4,557	5,819	4,557	5,819
Plant and equipment at Directors valuation - 30 June 2001	(a)	204,056	206,372	204,056	206,372
Less accumulated depreciation	(c)	107,841	99,635	107,841	99,635
		96,215	106,737	96,215	106,737
Plant and equipment under construction		18,381	6,144	18,381	6,144
Total plant and equipment		125,189	118,917	125,189	118,917

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
7B (ii) Infrastructure					
Electrical /site services					
Electrical /site services facilities - at cost		12	–	12	–
Less accumulated depreciation		1	–	1	–
		11	–	11	–
Electrical/site services facilities at Directors valuation - 30 June 2001	(a), (d)	50,807	24,082	50,807	24,082
Less accumulated depreciation	(c)	20,851	8,312	20,851	8,312
		29,956	15,770	29,956	15,770
Total infrastructure		29,967	15,770	29,967	15,770
7B (iii) Major national and major research facilities					
Major national research facilities - at cost		302	340	302	340
Less accumulated depreciation		36	36	36	36
		266	304	266	304
Major national research facilities at Directors valuation - 30 June 2001*	(a)	110,900	111,111	110,900	111,111
Less accumulated depreciation	(c)	73,467	69,773	73,467	69,773
		37,433	41,338	37,433	41,338
Major research facilities at Directors valuation - 30 June 2001	(a)	23,203	18,203	23,203	18,203
Less accumulated depreciation	(c)	7,720	5,818	7,720	5,818
		15,483	12,385	15,483	12,385
* includes $17,133 (2001 $17,133) buildings on leasehold land					
Research facility under construction at Directors valuation - 30 June 2001	(a)	–	5,000	–	5,000
Replacement Research Reactor Project capitalised cost		106,301	53,454	106,301	53,454
Total major national and major research facilities		159,483	112,481	159,483	112,481
Total infrastructure, plant, equipment and major facilities		314,639	247,168	314,639	247,168
Total land, buildings, infrastructure, plant, equipment and major facilities		453,172	404,459	453,172	404,459

Movement summary 2001-2002 for all consolidated assets irrespective of valuation basis (excluding intangibles)

	Land	Buildings	Total land and buildings	Infrastructure plant, equipment and major facilities	Total
	$'000	$'000	$'000	$'000	$'000
Gross value as at 1 July 2001	52,180	133,201	185,381	431,968	617,349
Additions - new assets		1,225	1,225	72,168	73,393
Additions - replacements			–		–
Transfers/Reclassifications		(24,511)	(24,511)	24,511	–
Revaluations			–		–
Disposals			–	(1,676)	(1,676)
Write-offs					
Gross value as at 30 June 2002	52,180	109,915	162,095	526,971	689,066
Accumulated depreciation/ amortisation 1 July 2001		28,090	28,090	184,800	212,890
Depreciation/amortisation		4,575	4,575	19,654	24,229
Transfer/Reclassifications		(9,104)	(9,104)	9,104	–
Revaluations			–		–
Adjustment for disposals			–	(1,226)	(1,226)
Write-offs					
Accumulated depreciation/ amortisation 30 June 2002		23,561	23,561	212,332	235,893
Net book value as at 30 June 2002	52,180	86,354	138,534	314,639	453,173
Net book value as at 30 June 2001	52,180	105,111	157,291	247,168	404,459

Note:

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

(b) The 2000 independent valuation of land, buildings, electrical and site services facilities was performed by Mr John Starr (registered valuer No. 2388) of the Australian Valuation Office Note 2(k).

(c) In accordance with the requirements of Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2001-2002) Orders, all revalued assets are shown on a gross basis: asset values are at deprival value, and accumulated depreciation has been calculated based on this value. The resulting adjustment has been transferred directly to the asset revaluation reserve.

(d) The value of buildings in 2002 was reduced by a reclassification of $24.5 million of items to infrastructure.

Movement summary 2001-2002 for all consolidated assets at valuation

	Land	Buildings	Total land and buildings	Infrastructure plant, equipment and major facilities	Total
	$'000	$'000	$'000	$'000	$'000
As at 30 June 2002					
Gross value	52,180	109,915	162,095	388,966	551,061
Accumulated depreciation/ amortisation		(23,561)	(23,561)	(209,879)	(233,440)
Net value	52,180	86,354	138,534	179,087	317,621
As at 30 June 2001					
Gross value	52,180	133,201	185,381	364,768	550,149
Accumulated depreciation/ amortisation		(28,090)	(28,090)	(183,538)	(211,628)
Net value	52,180	105,111	157,291	181,230	338,521

Summary of all consolidated assets under construction as at 30 June 2002

Gross value				124,681	124,681
Accumulated depreciation/ amortisation					
Net value as at 30 June 2002				124,681	124,681
Net value as at 30 June 2001				64,598	64,598

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
7C Inventories					
Raw materials and stores - not held for resale					
Stores - at cost		1,288	1,582	1,288	1,582
Cobalt-60 sources - at net realisable value		280	501	280	501
Reactor fuel and heavy water - at average purchase price		3,678	3,709	3,678	3,709
Nuclear materials - at net realisable value		7	698	7	698
Provision for stock dimunition		(64)	(162)	(64)	(162)
		5,189	6,328	5,189	6,328
Work in progress					
Work in progress - at cost		–	–	–	–
		5,189	6,328	5,189	6,328
7D Intangibles					
Licences - at cost		1,056	132	1,056	132
Less accumulated amortisation		411	23	411	23
		645	109	645	109
Licences - at valuation - 30 June 1999		–	290	–	290
Less accumulated amortisation		–	193	–	193
		–	97	–	97
Design fees - at cost		45	19	45	19
Less accumulated amortisation		8	13	8	13
		37	6	37	6
Software at cost		4,004	910	4,004	910
Less accumulated amortisation		248	7	248	7
		3,756	903	3,756	903
Software at deemed cost		458	603	458	603
Less accumulated amortisation		423	411	423	411
		35	192	35	192
Total intangibles		4,473	1,307	4,473	1,307

Movement summary 2001-2002 for all consolidated intangibles irrespective of valuation basis

	Licenses $'000	Software $'000	Total $'000
Gross value as at 1 July 2001	441	1,513	1,954
Additions - new assets	756	2,949	3,705
Revaluations			–
Disposals	(96)		(96)
Gross value as at 30 June 2002	1,101	4,462	5,563
Accumulated depreciation/ amortisation 1 July 2001	229	418	647
Depreciation/amortisation	191	252	443
Additions - new assets			
Additions - replacements/upgrades			
Revaluations			–
Adjustment for disposals			
Writeback of accumulated depreciation			
Accumulated depreciation/ amortisation 30 June 2002	420	670	1,090
Net book value as at 30 June 2002	681	3,792	4,473
Net book value as at 30 June 2001	212	1,095	1,307

7E Other

		Consolidated		Parent	
	Note	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000
Prepayments		5,502	1,049	5,502	1,049
		5,502	1,049	5,502	1,049
Total non-financial assets		468,336	413,143	468,336	413,143

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
8 LIABILITIES					
8A Interest-bearing liabilities					
Other -	(a)	2,194	2,070	2,194	2,070
Total interest-bearing liabilities		2,194	2,070	2,194	2,070
Provision and payables					
8B Capital use charge payable (refer Note 2(p))		1,355	1,355	1,355	1,355
8C Liabilities to employees					
Accrued salaries and wages		1,660	1,597	1,660	1,597
Annual leave		7,428	6,850	7,428	6,850
Long service leave		12,700	11,487	12,700	11,487
		21,788	19,934	21,788	19,934
8D Suppliers					
Trade creditors		8,679	6,453	8,474	6,266
		8,679	6,453	8,474	6,266
8E Grants					
Non-profit entities		76	33	76	33
		76	33	76	33
8F Other					
Revenue received in advance		228	195	228	195
HIFAR spent fuel rods -	(b)	1,000	1,000	1,000	1,000
HIFAR routine maintenance shutdown	(c)	3,166	1,140	3,166	1,140
Foreign currency fluctuation		–	1,296	–	1,296
Superannuation fluctuation	(d)	1,692	–	1,692	–
Common law and other claims		1,506	504	1,506	504
		7,592	4,135	7,592	4,135
Total provisions and payables		39,490	31,910	39,285	31,723
Total liabilities		41,684	33,980	41,479	33,793

Notes:

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

(b) Provision for HIFAR spent fuel rods.

In 1995 ANSTO created a provision for the overseas transport and reprocessing of HIFAR spent fuel rods. No expenses were incurred against the provision during 2001-2002 and, following a review, the balance has been retained.

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

(c) A provision has been created for the cost of disruption to business arising from a scheduled routine maintenance program for HIFAR scheduled for 2004. This provision will be reviewed annually.

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

		Consolidated		Parent	
	Note	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000
9 EQUITY					
Capital					
Capital 1 July		64,017	9,000	64,017	9,000
Equity injections from Government - Appropriation Act Nos. 2 & 4	(d)	64,039	55,017	64,039	55,017
Balance 30 June		128,056	64,017	128,056	64,017
Reserves, including movements					
Asset revaluation reserve					
Balance 1 July		269,859	170,330	269,859	170,330
Net revaluation increases		–	99,529	–	99,529
Balance 30 June		269,859	269,859	269,859	269,859
Fuel elements reserve					
Balance 1 July		5,600	5,000	5,600	5,000
Transferred from accumulated surpluses -	(a)	–	600	–	600
Transferred to accumulated surpluses		–	–	–	–
Balance 30 June		5,600	5,600	5,600	5,600
Instrumentation reserve					
Balance 1 July		4,500	3,000	4,500	3,000
Transferred from accumulated surpluses -	(b)	–	1,500	–	1,500
Balance 30 June		4,500	4,500	4,500	4,500

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
Waste treatment reserve					
Balance 1 July		4,300	–	4,300	–
Transferred from accumulated surpluses -	(c)	–	4,300	–	4,300
Balance 30 June		4,300	4,300	4,300	4,300
Total reserves		284,259	284,259	284,259	284,259
Accumulated surpluses					
Accumulated surpluses 1 July		76,081	87,760	76,267	87,760
Transfers to instrumentation reserve		–	(1,500)	–	(1,500)
Transfers to fuel elements reserve		–	(600)	–	(600)
Transfers to waste treatment reserve		–	(4,300)	–	(4,300)
Operating surplus		58,495	34,934	58,513	35,120
Capital use charge		(57,655)	(40,213)	(57,655)	(40,213)
Accumulated surpluses 30 June		76,921	76,081	77,125	76,267
Total equity		489,236	424,357	489,440	424,543

(a) Fuel elements reserve

A transfer has been made to this reserve in 2001 to identify separately the amount required for the purchase of fuel elements.

(b) Instrumentation reserve

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

(c) Waste treatment reserve

During the 2001 financial year, a $5.0 million equity injection was received from the Government to upgrade low level liquid effluent treatment facilities. The amount transferred to this reserve represents the remaining funds to be spent on this project.

(d) Equity Injection

The total drawdown of $64,039,000 (2001, $55,017,000) is for expenditure on capital projects. A further drawdown of $33,658,000 was available in 2002 but will now be made subsequent to year end.

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
10 CASH FLOW RECONCILIATION					
Reconciliation of operating surplus to net operating cash flows					
Operating surplus before extraordinary items		58,495	34,934	58,513	35,120
Extraordinary items (refer to Note 11)		–	–	–	–
Operating surplus after extraordinary items		58,495	34,934	58,513	35,120
(Increase) in prepayments		(4,453)	(474)	(4,453)	(474)
Decrease in inventories		1,749	789	1,749	789
(Decrease) in provision for waste treatment and disposal		–	–	–	–
Increase in creditors		2,226	4,191	2,207	4,005
Increase in employee entitlements		1,854	1,337	1,854	1,337
Increase in other provisions		3,500	1,690	3,500	1,690
(Increase)/decrease in accrued interest		50	(74)	50	(74)
(Increase)/decrease in receivables		(555)	2,999	(554)	2,999
Foreign exchange (gain)		(1,451)	–	(1,451)	–
Nuclear materials (devaluation)		(610)	(97)	(610)	(97)
Depreciation/amortisation		24,672	21,494	24,672	21,494
Gain on disposal of assets		(611)	(497)	(611)	(497)
Loss on disposal of assets		36	111	36	111
Write off obsolete stock		258	–	258	–
Increase in revenue in advance		124	1,525	124	1,525
(Increase)/decrease in other receivables		(64)	206	(64)	206
(Increase) in GST receivables		(1,898)	(1,601)	(1,898)	(1,601)
Net cash provided by operating activities		83,322	66,533	83,322	66,533

10A Cash flows presented on a net basis

Cash flows arising from profits and losses on foreign exchange activities are presented on a net basis in the Statement of Cash Flows and the cash flow reconciliation.

11 EXTRAORDINARY ITEMS

There were no extraordinary items for the year ended 30 June 2002 ($Nil 2001).

	Note	Consolidated 2002 $	Consolidated 2001 $	Parent 2002 $	Parent 2001 $
12 REMUNERATION OF MEMBERS OF THE BOARD					
Members' remuneration is determined by the Remuneration Tribunal and payment is made in accordance with Section 12 of the ANSTO Act 1987. Included in operating expenses (Note 5) are:					
Aggregate amounts of superannuation payments in connection with the retirement of members of the Board		24,087	32,221	24,087	32,221
Other remuneration received, or due and receivable, by the members of the Board.		366,365	347,614	366,365	347,614
		390,452	379,835	390,452	379,835
The number of members included in these figures is shown below in each relevant remuneration band:					
Remuneration between		Number	Number	Number	Number
$Nil and $9,999		1	1	1	1
$10,000 and $19,999		2	2	2	2
$20,000 and $29,999		2	1	2	1
$40,000 and $49,999		1	2	1	2
$260,000 and $269,999 *		1	1	1	1
		7	7	7	7

* Includes payment of special allowances

	Note	Consolidated 2002 $	Consolidated 2001 $	Parent 2002 $	Parent 2001 $
13 REMUNERATION OF EXECUTIVES					
Executive remuneration is determined by an Enterprise Agreement 1997, which is underpinned by the ANSTO Award. Included in operating expenses (Note 5) is total remuneration received or due and receivable by executives (excluding the Executive Director who is included in Note 12) who earn $100,000 or more in connection with the management of ANSTO.		1,839,653	1,963,444	1,839,653	1,963,444
The number of executives included in these figures is shown below in each relevant remuneration band:					
Remuneration between		Number	Number	Number	Number
$110,000 and $119,999		5	3	5	3
$120,000 and $129,999		2	1	2	1
$130,000 and $139,999		3	2	3	2
$140,000 and $149,999		2	5	2	5
$150,000 and $159,999		1	1	1	1
$160,000 and $169,999		–	1	–	1
$170,000 and $179,999		–	1	–	1
$180,000 and $189,999		1	–	1	–
		14	14	14	14

14 REPLACEMENT RESEARCH REACTOR PROJECT COSTS

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

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

15 INSURANCE

Insurance risks, including professional indemnity, general liability, industrial special risk for a property used substantially for commercial purposes, directors and officers, and travel, remain insured with Comcover. Workers compensation is covered by statute under the *Safety Rehabilitation and Compensation Act 1988*.

A Deed of Indemnity between the 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.

	Note	Consolidated 2002 $	Consolidated 2001 $	Parent 2002 $	Parent 2001 $
16 REMUNERATION OF AUDITORS					
Remuneration to the Auditor-General for auditing the financial statements for the reporting period		90,000	90,000	90,000	90,000

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

17 BOARD MEMBERSHIP

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

BOARD MEMBERSHIP

	Appointed	Term concluded	Term concludes
Member			
H M Garnett	11 May 2000		10 May 2005
I D Blackburne	1 July 2001		30 June 2006
M H Codd AC	21 July 1999	31 December 2001	
F A Khafagi	1 January 2000		30 June 2002
J M Craker	2 June 1998		31 December 2002
C Hillyard	21 July 1999		20 July 2004
G Cook	13 June 2001		4 April 2004
M Eager	1 January 2002		31 December 2006

For the 2001-2002 financial year the aggregate remuneration paid to members of the Board is disclosed in Note 12.

The aggregate of superannuation payments paid to the Commonwealth Superannuation Scheme (CSS) and Public Sector Superannuation Scheme (PSS), in connection with the retirement of members of the Board was $24,087 (2001, $32,221).

18 RELATED PARTY DISCLOSURES

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

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
19 TRUST MONEY					
Monies received by ANSTO for specific purposes are placed in special bank accounts and are expended for these specified purposes only. These monies are not recognised in the financial statements.					
Total					
Balance 1 July		3,306	2,642	3,306	2,642
Add: receipts		3,218	2,765	3,218	2,765
interest received		88	139	88	139
Deduct: payments		2,456	2,240	2,456	2,240
Balance 30 June		4,156	3,306	4,156	3,306
Represented by the following:					
ANSTO RPAH joint account					
Being monies paid by a debtor in accordance with a Deed of Agreement pending the outcome of litigation.					
Balance 1 July		–	255	–	255
Add: receipts		–	351	–	351
interest received		–	9	–	9
Deduct: payments		–	615	–	615
Balance 30 June		–	–	–	–
Trust account					
ANSTO receives monies from trade creditors as security deposits for contracts to be performed. These monies are held in a Trust Account and refunded to the respective trade creditors on satisfactory completion of the contract.					
Balance 1 July		5	5	5	5
Add: receipts		–	–	–	–
interest received		–	–	–	–
Deduct: payments		–	–	–	–
Balance 30 June		5	5	5	5

	Note	Consolidated 2002 $'000	Consolidated 2001 $'000	Parent 2002 $'000	Parent 2001 $'000
MNRF synchrotron					
The Australian Synchrotron Research Program Incorporated was established under the Major National Research (MNRF) Program.					
Balance 1 July		3,283	2,365	3,283	2,365
Add: receipts		3,190	2,414	3,190	2,414
interest received		86	129	86	129
Deduct: payments		2,456	1,625	2,456	1,625
Balance 30 June		4,103	3,283	4,103	3,283
ISRC - 2003					
ANSTO received this trust money to facilitate assistance to the attendance of students to the ISRC - 2003.					
Balance 1 July		–	–	–	–
Add: receipts		28	–	28	–
interest received		1	–	1	–
Deduct: payments		–	–	–	–
Balance 30 June		29	–	29	–
Welfare fund					
A Welfare Fund Trust Account is maintained to receive and manage donations to the fund and expenditure on specific welfare items for ANSTO employees.					
Balance 1 July		18	17	18	17
Add: receipts		–	–	–	–
interest received		1	1	1	1
Deduct: payments		–	–	–	–
Balance 30 June		19	18	19	18

20 FINANCIAL INSTRUMENTS

a) terms conditions and accounting policies

FINANCIAL INSTRUMENTS			
Financial Instruments	**Notes**	**Accounting policies and methods (including recognition criteria and measurement basis)**	**Nature of underlying instrument (including significant terms & conditions affecting the amount, timing and certainty of cash flow)**
Financial assets		Financial assets are recognised when control over future economic benefits is established and the amount of the benefit can be reliably measured.	
Cash at bank	6A	Cash is recognised at cost. Interest is accrued as it is earned.	All Australian dollar cash balances are with the Commonwealth Bank of Australia. At 30 June current rates were 3.50%pa (2001 3.75%pa), calculated daily.
Fixed term investment	6C	The deposit is recognised at cost. Interest is accrued as it is earned.	The deposit during the year with the Commonwealth Bank of Australia earned an effective rate of interest of 4.55%pa for 30 days and 4.75%pa for 90 day terms (2001 4.85%pa) payable on maturity.
Foreign exchange holdings	6A, 6B, 8F,	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 deposits are with the Commonwealth Bank of Australia, and earn an effective rate of interest of 2.25%pa (2001 3.50%pa).
Receivables for goods & services	6B	Receivables are recognised at the nominal amounts due less any provision for bad and doubtful debts. Provisions are made when collection of the debt is judged to be less rather than more likely.	Credit terms are net 30 days (2001 - 30 days).

20 FINANCIAL INSTRUMENTS (CONTINUED)

a) terms conditions and accounting policies (continued)

FINANCIAL INSTRUMENTS			
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)**
Loans	6B	The loan is a non-interest-bearing advance to a Commonwealth agency to initially meet on ANSTO's behalf costs incurred overseas, and is recognised at its nominal value.	Monthly reconciliation of expenses incurred and claimed by the Commonwealth agency provides the basis for reimbursement of the advance to the operating limit.
Other debtors	6B	As for receivables for goods and services.	As for receivables for goods and services.
Financial Liabilities		Financial liabilities are recognised when a present obligation to another party is entered into and the amount of the liability can be reliably measured.	
Trade creditors	8D	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	8E, 8A	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 monthly.
Other provisions	8F	Liabilities have been recognised for transport and reprocessing of spent fuel elements and pending common law claims.	Provision for spent fuel disposition will be drawn as and when required. Other provisions for common law claims are dependent upon completion and outcome of legal proceedings.

20) FINANCIAL INSTRUMENTS (CONTINUED)

(b) Interest rate risk - consolidated

Financial Instruments	Notes	Floating Interest Rate		Fixed Interest Rate 1 year or less		Fixed Interest Rate 2 - 5 years		Non Interest-bearing		Total		Weighted Average Effective Interest Rate	
		2002 $'000	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	2001 $'000	**2002 $'000**	**2001** $'000	**2002 $'000**	2001 $'000
Financial assets (recognised)													
Cash at bank	6A	7,547	27,013	–	–	–	–	–	–	7,547	27,013	3.50%	3.75%
Cash on hand	6A	–	–	–	–	–	–	5	17	5	17	n/a	n/a
Fixed term investment	6C	17,953	–	–	–	–	–	–	–	17,953	–	4.72%	4.85%
Foreign exchange holdings	6A	26,971	11,978	–	–	–	–	–	–	26,971	11,978	2.25%	3.50%
Receivables for goods and services	6B	–	–	–	–	–	–	9,941	6,033	9,941	6,033	n/a	n/a
Loans	6B	–	–	–	–	–	–	20	20	20	20	n/a	n/a
Interest accrued	6B	–	–	–	–	–	–	69	119	69	119	n/a	n/a
Unrealised foreign exchange gain	6B	–	–	–	–	–	–	–	–	–	–	n/a	n/a
Other	6B	–	–	–	–	–	–	78	14	78	14	n/a	n/a
Total financial assets (recognised)		52,471	38,991	–	–	–	–	10,113	6,203	62,584	45,194		
Total assets										530,920	458,337		
Total financial liabilities (recognised)													
Trade creditors	8D	–	–	–	–	–	–	8,679	6,453	8,679	6,453	n/a	n/a
Unrealised foreign exchange losses								–	–	–	–	n/a	n/a
Revenue received in advance	8A/8F	–	–	–	–	2,194	2,070	–	–	2,194	2,070	6%	6%
Other provisions	8F	–	–	–	–	–	–	7,592	4,135	7,592	4,135	n/a	n/a
Total financial liabilities (recognised)		–	–	–	–	2,194	2,070	16,271	10,588	18,465	12,658		
Total liabilities										41,684	33,980		

20 FINANCIAL INSTRUMENTS (CONTINUED)

(c) Net fair values of financial assets and liabilities

	Note	Consolidated				Parent			
		Total carrying amount	Aggregate net fair value	Total carrying amount	Aggregate net fair value	Total carrying amount	Aggregate net fair value	Total carrying amount	Aggregate net fair value
		2002 $'000	**2002 $'000**	2001 $'000	2001 $'000	**2002 $'000**	**2002 $'000**	2001 $'000	2001 $'000
Financial assets (recognised)									
Cash at bank	6A	7,547	7,547	27,013	27,013	7,547	7,547	27,013	27,013
Cash on hand	6A	5	5	17	17	5	5	17	17
Fixed term investments	6C	17,953	17,953	–	–	17,953	17,953	–	–
Foreign exchange holdings	6A	26,971	26,971	11,978	11,978	26,971	26,971	11,978	11,978
Receivables for goods and services	6B	9,961	9,961	6,033	6,033	9,961	9,961	6,033	6,033
Interest accrued	6B	69	69	119	119	69	69	119	119
Loans	6B	–	–	20	20	–	–	20	20
Other	6B	78	78	14	14	77	77	13	13
Total financial assets		62,584	62,584	45,194	45,194	62,583	62,583	45,193	45,193
Financial liabilities (recognised)									
Trade creditors	8D	8,679	8,679	6,453	6,453	8,679	8,679	6,453	6,453
Revenue received in advance	8A	2,194	2,194	2,070	2,070	2,194	2,194	2,070	2,070
Other provisions	8F	7,592	7,592	4,135	4,135	7,592	7,592	4,135	4,135
		18,465	18,465	12,658	12,658	18,465	18,465	12,658	12,658

(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.

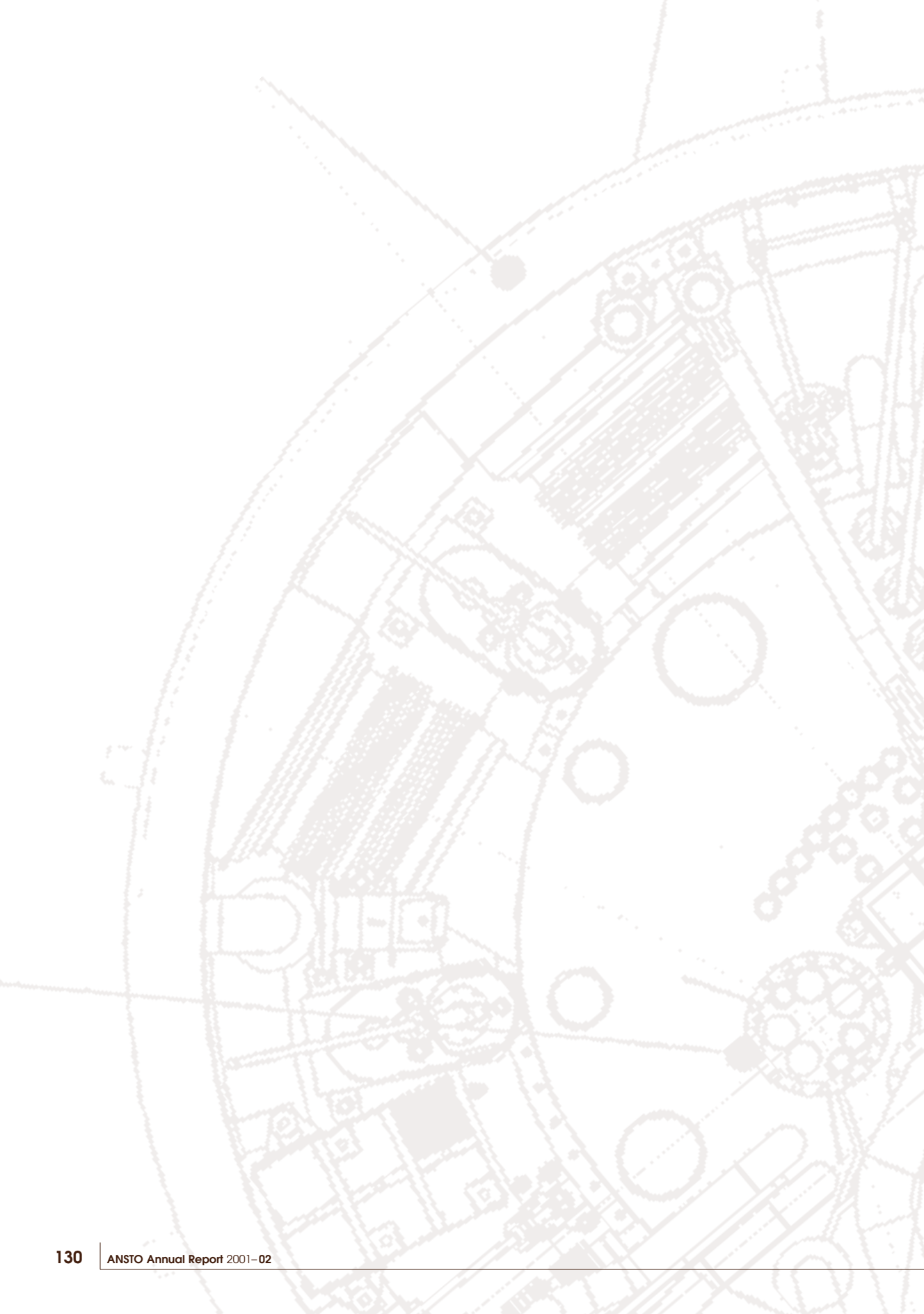
Financial liabilities

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 6.



Appendices

Appendix 1
Equal Employment Opportunity

OBJECTIVES

1) To ensure that Equal Employment Opportunity (EEO) principles and practices are actively incorporated into all people management activities.

2) To ensure that the structures and processes to implement EEO adjust to changing employment needs.

3) To confirm and communicate the vision that ANSTO's employment activities reflect ANSTO's values.

TOTAL STAFF = 851			
	Number employed	% of total staff	Average salary
Female	208	24%	$46,688
Male	643	76%	$57,317

STAFF IN SPECIFIC EMPLOYMENT CATEGORIES			
	Number employed	% of total staff	Average salary
People with disabilities	20	2.3%	$51,281
Aboriginal and Torres Strait Islanders	16	1.9%	$51,412
Non English speaking background	13	1.5%	$53,632

This information is based on data obtained from a survey of all ANSTO staff conducted during the year. Please note that staff had the option of choosing not to answer questions.

CORPORATE EXECUTIVE INFORMATION		
	Male	Female
Band 3 Corporate Executive	3	1
Band 2 Corporate Executive	9	
Band 1 Corporate Executive	1	2

STAFF NUMBERS AS AT 30 JUNE 2002				
	Full–time male	**Full–time female**	**Part–time male**	**Part–time female**
Executive Director		1		
Corporate Executives	13	3		
Professional Officers	180	47	3	7
Research Scientists	97	25	1	1
Technical Officers	248	25	1	6
Administrative Service Officers	34	72	2	18
Craftspersons	62	3	2	
Totals	**634**	**176**	**9**	**32**
Total staff: 851				
Gender	**Male**	**Female**		
% of total staff	75%	24%		

ACTIVITIES

ANSTO continued to regularly review people management policies and procedures to ensure the principles of EEO and diversity were actively encouraged and implemented and related issues effectively managed.

An ANSTO-wide survey was undertaken to update the organisation's equity and diversity data. In addition, a comprehensive revision of the organisation's human resource policies and procedures, encouraging the principles of EEO and diversity, was completed. The results of this revision will be promoted throughout the organisation in the upcoming year.

Staff and their families continued to be provided with access to the services of counsellors from Citipsych.

ANSTO's report on its implementation of the Commonwealth Disability Strategy is provided in Appendix 7.

Appendix 2
Freedom of Information

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

ARRANGEMENTS FOR EXTERNAL PARTICIPATION

Liaison groups

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

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

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

ANSTO/State Government arrangements

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

Associated organisation

The Australian Institute of Nuclear Science and Engineering (AINSE), an association of ANSTO and 36 universities, arranges access by staff and students of Australasian universities and institutes of technology 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, the *Lucas Heights News*, the Program of Research, Strategic Plans, ANSTO emergency plans, environmental monitoring reports, general information literature and videos (under loan arrangements) are available on request.

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

General correspondence includes ministerial briefs, speeches, conference papers for national and international meetings, parliamentary questions and answers, cables, telexes and facsimiles, and general records files. Technical documents held

include scientific and technical reports and laboratory notes comprising patents and inventions; computer tapes and printouts; plant and equipment operating manuals; maintenance, quality assurance and safety manuals; reactor operating authorisations, records and log books; radioisotope quality control procedures manuals; radioisotope catalogues and price lists; engineering service general records; nuclear material movement vouchers and accounting records; photographs; and radiographs. Health and safety documents include staff medical records; safety-related survey records; film badge and radiological records; accident reports; and emergency response procedures.

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

Facilities for access

By arrangement, FOI enquirers can peruse information, if they wish, 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 (e-mail smi@ansto.gov.au).

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

The Director, Government and Public Affairs, and the Director, Corporate Services, have been appointed as authorised officers under Section 23 of the FOI Act.

Appendix 3

Functions and Powers of the Organisation under the ANSTO ACT

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

Functions of the Organisation under the ANSTO Act

Section 5 of the ANSTO Act provides that:

(1) The functions of the Organisation are:

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

(i) nuclear science and nuclear technology;

(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;

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

(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;

(c) to provide and sell goods (whether produced by the Organisation or purchased or otherwise acquired by the Organisation) and services:

(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

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

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

(e) to provide advice on aspects of nuclear science and nuclear technology and other matters related to its activities;

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

(i) providing training and management expertise; or

(ii) selling or leasing equipment; or

(iii) leasing land and facilities; or

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

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

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

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

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

(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 [the Lucas Heights Science and Technology Centre] are situated to become a national nuclear waste repository.

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

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

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

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

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

Subsection 4 (2) of the *Australian Nuclear Science and Technology Organisation Amendment Act 1992* (the ANSTO Amendment Act) provides that subject to subsection 4 (3), for the purposes of paragraph 5 (1) (ba) of the ANSTO Act, any radioactive material or radioactive waste that is stored on the Organisation's premises is taken to be radioactive material and radioactive waste arising from the Organisation's activities.

General powers of the Organisation under the ANSTO Act

Section 6 of the ANSTO Act provides that:

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

(a) to enter into contracts;

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

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

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

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

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

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

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

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

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

Appendix 4

Status Report – EIA Conditions for the Replacement Research Reactor

Fourth 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 in March 2002.

Introduction

The 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 reasons based 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 fourth 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.

Since the completion of the environmental assessment process, there has been major progress on the replacement reactor project. The House of Representatives agreed to the necessary expediency motion on 26 August 1999 to carry out the work, based on the report of the Parliamentary Standing Committee on Public Works. The request for tender was subsequently provided to the four pre-qualified tenderers, with tenders closing in January 2000. After an exhaustive evaluation of the offers from the four tenderers, INVAP S.E. was named the preferred tenderer in June 2000. Following a period of pre-contract negotiation, the contract between ANSTO and INVAP was signed on 13 July 2000. INVAP is undertaking the project in an alliance with an Australian joint venture between John Holland Construction and Engineering Pty Ltd and Evans Deakin Industries Limited. Compliance with the Environmental Impact Statement conditions forms a contractual requirement.

In May 2001, the Preliminary Safety Analysis Report (PSAR) was submitted to ARPANSA as part of ANSTO's application for a licence to construct the Replacement Research Reactor. ARPANSA is currently finalising the review process with relation to the construction licence application (http://www.health.gov.au/arpansa/rrrp.htm). Since the previous report, submitted in September 2001, a number of major steps relating to the satisfaction of the conditions have been taken. A Stormwater Control Plan for the replacement reactor site and a Plan of Management for the Buffer Zone have been completed and approved by Environment Australia. A Construction Environment Management Plan has been completed and submitted to the Minister for the Environment and Heritage for his approval. The Minister for the Environment and Heritage has made a determination on the resolution of the Community Right to Know Charter. Twelve months' data have been collected from the groundwater monitoring program and submitted to ARPANSA.

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.

Status Report – EIA Conditions for the Replacement Research Reactor

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

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;*
- *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*

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Protection and Nuclear Safety Agency (ARPANSA) and the Department of the Environment and Heritage for agreement.

The Construction Environmental Management Plan (CEMP) was submitted to the Minister for the Environment in late 2001. The CEMP included plans for Erosion and Sedimentation Control, Remedial Action for the treatment of hydrocarbon-impacted soil, Air Quality and Noise management.

See response to Condition 11 for discussion of groundwater monitoring.

The results of the analysis of stormwater collected in three events during 2002 have been submitted to ARPANSA.

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.

As previously advised, the NSW Roads and Traffic Authority has advised that upgrading of the intersection is not necessary.

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.

The Stormwater Control Plan (SCP) was forwarded to the Department of the Environment and Heritage in September 2001. By way of a letter dated 9 November 2001, the Department advised that:

"…the Plan… is a satisfactory one and prepared in accordance with NSW EPA guidelines as required by the Condition… [T]he Plan as submitted fulfils Condition 5 to the satisfaction of this Department."

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.

The revised Lucas Heights Buffer Zone Plan of Management was forwarded to the Department of the Environment and Heritage in October 2001. By way of a letter dated 30 October 2001, the Department advised that:

"…the revised Plan… is a satisfactory revision of the earlier one… prepared in consultation with relevant stakeholders as required by Condition 6… [T]he review of the Plan fulfils Condition 6 to the satisfaction of this Department."

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.

In June 2001, ARPANSA issued an airborne radioactive discharge authorisation for ANSTO's operations which sets out a range of Notification Levels relating to emissions from stacks.

The discharge authorisation directly refers to this condition, and states that the values which have been used to demonstrate compliance are the levels foreshadowed in the EIS. As previously advised, ANSTO has already conducted significant research with the net result that gaseous emissions from Building 54 have already been reduced by almost an order of magnitude.

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 the airborne emissions from the LHSTC. As indicated above, the work on timing of process steps in Building 54 has resulted in a reduction in emissions of almost an order of magnitude. As part of the ISO14001 process, ANSTO is continuing its characterisation of other emission sources.

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

The changes in processes outlined under condition 7 have seen significant reductions in releases achieved. ANSTO has also in place a major project that is reviewing all aspects of molybdenum-99 production, including new target technology, modification of the target handling system and new processing techniques. The review is scheduled for completion in 2003. Consultations with ARPANSA will take place once initial scientific studies are completed.

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

ANSTO's Trade Waste Agreement requires that, by the time discharges from Lucas Heights reach the Sewage Treatment Plant at Cronulla, the levels of radioactivity in the sewage arriving at the plant comply with the World Health Organisation's derived concentration limits for drinking water. The Trade Waste Agreement will be reviewed periodically to ensure that it takes into account any changes in operations, both within the LHSTC and within the sewage handling system. As part of its Environmental Management Action Project, ANSTO is in the process of characterising its liquid discharges in terms of their source within the LHSTC and their contribution to the discharge to sewer. This assessment will be submitted to ARPANSA prior to reactor operations commencing. Further, ANSTO plans to construct a new liquid waste treatment plant during 2003, which will result in further reductions in discharges of radioactivity to the sewer. Design and operation of the plant will need to meet ARPANSA's requirements.

A new Cronulla Sewage Treatment Plant was commissioned in May 2001. As foreshadowed in the previous report, an investigation into the behaviour of radionuclides within the plant's systems is currently under way.

11) As part of the groundwater monitoring program (see Recommendation 2 above), ANSTO must establish bores at appropriate locations in the LHSTC and the buffer zone to ensure coverage of contaminants from the site overall and aquifer flows downstream of the proposed reactor. The locations and monitoring regimes must be agreed with ARPANSA.

The collection of baseline groundwater commenced during the year 2000. A report on 12 months' monitoring was submitted to ARPANSA in

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Status Report – EIA Conditions for the Replacement Research Reactor

February 2002. This report has since been independently reviewed by PPK Environment & Infrastructure, as required. The PPK review was provided to ARPANSA in March 2002. Its recommendations for changes to the monitoring program will be discussed with ARPANSA as part of the program's continual improvement.

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.

Three new ultra-sensitive Exploranium radiation detectors for conducting a detailed radiological characterisation of the site and buffer zone have been commissioned by ANSTO. The three detectors are now deployed to measure airborne emissions, sending data back to a central server by radio-modem. These detectors are being used to evaluate the atmospheric transport and dispersion models used to estimate the impact of airborne emissions.

An airborne gamma radiation survey will be undertaken to provide a radiological characterisation of the site and the buffer zone. Any anomalies will be investigated using the portable Exploranium radiation detector bought for the purpose. This unit is combined with a global positioning system, which enables ground-based traverses to provide radiation plots.

The characterisation of the remainder of the site and the buffer zone will be completed prior to commissioning of the reactor.

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 our previous report, Senator Hill advised ANSTO in August 2001 that, in view of ARPANSA's report that the review had been completed to its satisfaction, "Condition 13 has been met".

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.

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 is being examined by ARPANSA as part of its consideration of the PSAR and the application for a construction licence.

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 is considering this issue as part of consideration of the PSAR and the application for a construction licence.

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

This matter was addressed in the PSAR. ARPANSA is considering this issue as part of consideration of the PSAR and the application for a construction licence.

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

An analysis and design of the fire suppression system was undertaken during the detailed design phase. The proposed systems were described in the PSAR. ARPANSA is considering this issue as part of consideration of the PSAR and the application for a construction licence.

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

This matter was addressed in the PSAR. ARPANSA is considering this issue as part of 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 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 (see condition 13). At an appropriate time after the issue of any Construction Licence by ARPANSA and 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.

The ANSTO Local Liaison Working Party will shortly be asked to endorse a consolidated emergency plan, covering ANSTO's existing facilities, for the site.

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

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Industry, Science and Resources and the Minister for Health, prior to the reactor being commissioned.

ANSTO distributes information to the local community on credible hazards and emergency planning arrangements. This information is available in local libraries. The Local Emergency Management Committee, which has the responsibility for communication on the emergency plans, has recently completed a new public information pamphlet on hazards and risks from the existing HIFAR reactor. Plans for facilitating community understanding of hazards and risks from the replacement reactor will only be able to be developed once the CEO of ARPANSA has assessed the PSAR and reached conclusions regarding the nature of the credible hazards and risks.

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.

On 1 July 2001, the then Minister for the Environment and Heritage advised that he was satisfied with the draft community information program, and that he looked forward to periodic reports on its implementation. The components of the public participation-based Working Together strategy involve working with sectors of the general public in relation to specific design and other elements of the publicly accessible areas of the new facility, together with surrounding features. In order to successfully implement the strategy, several key areas – such as infrastructure, schools and training - required review and the development of appropriate internal ANSTO resources and procedures. A particular focus of the first phase of the program has been on schools and education, with the revision of the organisation of ANSTO tours and the release of an information video entitled "Australian Radioisotopes". The implementation of the program will be further strengthened if a decision is made to grant a construction licence.

25) A high priority must be given by ANSTO to finalising a 'Community Right to Know Charter' between ANSTO and the community. This charter, as a minimum, must establish principles for information exchange, the obligations of parties in providing and using information, timely mechanisms for dispute resolution, and a process for periodic review and update. The use of a recognised mediator to facilitate completion of the charter should be considered. If a charter has not been agreed within 12 months of the date of these recommendations, the outstanding issues of dispute should be referred to the Minister for the Environment and Heritage for resolution, in consultation with the Minister for Industry, Science and Resources and the Minister for Health.

On 3 September 2001, the then Minister for the Environment wrote to ANSTO's Executive Director and to the Mayor of Sutherland Shire advising of his decision on the one issue outstanding from the negotiations on the Charter. The Minister went on to:

"…urge both ANSTO and representatives of the community in the vicinity of the reactor to enter into negotiations to finalise the text of the Community Right to Know Charter, in the light of the terms already agreed upon … and my determination."

Later that same month, the Executive Director of ANSTO wrote to the Mayor of Sutherland Shire requesting an indication of Council's availability for a discussion to finalise the text of the Charter. ANSTO has received no reply to that letter. We recently wrote to Council again, reiterating our availability for such a discussion.

26) Reactor construction should not be authorised until arrangements for the management of spent fuel rods from the replacement reactor have been demonstrated to the satisfaction of ARPANSA and the Minister for the Environment and Heritage.

This matter formed part of the PSAR submitted to ARPANSA (see condition 13). On 20 August 2001, the Executive Director provided the Minister for the Environment and Heritage with a copy of the spent fuel management strategy that was

appended to ANSTO's application for a construction licence.

27) The Minister for Industry, Science and Resources and the Minister for Health should give timely consideration to strategies for the long term management and eventual permanent disposal of Australia's long-term intermediate-level nuclear wastes, and associated issues.

This is not a matter for which ANSTO is responsible. However, we note that the Minister for Industry, Science and Resources announced on 8 February 2001 that the Federal Government will establish a safe purpose-built facility on Commonwealth land for the storage of national intermediate-level radioactive waste produced by Commonwealth agencies. On 16 July 2001, a discussion paper entitled "Safe Storage of Radioactive Waste - The National Store Project: Methods for Choosing the Right Site", prepared by the National Store Advisory Committee and the then Department of Industry, Science and Resources, was released for public comment. The paper looks at the range of criteria that could be used to decide a site for the store. The release of the document is a significant step in the process to select a site for the facility. A paper responding to public comment will be released shortly. The suitability of Commonwealth land for the national store will be assessed against the selection criteria, and we are advised that shortlisting of potential sites is proceeding, with possible completion by the end of 2002.

28) ANSTO must continue, as a high priority, to review and upgrade its environmental management systems (EMS) to achieve ISO 14000 standards. The EMS should be certified by a suitably accredited independent body and be in place prior to the replacement reactor being commissioned.

The process of achieving certification to ISO 14001 prior to commissioning continues. A process for determining environmental aspects of operational activities and services is being implemented for all facilities within ANSTO. The process, which utilises a custom-made computer-based data entry and analysis system, allows staff to analyse the potential impacts of those activities and services. At this stage about 70% of ANSTO activities have been reviewed. The next stage under ISO 14001 is to develop a list of significant environmental aspects. An accredited independent body will certify the EMS prior to commissioning of the replacement reactor.

29) ANSTO must report to the Minister for the Environment and Heritage on measures taken, or to be taken, to implement the above recommendations, including the undertakings and commitments referred to at Recommendation 1. This is to be done by way of an initial written report to the Minister prior to construction commencing and thereafter at six monthly intervals until all recommendations have been addressed to the satisfaction of the Minister for the Environment and Heritage. These reports must be made publicly available by ANSTO, following their acceptance by the Minister.

This report constitutes the fourth report to the Minister for Environment and Heritage as provided by this condition.

Appendix 5
ANSTO Technology Park Tenants

Australian Communications Authority
ABN: 78 334 953 951

The Australian Communications Authority (ACA) is responsible for regulating telecommunications and radio-communications. This includes radio-communications and telecommunications licensing, spectrum management, compliance with codes and standards, performance monitoring and consumer safeguards. The ACA also administers legislative provisions relating to powers and immunities of carriers in installing communications facilities.

The ACA site at Lucas Heights is used for remote monitoring of the radio spectrum. Lucas Heights was chosen for its relatively quiet radio environment.

ATA Scientific Pty Limited
ABN: 85 003 951 737

ATA Scientific Pty Ltd supplies and services analytical instruments. The product range covers the following application areas:

- particle size and powder technology
- spectroscopy - ultraviolet, Fourier transform infra red (FTIR), Raman FTIR, and near infra red (NIR)
- polarimetry - digital and CD spectropolarimetry.

Australian Institute of Nuclear Science and Engineering (AINSE)
ABN: 42 975 449 183

AINSE provides a mechanism through which universities can access the special facilities at Lucas Heights. It also provides a focus for cooperative research in the nuclear scientific and engineering fields. For more information on AINSE please refer to page 83 or go to http://www.ansto.gov.au/ainse/index.html.

Becquerel Laboratories Pty Ltd
ABN: 28 003 271 832

Becquerel Laboratories are specialists in neutron activation analysis, providing multi-element analysis of samples, mainly for mineral exploration and mining groups.

Bilyara Aviation Services Pty Ltd
ABN: 96 003 908 414

Bilyara Advanced Technologies Pty Ltd
ABN: 67 095 469 113

Bilyara Aviation Services Pty Ltd is a privately owned Australian company providing high technology goods and services to the aviation industry in Australia, China and the Pacific Rim. Bilyara Advanced Technologies, formed in 1992, specialises in support services for the non ferrous metals industry, particularly alumina refineries and aluminum smelters, in Australia and China.

The Bilyara Group is now a successful international company, providing marketing and project management services to Australian and international companies seeking to do business in Australia, China and the Pacific Rim.

Shire of Sutherland Credit Union
ABN: 89 087 650 708

The Sutherland Shire Credit Union operates an automatic teller machine in ANSTO's Reception Centre and has an office on site where staff can see a Credit Union staff member by appointment.

Commonwealth Scientific and Industrial Research Organisation (CSIRO) - Division of Minerals and Division of Energy Technology
ABN: 41 687 119 230

Both CSIRO Energy Technology and CSIRO Minerals Divisions are represented at the Lucas Heights site. CSIRO Energy Technology undertakes research and development on clean coal utilisation, gas utilisation, hybrid solar-fossil energy technologies and greenhouse gas mitigation. CSIRO Energy Technology also contributes to CSIRO's broader environmental capability through expertise in advanced analytical and biological chemistry applied to water quality through the Centre for Advanced Analytical Chemistry. The Centre is a world leader in ultratrace analysis of environmental samples and the environmental chemistry of natural water systems.

CSIRO Minerals has established a reputation as a world leader in the development, implementation

and commercialisation of on-line analysis systems in the mineral and coal industries. The current emphasis of the CSIRO Minerals Lucas Heights Group is on meeting the needs of Australian industry for on-line analysis systems by applying nuclear, microwave, ultrasonic and optical techniques to on-line determination of composition, mineralogy, flow and particle size for ore sorting.

Silex Systems Limited
ABN: 69 003 372 067

Silex Systems is an Australian technology company listed on the Australian Stock Exchange. The principal business activity is the development of Laser Isotope Separation Technology known as "SILEX". The main applications for this technology are:

- uranium enrichment for nuclear power fuel. This application is under development with US partners USEC Inc
- silicon and carbon enrichment for advanced semiconductor materials such as enriched silicon wafers.

Silex Systems Ltd also has extensive interest in several advanced semiconductor technologies, with activities in the photonics/fibre optic arena as well as in the conventional silicon semiconductor industry.

Vita Medical Limited (Formerly Tetley)
ABN: 46 002 141 504

Vita Medical develops, manufactures and distributes diagnostic medical products. The company specialises in lung ventilation imaging in the field of nuclear medicine.

Tru-Tec Australasia (Koch Australia Pty Ltd)
ABN: 70 080 357 366

The Process Diagnostic Division of Tru-Tec Services Inc. specialises in unique diagnostic techniques used to evaluate the integrity and performance of distillation columns, reactors, heat exchangers and other critical process systems. Tru-Tec has become a world leader in industrial process diagnostics, helping to solve practical on-line problems that relate to plant operation and maintenance.

Waste Service NSW
ABN: 93 524 709 106

Waste Service NSW provides putrescible and non-putrescible waste disposal facilities for the community and encourages waste recycling and processing. The organisation operates regional solid and liquid waste management facilities, including landfill sites, transfer stations and recycling and processing centres in the Sydney metropolitan area. It offers consultancy services based on 25 years of experience to local and overseas projects whether private, public sector or joint private/public sector. A major consultancy project was the remediation of Homebush Bay in Sydney.

Appendix 6

Ecologically Sustainable Development and Environmental Performance

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

The Health, Safety and Environment Policy of the organisation places the protection of human health and safety and the environment as ANSTO's highest priority. The commitment involves the implementation of an ISO 14001 compliant Environmental Management System, which is a recognised framework for continuous improvement in environmental performance. The ISO Standard will be fully implemented before the commissioning of the Replacement Research Reactor. An Environmental Principles Plan is being implemented to ensure incorporation of ecologically sustainable development principles through all stages of the design and construction of the replacement reactor. A specific construction environmental management plan has been prepared for the construction stage.

Under its Health, Safety and Environment Policy, ANSTO provides verifiable evidence of the fulfilment of this policy through a program of monitoring and audit, and regular public reporting of results. The scope of the monitoring program and the results are published in a series of annual reports: *Environmental and Effluent Monitoring at ANSTO Sites*. The monitoring program covers not only the Lucas Heights Science and Technology Centre but also the 1.6 km buffer zone and other locations that could be affected by ANSTO activities, such as the Cronulla Sewage Treatment Plant and the sea surrounding the effluent release point at Potter Point. Further details are provided under "Treatment and management of man-made and naturally occurring radioactive substances", page 45, and "Safety and environmental protection arrangements at ANSTO facilities", page 67, in this report.

Commitment to ecologically sustainable development includes the handling of ANSTO's historical wastes and the management of the current waste stream in a manner that protects human health now and in the future. Emphasis is being placed on waste minimisation measures. It also includes the management of engineering services on site in a manner that leads to savings in electricity and water consumption.

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

Appendix 7
Commonwealth Disability Strategy

ANSTO carried out a number of activities relating to the Commonwealth Disability Strategy during the year:

- *In its role as Policy Adviser:* A number of formats are used to publicise ANSTO initiatives. These include face-to-face briefings with the local community and representative groups, postal advice and ANSTO's website.
- *In its role as Regulator:* ANSTO has a website that publishes a significant amount of information about the organisation, including its activities, legislation, opportunities for employment and media releases.
- *In its role as Employer:* ANSTO is committed to equitable and fair treatment in the workplace. An organisation-wide survey undertaken to update Human Resources master data included identifying anyone with a disability. In addition a comprehensive review of the Human Resource policies and procedures confirmed that ANSTO's employment policies, procedures and practices comply with workplace diversity requirements.

Vacancies are posted on the Internet and there are guidelines and assistance to members of recruitment panels who deal with applicants with a disability.

No complaints were made or grievances raised by people with disabilities in relation to employment practices during the year. ANSTO has formal complaints and grievance mechanisms outlined in its enterprise agreement. Staff also have access to an internal Contact Officer network and counselling through an employee assistance program.

Appendix 8
Index of compliance with reporting guidelines

INDEX OF COMPLIANCE WITH REPORTING GUIDELINES UNDER VARIOUS ACTS, REGULATIONS AND ORDERS APPLICABLE TO ANSTO

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AHSEC	ANSTO Health, Safety and Environment Committee
AIMS	Australian Institute of Marine Science
AINSE	Australian Institute of Nuclear Science and Engineering
AMS	Accelerator Mass Spectrometry
ANAO	Australian National Audit Office
ANBF	Australian National Beamline Facility
ANSTO	Australian Nuclear Science and Technology Organisation
ANTARES	Australian National Tandem Accelerator for Applied Research
ARC	Australian Research Council
ARI	ANSTO Radiopharmaceuticals and Industrials
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASNO	Australian Safeguards and Non-proliferation Office
ASRP	Australian Synchrotron Research Program
BIPM	Bureau International des Poids et Mesures
CEA	French Atomic Energy Commission
CRC	Cooperative Research Centre
CRP	Coordinated Research Programs
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCC	Digital Coincidence Counting
EIS	Environmental Impact Statement
EMAP	Environmental Management Action Plan
EMP	Environmental Management Plan
EPA	Environment Protection Authority
FDG	Fluorine-18 fluorodeoxyglucose
FNCA	Forum for Nuclear Cooperation in Asia
IAEA	International Atomic Energy Agency
IBA	Ion Beam Analysis
INIS	International Nuclear Information System
ISO	International Standards Organisation
LENS	Learning Environment for New Strategies program
LHSTC	Lucas Heights Science and Technology Centre
LLWP	Local Liaison Working Party
mSv	millisieverts
NEA	Nuclear Energy Agency
NMC	National Medical Cyclotron
NMR	Nuclear Magnetic Resonance
OECD	Organisation for Economic Cooperation and Development
PI^3	Plasma Immersion Ion Implantation
PSAR	Preliminary Safety Analysis Report
RCA	Regional Cooperative Agreement
RRR	Replacement Research Reactor
SAP	Software supporting ANSTO's business information system
SIMS	Secondary Ion Mass Spectrometry
TGA	Therapeutic Goods Association

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Guided Tours
Free guided tours of the ANSTO site and laboratories are available to individuals, groups and schools. For bookings and information, telephone (02) 9717 3168

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Opposite page: the Australian Atomic Energy Cooperation, ANSTO's predecessor, published its first annual report in 1953, making the ANSTO Annual Report for 2001-2002 the 50th in the series.

COMMONWEALTH OF AUSTR

AUSTRALIAN ATOMIC ENERGY COMMISSION

FIRST ANNUAL REPORT
1953

To the Hon. Howard Beale, Q.C., M.P
Minister of State for Supply.

Sir,

In accordance with section 31 of
for your consideration the annexed first
Atomic Energy Commission.

The report reviews the operations
on 17th April, 1953, to 30th June, 1953,
to that date, with a report by the Audi
by the Act.

The functions committed to the
fall broadly into two divisions. On the
the development of the uranium resou
of this metal for the production of a

HISTORY AND ESTABLISHMENT.

THE PERIOD UNDER REVIEW.

1. The establishment of the Australian Atomic Energy Comm
provided for statutorily by the Atomic Energy Act 1953, which was
on 15th April, 1953. The members of the Commission were appoi
Governor-General on 17th April, 1953. In a statutory sense, the
operations of the Commission had their commencement on that
report is accordingly presented as a report for the period from
1953, to 30th June, 1953, the Act providing that the Commission sh
to the Minister administering the Act a report of its operations to t
day of June in each year.

2. The review given in the following pages, however, covers a perio
back considerably beyond the date of the Commission's establish
statutory body. Although its operations under the Act date only
April, 1953, the Commission came into existence as an administrative
the Government on 27th November, 1952, when its members were selec

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	61,341	17	6
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n Pty. Ltd.			
nature of salaries			
	£	s.	d.

Australian Nuclear Science & Technology Organisation