

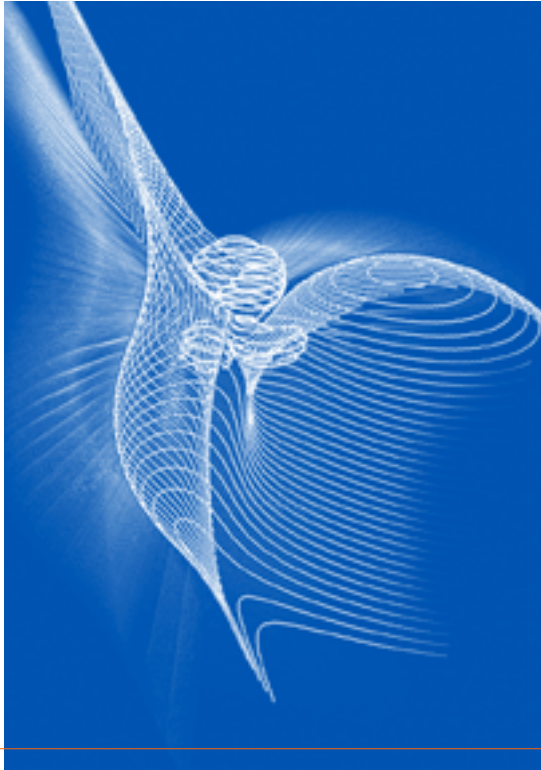


ANSTO Annual Report 2000 - 2001



Ansto

Australian Nuclear Science & Technology Organisation



Calculated contour lines of electric fields surrounding a molecule of the iodine-123 labelled radiopharmaceutical iodomethylphenidate. Iodomethylphenidate binds to specific proteins in the human brain. As the iodine-123 decays it produces an image of the density and distribution of these proteins, enabling clinicians to diagnose diseases such as Parkinson's and Attention Deficit Hyperactivity.



Lucas Heights Science & Technology Centre,
New Illawarra Rd
Lucas Heights, NSW
Private Mail Bag 1 Menai, NSW 2234.
General telephone (61 2) 9717 3111
Facsimile (61 2) 9543 6907

28 September 2001

Senator The Hon, Nick Minchin
Minister for Industry, Science and Resources
Parliament House
CANBERRA ACT 2600

Dear Minister

In accordance with section 9 of the Commonwealth Authorities and Companies Act 1997 I am pleased to present the Annual Report of the Australian Nuclear Science and Technology Organisation for the period 1 July 2000 to 30 June 2001.

Yours sincerely

A handwritten signature in black ink, appearing to read "S M Richards".

S M Richards
Chairman at June 30, 2001.

Chairman's Letter to the Minister	ii
About ANSTO	
Mission, Enabling legislation, Responsible Minister, Statement of compliance	iv
Organisation chart	v
Members of the Board	vi
Chairman's report	1
Executive Director's report	3
Highlights	5
Key Performance Indicators	9
Core Business Areas	13
International strategic relevance of nuclear science and technology	14
Core nuclear facilities operation and development	22
Nuclear science for environment and sustainability	30
Treatment and management of man-made and naturally occurring radioactive substances	33
Sustainability and international competitiveness of industry	38
Organisational development and support	45
Safety and environmental protection arrangements at ANSTO facilities	51
Corporate Governance	59
Associated organisations	66
Australian Institute of Nuclear Science and Engineering	67
Financial Statements	F1
Appendices	A1
1. Equality of employment opportunity	A2
2. Freedom of Information	A3
3. Functions and powers of the Organisation under the ANSTO Act	A5
4. Status report on the implementation of the conditions arising from the Environmental Impact Assessment of the Replacement Research Reactor	A8
5. ANSTO Technology Park tenants	A18
6. Ecologically sustainable development and environmental performance	A21
7. Index of compliance with reporting guidelines	A22
Glossary	A23
Index	A26

The Australian Nuclear Science and Technology Organisation (ANSTO) is Australia's national nuclear research and development organisation. It has a staff of approximately 800 and is located at the Lucas Heights Science and Technology Centre, some 40 km south west of Sydney city centre. The science and technology centre occupies 70 hectares and is surrounded by a 1.6 km buffer zone.

ANSTO operates Australia's only nuclear reactor, the research reactor HIFAR (which stands for High Flux Australian Reactor). 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 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. The facility is located in the grounds of the Royal Prince Alfred Hospital in Camperdown, an inner west suburb of Sydney.

ANSTO provides the broad range of technical expertise needed to support Australia's nuclear interests. It advises the Commonwealth Government on issues associated with the nuclear fuel cycle and the operation of nuclear facilities and it supports industry through the development and application of nuclear science based technology and associated capabilities.

ANSTO organises its activities under six core business areas. Safety and environmental protection arrangements at ANSTO facilities are reported against separately. Further information about the organisation is available on ANSTO's web site at www.ansto.gov.au.

Mission

ANSTO's 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.

Enabling legislation

The Australian Nuclear Science and Technology Organisation (ANSTO) is a body corporate established by the Australian Nuclear Science and Technology Organisation Act 1987.

The functions and general powers of ANSTO are set out in Part 2, Sections 5 and 6 of the Act. See also 'Functions and Powers of the Organisation under the ANSTO Act', Appendix 3 of this Report.

Responsible Minister

The responsible Minister during the reporting period was Senator the Hon Nick Minchin, Minister for Industry, Science and Resources.

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. An index of compliance is provided in Appendix 7.

As at 30 June 2001

MINISTER

SENATOR THE HON. NICK MINCHIN MP
Minister For Industry, Science and Resources

BOARD

DR MAX RICHARDS
Chairman

CHIEF EXECUTIVE AND EXECUTIVE DIRECTOR

PROFESSOR HELEN GARNETT

MS CHRISTINE EYLES
Executive Secretary

SENIOR MANAGEMENT

DR RON CAMERON
Director, Safety

MR KEN HORLOCK
Director, Nuclear Technology

DR STUART CARR
Director, Radiopharmaceuticals

DR ADAM JOSTSONS
Director, Materials

DR GREG DOHERTY
Director, Information Management

MR JOHN ROLLAND
Director, Government and Public Affairs

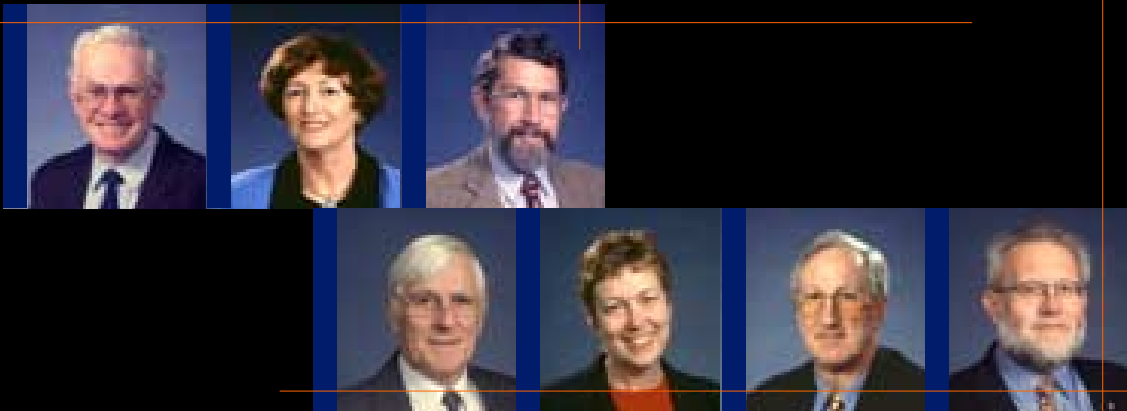
MR ROGER GRAY
Director, Business Collaboration

DR BRIAN SPIES
Director, Physics

PROFESSOR ANN HENDERSON-SELLERS
Director, Environment

MR ROBERT WILSON
Director, Corporate Services

MR BARRIE HILL
Director, Engineering



Members of the Board from the top, left to right

DR MAX RICHARDS *Chairman*

Chairman since 1 January 1997.
Appointed on 5 July 1996 until 30 June 2001.
Company director.

PROFESSOR HELEN GARNETT

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

Reappointed on 1 January 2000 until 30 June 2002. Nuclear medicine physician.

MR JOHN CRAKER

Appointed on 2 June 1998 until
31 December 2002.

DR CARRIE HILLYARD

Appointed on 21 July 1999 until 21 July 2004.
Venture capital partner.

MR MIKE CODD AC *Deputy Chairman*

Deputy Chairman since 1 January 1997.
Reappointed on 21 July 1999 until
31 December 2001. Company director.

MR JOHN SPASOJEVIC

Appointed 21 July 1999. Resigned 23 March 2001.*
Deputy Chief Executive Officer, Department of
Industry, Science and Resources.

* Replaced by Mr Grahame Cook

MR GRAHAME COOK

(Not pictured above)
Appointed 13 June 2001 until 4 April 2006.
Head, Innovation and Science Division, Department
of Industry, Science and Resources.

This is my final report as Chairman of ANSTO, and the 49th Annual Report of ANSTO and its predecessor, the Australian Atomic Energy Commission.

Effective parliamentary appropriation (including equity injections and excluding capital use charge) received in 2000-2001 was \$140.7 million (1999-2000, \$80.069 million). This included \$50.0 million for the replacement research reactor and \$13.5 million to remove HIFAR spent fuel elements. Appropriation for operational and capital expenses for science and technology activities was \$77.2 million (1999-2000, \$67.754 million). Expenditure on capital equipment and infrastructure was \$14.7 million (1999-2000, \$12.9 million) excluding expenditure on the replacement research reactor. With regard to revenue, ANSTO generated \$35.8 million (1999-2000, \$32.2 million) from external services, representing 29.5% of total income, excluding capital use charge.

The operating result represents a \$5.3 million deficit. An outcome of this kind had been forecast to the Board, the Minister and the Department of Finance, for some time with



agreement that funding would be provided to cover this deficit in 2000-2001. The deficit was an outcome of our limited ability to respond to decreasing parliamentary appropriations and various new government charges, while maintaining the operation of facility safety and the core competencies of the organisation. In response to these funding challenges, the organisation increased external earnings, improved efficiencies and reduced expenditure on research and development. With the aim of establishing an appropriate base for the future, ANSTO undertook an output pricing review with the Department of Finance. This review concluded that the price for operating the nuclear facilities and delivering nuclear expertise is appropriate, and that ANSTO's

management and pricing are consistent with world's best practice. Government has agreed that ANSTO be supplemented for the increased costs associated with regulation, that backlog maintenance funding be provided for three years, and that there be no further cuts to ANSTO's research funding.

The Department of Finance determined that funding to cover the \$5 million operating deficit for 2000-2001, would be received as an equity injection during 2001-2002 rather than in the 2000-2001 financial year.

The financial pressures referred to above and the organisation's responses to them obliged the Board to carefully monitor research expenditure to ensure it was well focussed on worthy achievable objectives. The Technical Advisory Committee (Appendix 3, pA5) met each year for the past five years for this purpose and its reports are reassuring. ANSTO, through its people, its facilities and its attitudes, is bringing considerable credit to Australia in nuclear-related matters and the application of its expertise to address issues of socio-economic importance.

Other highlights include:

- the replacement research reactor project, to be completed in 2005, proceeded on schedule and within budget
- the fifth shipment of spent fuel was made successfully, so that more than half of the spent fuel accumulated over the entire lifetime of HIFAR has now been shipped overseas
- radiopharmaceutical sales reached \$17.9 million, a \$2 million increase over the previous year.

During my five years as Chairman, I have come to admire ANSTO people for their expertise, their willingness to embrace change and their fortitude in the light of much unfounded and uninformed criticism. Professor Garnett's leadership is outstanding, and the contribution made by the whole Board has been substantial.

I am privileged to have served Australia, through ANSTO, in this way.



DR MAX RICHARDS
Chairman

During this past year the staff of ANSTO have, once again, given of their best to take the Organisation forward. At the beginning of the year, we celebrated the signing of the Contract for the Replacement Research Reactor with INVAP S.E., who, in association with John Holland Construction and Engineering Pty Ltd and Evans Deakin Industries Limited (now Downer Engineering Group Pty Limited) alliance, were awarded the contract for the detailed engineering design, construction and commissioning of the replacement research reactor at the Lucas Heights Science and Technology Centre. Since then a great deal of effort has been expended by ANSTO teams working on the Preliminary Safety Analysis Report for the reactor, as well as the review of the detailed engineering design. The project is currently within budget and on schedule.

Another milestone this year, not only for ANSTO but Australia as a whole, was the entry into force in January of an Integrated Safeguards Agreement with the IAEA. ANSTO, together with the Australian Safeguards and Non-Proliferation Office have led the world on the implementation of integrated safeguards, and other countries are now following. While this development has required the investment of additional resources by ANSTO, it is an investment that will set a new standard for transparency and strengthening of the international safeguards regime.

Safety has continued to be the focus of everything ANSTO does. The days lost due to occupational work place incidents fell significantly with promotion of early return to work a key focus. Improvements in technology led to a further reduction in ANSTO's already very small emissions. As has been the tradition over many years, ANSTO will publish a separate Environment Report.

ANSTO's efforts are also leading to continuous improvement in the resource and environmental sectors. Its technology in monitoring and predicting the behaviour of sulphidic effluent from mine wastes are now being recognised by the International Network for Acid Prevention. Another pleasing outcome was the recognition of ANSTO's radio-tracer expertise in solving pollution related problems.



In July 2000 the contract for the design and construction of the replacement research reactor was signed between ANSTO and INVAP S.E., an Argentine company.

Testimony to this was the award of the Hong Kong-Australia Business Association and HSBC Business Award 2000 in the category of Export Services, for work conducted over several years in accessing the dispersal of effluent from sewerage outfalls in Hong Kong Harbour.

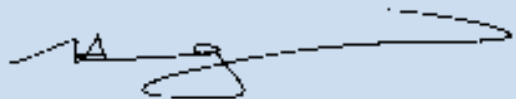
In the health sector, ANSTO's reputation and capabilities continued to grow with Therapeutic Goods Administration approval for FDGen™, a metabolic tracer used in the diagnosis of the staging of cancer in cardiac imaging and the imaging of certain neurological conditions. Another significant achievement was the growth in revenue for ANSTO's Radiopharmaceutical and Industrials business, which grew by 12.5% over the year. ANSTO's international standing in the field of radiopharmaceuticals was reinforced by selection as the host institution for the 15th International Symposium on Radiopharmaceutical Chemistry in August 2003.

Not only is the application of, and recognition for, ANSTO's knowledge and know-how important for the future of the Organisation, equally important is in the on-going development of new knowledge and know-how through strategic research. The fact that the number of quality peer

reviewed journal articles has been sustained, even as effort has been directed to the replacement research reactor and spent fuel projects as well as to initiatives to achieve value from the existing intellectual property, is heartening.

In the field of strategic research, the use of neutron scattering techniques to understand the structure of a range of materials from charcoal to polymers has yielded some exciting results. Studies on the variation of porosity in charcoal have already led to a hypothesis of how the nature of charcoal might influence its efficiency in purifying metal in a blast furnace. Similarly, studies on the structure of polymer chains are already suggesting how the entanglement, a result of the manufacturing process, might influence the properties of a manufactured item.

With some serious financial issues resolved through the outcome of a Pricing Review, undertaken in cooperation with the Department of Finance and Administration, and with the replacement research reactor project well under way, ANSTO and its staff can look forward to an exciting future which should be rewarding, not only to the Organisation, but to Australia at large.



PROFESSOR HELEN GARNETT
Chief Executive and Executive Director

International strategic relevance of nuclear science and technology

- Through its close cooperation with the Australian Safeguards and Non-proliferation Office (ASNO), ANSTO helped establish the conditions that enabled Australia to become the first country to operate under the new IAEA integrated safeguards regime. This new standard for transparency and openness to international safeguards scrutiny further strengthens the international non-proliferation regime. The IAEA has used Australia's drive and leadership as an example for other countries to follow. It has enabled the IAEA and Australia to effectively promote integrated safeguards as the emerging norm in effective and cost-efficient safeguards implementation. Australia's leading role on integrated safeguards is attracting interest from around the world.
- Parliament and the public were provided with extensive information on the replacement research reactor to be constructed at Lucas Heights and on the management of spent fuel.
- ANSTO has been recognised by its peers and the IAEA as one of the leading laboratories for developing advanced methods for tracing environmental signatures from any undeclared nuclear activities such as reprocessing, and the deployment of depleted uranium-based ammunition.



In April a group of 2001 Young Environment Envoys from the Asia Pacific Region visited ANSTO as part of an Australian study tour. The program was set up by the United Nations to train future leaders in environmental protection and the sustainable management of natural resources in the Region.

- ANSTO played a key role in formulating integrated arrangements to coordinate assistance in implementing strengthened radiation protection mechanisms provided by the IAEA to its member states.

Core nuclear facilities operation and development

- In July 2000 contracts for the design, construction, commissioning and demonstration of performance of the replacement research reactor were signed. The main contractor is INVAP S.E., an Argentine company, working in partnership with an Australian joint venture subcontractor comprising John Holland Construction & Engineering Pty Ltd and Evans Deakin Industries Limited.
- In May 2001 ANSTO submitted to ARPANSA an Application for a Facility Licence, Construction Authorisation for the replacement research reactor.

- In January 2001, 360 HIFAR spent fuel elements (approximately 30% of the remaining site inventory) were safely transported to COGEMA in France for reprocessing.

Nuclear science for environment and sustainability

- A memorandum of understanding (MOU) was signed in September 2000 between the Institut de Recherche pour le Développement (IRD) Noumea and ANSTO for collaboration in an investigation of the tropical coastal and the marine environment zone around New Caledonia using environmental radiotracers. The first collaborative research voyage under this MOU was completed in March 2001.

- ANSTO, in collaboration with the Philippines Nuclear Research Institute (PNRI), used radiotracer techniques to validate a three dimensional water circulation model of Manila Bay developed by the UNSW Water Research Laboratory and carried out within the framework of an IAEA/Regional Cooperative Agreement project. The model will be used to address harmful algal bloom concerns in a wider program coordinated by the University of the Philippines and PNRI.
- ANSTO contributed to the International Aerosol Characterisation Experiment (ACE) in Asia, which is characterising soil dust and industrial pollution and studying their effects on global climate change. ANSTO scientists are tracking radon to identify the origins of the material and using the organisation's accelerator facilities to analyse samples collected from various Asian locations.

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

- ANSTO presented five papers, including a plenary, at "Uranium 2000", held in Saskatoon, Canada. This international symposium on the process metallurgy of uranium was the first on the subject for 20 years. ANSTO's work in applied research and technology was acknowledged as very relevant in an industry where research has been lacking.



In September 2000 ANSTO Safety gained AS/NZS ISO 9002:1994 certification for health physics instruments calibration, external dosimetry and stack monitoring operations. Here Ron Cameron (right), Director of Safety, receives the Certificate of Registration from Mario Bracco, the Quality Assurance Services Auditor.

- In August last year ANSTO's synroc team organised a Materials Research Society symposium in Sydney on the Scientific Basis for Nuclear Waste Management. This series of annual international conferences is generally held in the United States. It was attended by more than 200 scientists from around the world and by representatives of the International Atomic Energy Agency (IAEA). ANSTO staff were authors or co-authors of 20 papers out of a total of 140.
- Hot isostatic pressing of synroc with surrogate wastes was demonstrated in the fully remote hot cells at Argonne National Laboratory-West in Idaho in the United States under a joint Cooperative Research and Development Agreement (CRADA). The final demonstration with full radioactive waste will take place in October 2001.

Sustainability and international competitiveness of industry

- ANSTO received general marketing approval from the Therapeutic Goods Association (TGA) for the commercial sale of fluorine-18 fluorodeoxyglucose (FDG), which was registered under the tradename FDGen® (pronounced efdgen). FDGen® is a very sensitive metabolic tracer used in the diagnosis and staging of cancer, in cardiac imaging and in imaging the effects of certain neurological conditions. It has a half-life of only 110 minutes so cannot be transported long distances.

The approval of FDGen® was a major achievement for ANSTO as there are fewer than 10 registered manufacturing sites in Europe.



Amy Le, a production engineer, working with the FDGen® Automatic Dispenser Unit.

FDGen® is a very sensitive metabolic tracer used in the diagnosis and staging of cancer, in cardiac imaging and in imaging the effects of certain neurological conditions.

This Dispenser was recently purchased and installed in the PET Clean Room at the NMC and will be used to aseptically dispense the bulk FDGen product into specific customer orders.

- ANSTO began leading the International Network for Acid Prevention (INAP) research project on the scale-up from test results to the prediction of the behaviour of full-scale piles of sulfidic mine wastes. The project involves collaboration with the University of Waterloo, Canada. As a Research Member of INAP, ANSTO attended Operating Committee meetings in Vancouver in November 2000 and Santiago, Chile in April 2001.
- The American Water Works Association Research Foundation (AwwaRF) awarded ANSTO and a coalition of several US universities and contract engineers a grant of US\$200 000. This will enable the sulfite-UV technology that was jointly patented with the CRC for Waste Management and Pollution Control to be independently assessed against other technologies for arsenite oxidation and represents a key milestone for commercialisation of the process.
- ANSTO's environmental analytical chemistry team participated in the 14th National Oceanographic and Atmospheric Administration Inter-laboratory Comparison and received a superior rating in the analysis of marine sediments and tissues. Additionally, ANSTO Environmental Chemistry was the only laboratory to have all analyses for both tissue and sediment samples fall within set limits.

- Jointly with the Australian Centre for Mining Environmental Research (ACMER), ANSTO contributed to a review of the capacity of the minerals industry to enhance and promote biodiversity conservation through a Regional Research Program as part of the Mining Minerals and Sustainable Development (MMSD) global initiative.

Organisational development and support

- ANSTO specified its requirements, and selected a supplier, for an integrated IT system to serve the entire organisation. The system will provide operational improvements and more effective management controls.

Safety and environmental protection arrangements at ANSTO facilities

- ANSTO's Environment Division gained AS/NZS ISO 9001:2000 certification for its Quality Management Systems and Safety Division gained AS/NZS ISO 9002:1994 certification for health physics instruments calibration, external dosimetry, stack monitoring operations, safety training, site operations safety supervisory services, internal dosimetry and management of workers compensation for all ANSTO employees.

The Triennium Funding Agreement between ANSTO, CSIRO and the Australian Institute of Marine Science with the Minister for Industry, Science and Resources and the Minister for Finance and Administration was renewed in October 2000 for a further term of three years.

This agreement is a manifestation of the Government's support in terms of funding for the next three years and provides recognition of the need for science organisations to have a stable financial environment in which to plan. The Government has developed, with the science organisations, the framework and operational elements of arrangements for the next triennium period and these include performance reporting requirements containing an agreed set of performance indicators.

These indicators are used as part of the process of monitoring the performance of ANSTO's functions and achievement of its objectives. Comparative figures for prior years are shown where the same indicators were included in the previous triennial agreement.

I. RESEARCH AND DEVELOPMENT

This set of indicators measures the performance in terms of ANSTO's objective 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 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.

- **Publication level measured by number and categorised by type of publication**

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

- **List of distinguished awards and major prizes**

- Winner Hong Kong/Australia Business Association and HSBL/NSW Business Award for export services
- Fellowship from the Japanese Society for the Promotion of Science

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

- 11 nominations

II. LIAISON AND COLLABORATION

This set of indicators measures the performance of our objective to encourage the transfer of research through liaison and collaboration with industry, government and other users (includes science and academic communities).

The performance indicator is the level of use of ANSTO's facilities.

	ISRN*	CFOD*	NSTN*	TMRS*	SICI*	ORDS*	Total
• The number of post graduate/under graduate students jointly supervised by ANSTO							
2000-2001	0	53	77	23	38	0	191
1999-2000	**	**	**	**	**	**	188
1998-1999	**	**	**	**	**	**	189
• Number of post doctorals using							
	0	11	8	9	17	0	45
• Number of collaborative research projects during the year involving business, governments and other parties external to ANSTO							
	2	136	69	30	39	0	276
• Others using ANSTO facilities							
	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

NSTN: 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 in previous years

III. 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 to Australia.

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

- **External earnings gained as a percentage of total funds**

	From grants	Commercially	Other	Total
External earnings of projects				
- from Government	\$34,028	\$6,180,056	\$2,900,905	\$9,114,990
- from Industry	\$314,158	\$14,815,168	\$5,962,326	\$21,091,652
- International	\$251,704	\$4,006,300	\$28,022	\$4,286,026
Other	\$0	\$0	\$669,377	\$669,377
Total revenue (net of disposal of assets)	\$599,890	\$25,001,524	\$9,560,630	\$35,162,045
Total Government revenue (excluding Capital Use Charge)				\$77,193,000
Total revenue received (net of disposal of assets)				\$112,355,045
Percentage of external revenue to total revenue received			(1999-2000 : 28%)	31.3%

IV. 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.

- **Effort expended for, and on behalf of, Government on domestic and international policy-related issues**

	2000 - 2001
Number of projects	17
Number of person years	(27.7 in 1999-2000) 28.9 years
Amount expended	\$5.84 million

V. CUSTOMER SATISFACTION

This performance indicator measures the performance of our objective to ensure a high level of customer satisfaction.

The performance indicator is the level of successfully completed research and service contracts for industry and government.

- **Proportion of contracts completed through milestone achievements against the number of reports due for completion in the financial year**

	ISRN*	CFOD*	NSTN*	TMRS*	SICI*	ORDS*	Total
Number of contracts due to be completed during the year 2000-2001.	0	58	83	42	408	0	591
Proportion of those contracts completed during the year 2000-2001.	n/a	100%	99%	100%	99%	n/a	99%
Number of continuing contracts at the end of the period 2000-2001.	0	27	0	13	7	0	47
Proportion of those contracts that met their milestones.	n/a	100%	n/a	100%	100%	n/a	100%
Proportion of all contracts in 2000-2001 that were completed or met milestones.	n/a	100%	99%	100%	99%	n/a	99%

* See legend, page 10

- Comparable performance in:

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%

ANSTO Annual Report 2000 - 2001



DRIVER: Government

OBJECTIVES

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.

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.

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

OUTCOMES*

* For the purposes of this report, outcomes are defined as the results, impacts or consequences of ANSTO's work on the Australian and international community.

- Australia continued to play a prominent role in international nuclear initiatives designed to enhance the nuclear non-proliferation and nuclear safety regimes, on a much more influential basis than our national size would suggest. This role was strengthened by the availability of ANSTO's broadly based multidisciplinary nuclear expertise.
- ANSTO's expertise in ultra-sensitive detection of nuclear signatures by accelerator mass spectrometry resulted in ANSTO's acceptance as a member of the IAEA Network of Analytical Laboratories, which supports the international nuclear safeguards program.

Nuclear signatures are the telltale traces of radioactive material left following uranium enrichment and nuclear reprocessing activities. ANSTO is the only laboratory participating in the IAEA field trials with the analytical capability to detect uranium-236 in atmospheric samples near reprocessing plants.

- The focus of the IAEA Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology, embracing 17 countries in our region, is progressively becoming better aligned with regional needs. Regional countries are accepting a greater ownership of the projects within the program, as a result of the implementation of management initiatives facilitated by ANSTO officers.
- The safety of visits by nuclear-powered warships to Australian ports was demonstrated by the comprehensive radiation monitoring program undertaken by ANSTO officers for each of nine such visits. ANSTO's new radiation monitoring system for visiting nuclear-powered warships, trialed last year, was brought into routine operation in one port.
- ANSTO's expanded community outreach activities, which embraced exhibitions and displays, enhanced media and print-based information, increased promotion of site tours and specialist speaking programs, and the development of schools-specific materials, have meant that the community has access to a greater range of communications resources to increase awareness of the benefits of ANSTO's activities.

Aerial photograph, previous page: ANSTO occupies approximately 70 hectares and is surrounded by a 1.6 km radius buffer zone consisting largely of bushland. It is situated at Lucas Heights, about 40 km south of Sydney's city centre.

International strategic relevance of nuclear science and technology

ACTIVITIES AND OUTPUTS

Services to the Australian Government and other national stakeholders

ANSTO provided information and advice on nuclear developments occurring around the world to government departments and agencies, other organisations, the media and members of the public. The information included details of nuclear power programs and electricity production, nuclear research and fuel cycle facilities, safety aspects of nuclear reactors and shipments of radioactive materials. The Replacement Research Reactor Project and radioactive waste management issues were two of the factors that stimulated particular interest in nuclear issues both within Australia and overseas.

ANSTO's Power Reactor Status Summary, available to the public on the organisation's Internet website, was regularly updated. Nuclear power continues to be a major source of the world's electricity with 437 reactors supplying 17% of the world's electricity requirements. Of the 30 power reactors currently under construction in the world, 20 are in the Asia-Pacific region, including eight in China. Nuclear power plants supplied 33% of the total electricity demand in Japan and 40% in the Republic of Korea.

ANSTO continued to contribute to Australian initiatives, coordinated by the Department of Foreign Affairs and Trade, to maintain and develop multilateral nuclear export control regimes by providing technical experts to participate in Australian delegations to attend meetings of bodies such as the Nuclear Suppliers Group.

International Atomic Energy Agency activities

The International Atomic Energy Agency (IAEA), a specialised agency within the United Nations system, is the central intergovernmental forum for nuclear scientific and technical cooperation. ANSTO, as Australia's national nuclear research institute, provides Australia's

principal technical interface with the IAEA. During the year ANSTO's staff participated in a wide range of IAEA activities, including committees, advisory groups and IAEA consultants' meetings. Some 48 ANSTO officers participated in IAEA visits or missions. This broad technical interface with the IAEA, together with the policy role exercised primarily through the Department of Foreign Affairs and Trade, ensured that Australia exercised a positive and influential role in IAEA issues of importance to it.

ANSTO scientists participated in five ongoing IAEA Coordinated Research Programs (CRPs) during the year and began working on two new ones: "Australia's contributions to the IAEA Research Reactor Reliability Data" and "Integration of residence time distribution (RTD) tracing with computational fluid dynamics (CFD) simulation for industry process visualisation and optimisation".

ANSTO contributed to an IAEA consultants meeting on "The Extent of Environmental Contamination by Naturally Occurring Radioactive Materials (NORMs) and Relevant Abatement Measures" and acted as a consultant in the preparation of a final report for the IAEA Co-ordinated Research Program on "Treatment of Liquid Effluents from Uranium Mines and Mills during and after Operation".

Australia regularly assists the IAEA's Technical Cooperation Program by hosting training courses and providing specialists for lecturing and expert assignments. Five IAEA training events and two IAEA technical meetings were hosted by Australia. ANSTO was directly involved in the implementation of three of these events.

ANSTO coordinates the placement and management of all IAEA fellowship holders undergoing training in Australia. During the year, ANSTO hosted Fellows from Bangladesh, the Republic of Korea, Syria and Vietnam and coordinated the placement and management of

International strategic relevance of nuclear science and technology

50 IAEA fellowship holders undergoing training in Australia. These technical cooperation activities reinforce Australia's commitment to meeting its obligations under Article IV of the Nuclear Non-Proliferation Treaty, which provides for parties to the Treaty to make available materials and information to other parties and to cooperate in the further development of the peaceful applications of nuclear energy.

ANSTO took part in an IAEA communications exercise involving 54 countries as part of an emergency exercise held at the Gravelines nuclear power plant site in France in May. The exercise was carried out to test the arrangements that support the Convention on Early Notification in the Event of a Nuclear Accident.

IAEA Regional Cooperative Agreement activities

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.

Over the past 21 years, Australia has provided around \$5 million in extrabudgetary contributions to the RCA through AusAID. In addition, Australia continued to make substantial technical contributions to support its RCA membership, primarily channelled through ANSTO, and to actively participate in the development and management of the RCA program through the formal National RCA Representative and National Coordinators' networks.

The Director of Government and Public Affairs, Mr John Rolland, is the National RCA Representative. He attended the RCA General

Conference meeting in Vienna in September and the RCA Meeting of Representatives in Bangladesh in March. At both meetings Australia continued to take a leading role with initiatives and proposals to achieve a process of increased self-reliance. These reforms will further strengthen RCA regional management and decision-making arrangements and reflect the growing maturity of the program. The Director of Government and Public Affairs also participated in the tripartite meeting for the regional agreements for Asia Pacific, Africa and Latin America, which was held in Vienna in September.

Australia is the Lead Country in a major RCA project on the Management of the Marine Coastal Environment and its Pollution. During the year a regional RCA workshop, jointly hosted by ANSTO and the Philippines Nuclear Research Institute, was the highlight of an activity that involved the use of radiotracer techniques to validate a water circulation model of Manila Bay by the UNSW Water Research Laboratory.

ANSTO provided input on technical aspects of radiation processing, irradiation facilities and dosimetry at a Food and Agriculture Organisation/IAEA (RCA) workshop on Certification of Irradiation as a Sanitary and Phytosanitary Treatment for Food and Agricultural Commodities, held in Sydney in December 2000.

Regional support for enhancing 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 part of this program, ANSTO's Director of Safety, Dr Ron Cameron, chairs a Coordination Group, which met in New Zealand, to plan the workshops and training courses for 2001-2002.

International strategic relevance of nuclear science and technology

ANSTO also played a key role this year in formulating new integrated arrangements for coordinating the provision of assistance in radiation protection measures from the IAEA to Member States. The new programs will incorporate the previous mechanisms, mentioned above, and will be directly linked to national workplans in each country, which are based on identified priorities. The Coordination Group will extend its overview role to this larger program. The first meeting with National Counterparts took place in Hanoi in May. ANSTO took a lead role in these discussions.

Staff assisted regional countries by conducting expert missions and hosting workshops on topics such as the safe transport of radioactive material, held in November 2000.

Staff also continued to be involved in the production and trials of distance learning material on radiation protection. Although the official trials concluded in March, the draft material continued to be used. ANSTO staff are helping to review and consolidate the draft material before it is submitted to the IAEA for publication.

Regional Nuclear Cooperation in Asia

ANSTO contributed strongly to Australia's continued participation in the Regional Nuclear Cooperation in Asia (RNCA) initiative through activities under 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 signatories to the Nuclear Non-Proliferation Treaty. The FNCA evolved from the International Conference for Nuclear Cooperation in Asia (ICNCA) in 2000 following decisions on restructuring agreed at the 10th ICNCA meeting in 1999. Australia was a founder member of the ICNCA, which was launched in 1990.

The first meeting for the FNCA was held in Bangkok in November. The Australian delegation

was led by ANSTO's Executive Director. The meeting adopted a vision for FNCA "to be a recognised as an effective mechanism for enhancing socio-economic development through active regional partnership in the peaceful and safe utilisation of nuclear technology". A strategic plan for the FNCA was also adopted to introduce and implement projects in fields where socio-economic benefit can be expected and to make more efficient linkages with the IAEA and other appropriate international organisations. The Executive Director also led the Australian delegation to the second FNCA Coordinators' Meeting, which was held in Tokyo in March.

The fourth Nuclear Safety Culture workshop to be organised through the FNCA took place in Shanghai from 4-7 September 2000. The workshop, which was sponsored jointly by Australia and China, was attended by 25 participants. ANSTO staff prepared and delivered papers and presentations and chaired the meeting. The value of holding the workshop in China was underscored by the strong representation from Chinese organisations (the Chinese National Nuclear Corporation and the Chinese Atomic Energy Agency) and the opportunity to review the strong progress of nuclear activities in China.

ANSTO was the local host for the FNCA workshop on Radioactive Waste Management held in Sydney 12-15 December 2000. The workshop was jointly hosted by ANSTO and the Science and Technology Agency (STA) of Japan, in cooperation with Japan Atomic Industrial Forum, Inc (JAIF). Thirty-two participants (28 from outside Australia) representing the nine participating countries attended the workshop.

OECD Nuclear Energy Agency activities

The Organisation for Economic Cooperation and Development (OECD) comprises industrialised countries with shared democratic principles and

International strategic relevance of nuclear science and technology

free-market economies. Participation in the activities of the OECD's Nuclear Energy Agency (NEA) enables ANSTO to keep abreast of current trends and developments in this technologically advanced community. ANSTO has direct access to the OECD document database in Paris and contributes to OECD/NEA programs on nuclear safety, radiation protection and public health, nuclear science and radioactive waste management. ANSTO's Counsellor (Nuclear) London regularly participates in meetings of the NEA Steering Committee and various NEA standing technical committees.

The NEA's main focus is on technical issues relevant to all aspects of nuclear technology. It is also placing greater emphasis on the need for the nuclear industry to interact with civil society – work that ANSTO is following with interest – and continuing its program for enhancing cooperation, particularly in nuclear safety, with non-member states in central and eastern Europe.

Dr Tim Payne of ANSTO Environment was nominated as a member of the Technical Direction Team of the NEA international forum on modelling radionuclide sorption for assessing the safety of radioactive waste repositories. Dr Paul Brown, also of ANSTO Environment, was elected chairman of the NEA review of zirconium thermochemistry, part of a project to provide fundamental data that can be used in assessing the safety of radioactive waste repositories.

Bilateral cooperation

As part of the tenth round of the Australia-Republic of Korea nuclear policy consultations, a meeting was held in Seoul to review the implementation of technical cooperation activities between the Republic of Korea and Australia. This meeting involved representatives from ANSTO, the Australian Safeguards and Non-proliferation Office, the Korea Atomic Energy Research Institute (KAERI) and the Korean Institute of Nuclear Safety (KINS). In March the Executive Director visited KAERI for discussions on ongoing ANSTO/KAERI collaboration; the Implementing

Arrangement covering ANSTO/KAERI cooperation was extended to May 2005.

Australia is party to a number of other bilateral cooperative arrangements involving nuclear and scientific institutes in France, Japan, China, Indonesia, Russia, the United States and the United Kingdom. These arrangements involve ANSTO activities, including cooperative research and development projects in radioactive waste management technologies.

A collaborative project was formalised with the National Academy of Sciences of Belarus to investigate Chernobyl contamination of Belarus territory. ANSTO scientists are using ANSTO's accelerator mass spectrometry facility to distinguish between Chernobyl uranium and natural uranium in the area.

External representation

ANSTO continued to maintain specialised overseas representation through three Counsellor (Nuclear) posts located in the Australian diplomatic missions in Vienna, London and Washington DC. These posts facilitate technical contacts with the IAEA and OECD/NEA and provide essential links between ANSTO and those geographical regions most active in nuclear science and technology. ANSTO also maintains a Canberra Liaison Officer position to facilitate contacts with Canberra-based departments and agencies.

Cooperative research to enhance the international nuclear safeguards regime

ANSTO's research and development effort, in cooperation with the Australian Safeguards and Non-Proliferation Office (ASNO), assisted in the continued development of technical measures to strengthen the international nuclear safeguards program delivered by the IAEA.

Environmental sampling is one means of verifying compliance with the Nuclear Non-Proliferation Treaty (NPT) and the Comprehensive Nuclear Test Ban Treaty (CNTBT). The recently strengthened

International strategic relevance of nuclear science and technology

IAEA safeguards regime (the IAEA Model Protocol Additional to IAEA Safeguards Agreements) includes a provision for environmental sampling with the objective of detecting undeclared nuclear activities. Radionuclides such as chlorine-36, iodine-129 and uranium-236 are signatures of nuclear activities such as reprocessing of irradiated nuclear fuel. In cooperation with ASNO, ANSTO reviewed and provided a detailed analysis of an IAEA report on the potential of wide-area environmental sampling for this purpose.

Although the radionuclides of interest occur at very low abundance in environmental samples, they can be measured on Accelerator Mass Spectrometry (AMS) facilities such as ANTARES. Participation in an inter-laboratory comparison of nuclear signature measurements confirmed ANSTO as the leading laboratory for measurement of uranium-236 at the very low levels found in the environment. An application by ANSTO to join the IAEA's Network of Analytical Laboratories for safeguards purposes was accepted in principle.

ANSTO has pursued 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. They included marine discharges from nuclear reprocessing, releases from the Chernobyl accident, and recent military use of depleted uranium. 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.

Nuclear safeguards

ANSTO was pleased to cooperate with the IAEA and the Australian Safeguards and Non-Proliferation Office (ASNO) in the implementation of new safeguards measures as a means of supporting Australia's leading role in developing new safeguards procedures and approaches aimed at ensuring the accuracy and completeness of

the declarations that States make to the IAEA concerning their nuclear activities.

Until the end of March 2001 monthly ASNO audits were complemented by routine quarterly inspections of ANSTO's nuclear materials by inspectors from the International Atomic Energy Agency (IAEA), attended also by ASNO inspectors. In January 2001, the IAEA introduced an integrated safeguards system for Australia, replacing the previous four inspections per year at ANSTO with a single physical inventory verification, supported by an average of one unannounced inspection during the year, together with "complementary access" to any part of the Lucas Heights site. During an inspection, IAEA inspectors can request complementary access at short notice (two hours). Australia is the first country in the world where integrated safeguards on a "state-as-a-whole" level have been introduced.

A comprehensive revision to ANSTO's Manual of Accounting and Control Procedures for Safeguarding Nuclear Material was approved by the Director General of ASNO and issued on site at the end of February 2001.

Security

Physical protection of the Lucas Heights Science and Technology Centre is the responsibility of the Australian Protective Service (APS), an operational unit of the Attorney-General's Department. The APS ensures that physical security of the site is constantly maintained, and controls access to the site by staff, contractors and visitors. Physical protection of all facilities and materials was satisfactorily maintained in accordance with international obligations and criteria recommended by the IAEA, and with national requirements set by ASNO. Physical protection of all facilities and materials was satisfactorily maintained in accordance with national and international obligations. Physical protection services and technology were upgraded as part of a program of continuous improvement. Protective security arrangements covering classified material and information, and

International strategic relevance of nuclear science and technology

security vetting of staff and contractors, were satisfactorily managed. There were no incidents involving a breach of the physical protection system. During the year, ANSTO reviewed its security arrangements in line with the Commonwealth Protective Security Manual. ASNO, the national regulator for the physical protection of nuclear material and facilities, was satisfied with ANSTO's physical protection arrangements.

Nuclear-powered warship monitoring

ANSTO provides operational health physics support and technical advice to the States and the Commonwealth for visits of nuclear-powered warships (NPWs) to Australian ports. During the year there were nine such visits, each involving either a single vessel or two or more vessels arriving shortly after each other. One of these visits was the first to Australia by a French nuclear-powered submarine.

ANSTO's new radiation monitoring system for visiting NPWs, trialed last year, was brought into routine operation in one port. Further field testing was carried out and discussions held between ANSTO and port emergency services regarding methods of incorporating the radio transmission system into port safety plans.

Staff attended three Visiting Ships Panel nuclear meetings, took part in two port validations and one NPW workshop and ran two training courses for State and Commonwealth personnel involved with NPW visits. They also organised and carried out four emergency training exercises for State and Commonwealth personnel involved with NPW visits.

Epidemiological study on the effects of low doses of ionising radiation

ANSTO continued its participation in an international study of cancer risk among radiation workers in the nuclear industry. The study, which commenced in 1995, is being undertaken by the International Agency for Research on Cancer (IARC), Lyons, France. Data are being analysed and initial publications on

dosimetry methodology are expected this year. A local study based on this data is being carried out by the University of New South Wales.

Communications

Following the signing of contracts for the replacement research reactor in July 2000, the requests for information on the project, and on the science and research activities of ANSTO in general, have increased considerably. Most requests were made by telephone, but there were also numerous email and Web-based inquiries. To meet this demand, a comprehensive range of publications incorporating both electronic and print options was incorporated into the organisation's communications plan.

More than 4,000 people took the opportunity during the year to visit the Lucas Heights Science and Technology Centre in small groups for guided tours. ANSTO's five part-time tour guides showed some 117 groups over the site in this way.

Media releases and a range of feature and opinion pieces were issued to appropriate national, regional and local newspapers, radio, television, feature magazines,



ANSTO has produced a range of documents and reports for Parliament, ARPANSA and the public on the replacement reactor to be built at Lucas Heights.

International strategic relevance of nuclear science and technology



ANSTO maintains nuclear counsellor positions in Australian embassies in London, Vienna and Washington DC to enhance the organisation's international linkages.

Dr Claudio Tuniz (left), ANSTO's counsellor in Vienna and Dr Ron Hutchings (right), ANSTO's counsellor in Washington, are seen meeting with Dr Jay Davis, Director US Defense Threat Reduction Agency in Washington in February to discuss international nuclear safeguards developments.

newsletters and journals. All media releases were also issued online. Media coverage of organisational activities was achieved in all major Australian newspapers and on radio, with interviews with key ANSTO scientific staff. A regular column in local newspapers, "What I do at ANSTO", was published. Other methods of keeping the community informed of ANSTO's activities included a regular newsletter entitled ANSTO Update distributed to residents of neighbouring suburbs, provision of literature in Sutherland Shire public libraries, displays at exhibitions and a permanent display at the organisation's Reception Centre.

Planning for the 2001 Open Day event commenced in readiness for an August/September 2001 program. This 3-day program of on-site displays, interactive exhibits, activities and tours is considered a major opportunity to enhance awareness of ANSTO activities among industry, business, students and the broader local community.

ANSTO's Internet Home Page continued to be developed as a key interactive communications mechanism. External usage increased by 47%, with 69,000 hits received during the year. ANSTO's Intranet was further developed to provide staff with increased online access to documents and services. Considerable progress was made towards implementing the Government's requirement for all government-based services to be available online via the Internet by December 2001. ANSTO is on track for meeting this deadline, and published its Government Online Action Plan on the ANSTO Home Page in September 2000.

It is compliant with Online Information Service Obligations, the Australian Government Locator Service Metadata Standard, accessibility in relation to web content, the Privacy Act 1988, and security.

Services available via the ANSTO Home Page include online registration for safety courses, conferences and seminars hosted by ANSTO, full accessibility to the ANSTO Library online catalogue and online applications for AINSE-supported use of ANSTO facilities. Considerable documentation relating to ANSTO's replacement research reactor projects was made available online.

Ministerial and other VIP visits

During the year, visitors to ANSTO included Senator the Hon. Grant Tambling, Parliamentary Secretary to the Minister for Health and Aged Care; members of the Senate Select Committee Inquiring into the Contract for the Replacement Research Reactor at Lucas Heights; members of the National Party Resource, Environment and Energy Policy Committee; and the ARPANSA Nuclear Safety Committee. ANSTO also welcomed senior staff from the Office of the Minister for Industry, Science and Resources, and a range of Commonwealth Government departments.

Other visitors included senior officials from regional national nuclear institutes.

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

OBJECTIVES

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

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

To provide effective access by Australian scientists to synchrotron facilities.

OUTCOMES*

* For the purposes of this report, outcomes are defined as the results, impacts or consequences of ANSTO's work on the Australian and international community.

- HIFAR's silicon irradiation generated revenue of approximately \$3.5 million, \$1.5 million more than last year. This substantial increase was due to a full operating year with a high level of reactor availability, improvements in the reliability of the irradiation facilities, and strong demand for quality irradiation services.
- Improvements to ANSTO's ANTARES facility have placed it in the top bracket of international radiocarbon dating laboratories. It continued to achieve high precision, enabling scientists to date to within 40 years samples less than 10,000 years old.
- ANSTO's success in the use of the cosmogenic isotopes beryllium-10 and aluminium-26 for dating samples in the earth sciences and ice-core studies related to climate change resulted in an almost 50% increase in Australian and international demand for this type of

analysis. The analyses are carried out using the ANTARES accelerator mass spectrometry (AMS) facility.

- ANSTO's involvement in international air pollution projects covering 13 countries in South East Asia confirmed its status as a major player in accelerator-based technologies for monitoring air pollution.
- ANSTO maintained its position as a leader in integrated software packages for analysis of x-ray spectra for commercial and research applications. It was invited to participate in key analysis round robins and in an international workshop on x-ray analysis software.

ACTIVITIES AND OUTPUTS

HIFAR RESEARCH REACTOR

Operation and general utilisation:

ANSTO operates Australia's only nuclear reactor, the High Flux Australian Research Reactor (HIFAR). During the year the research reactor operated for approximately 7,630 hours (98.7% of its scheduled time) at an average power of 10 MW. There were eleven scheduled shutdowns for maintenance and fuel changes, which took approximately 47 days.

More than 1,900 targets were irradiated to produce medical and industrial isotopes. The reactor was also used to irradiate 1,314 batches of silicon targets, 450 samples for project-based analysis of environmental and geological samples and samples relating to industrial processes, and more than 12,000 mineral samples for commercial customers.

ANSTO provided time on HIFAR neutron beam instruments to holders of 35 Australian Institute of Nuclear Science and Engineering (AINSE) research and training grants, involving 24 PhD and honours students, and to three post doctoral award holders, and assisted with data processing and interpretation.

Core nuclear facilities operation and development

How ANSTO's research reactor is used by industry

ANSTO's research reactor, HIFAR, is the main source of the radioactive materials used in nuclear medicine in Australia. It is also used for research into new materials, for irradiating silicon for use in computer chips and power transmitters, for analysis of geological and biological samples and for producing isotopes for use in environmental management, agriculture, industry and minerals exploration.

Sixty-nine projects organised by AINSE involving 15 universities in Australia and New Zealand were completed. The university projects funded by AINSE used 442 instrument days, and internal ANSTO researchers used 334 instrument days. ANSTO research involving collaboration with international research organisations, university groups and training of PhD students used a further 375 instrument days.

Maintenance and support

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 November 2000 and June 2001.

As part of a program of self-assessment, reactor staff identified and implemented improvements to the manner in which modifications are made to the facility. These assessments and enhancements were part of the continual improvement process associated with the Quality Assurance systems and licence conditions.

The final report on the Year 2000 Major Shutdown of HIFAR was presented to Australia's nuclear safety regulator, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) in February 2001. The report concluded that HIFAR was in good condition and fit for continued service.

Thirty-four engineering projects were completed during the year, most relating to plant upgrades and safety enhancement.

The reactor's maintenance program was intensified and its instrumentation electrical power supplies upgraded, resulting in improvements to the operation and availability of HIFAR. The occurrence of unscheduled shutdowns due to lightning strikes was significantly reduced by modernising the reactor coolant pump control panels.

Fuel management and handling

In January a shipment of 360 spent fuel elements arising from the operation of the HIFAR research reactor was safely packaged and transported to France for reprocessing. The purpose of reprocessing is to separate the radioactive waste products from the re-usable uranium and to then place the wastes in a stable wastefrom that can be safely managed over the long term. The wastes arising from the reprocessing will be returned to Australia around 2015 for long-term storage in the planned national store for long-lived intermediate-level waste.



Approximately every 10 years the external surface of the HIFAR research reactor containment building is repainted. On this occasion the building was sandblasted first to prepare the surface. The reactor was wrapped up during the process to prevent debris spreading into the nearby area.

This was the fifth shipment of spent fuel from Lucas Heights and has resulted in more than half the spent fuel arising over the entire lifetime of the HIFAR reactor being sent overseas. It was also the second shipment made under the terms of a contract signed by ANSTO and COGEMA in January 1999. The removal program includes continuing repatriation of elements of US origin to the United States. These two arrangements provide for the disposition of all spent fuel arising from HIFAR operations, up to and including its permanent shutdown.

Environment Australia, the Australian Maritime Safety Authority, the Australian Safeguards and Non-Proliferation Office, and Australia's nuclear safety regulator, the Australian Radiation Protection and Nuclear Safety Agency, as well as their respective French regulator counterparts, each approved arrangements for the shipment.

Another milestone in spent fuel management was reached this year with the unloading of the final fuel elements from Dounreay flasks. These spent fuel shipment flasks were built in the 1960s and some 175 HIFAR spent fuel elements had been stored in dry storage inside seven Dounreay flasks since the mid-1960s.

The program of overseas shipments of spent fuel has made space available in ANSTO's spent fuel storage pond to permit the progressive unloading of the Dounreay flasks. These 175 elements are included in the ongoing overseas shipment program.

Reactor analysis

ANSTO's large-scale experimental water tunnel facility was used to replicate flow around prototype design models of isotope production cans. The aim is to design cans that produce the best flow characteristics for cooling during the isotope production process. The water tunnel was also used by university scientists to study near-wall turbulence phenomena (turbulence in the layer of water flowing next to the internal surface of the tunnel) and how changes in the roughness of the pipe surface affect this.

Management of these phenomena can increase the efficiency of water-based heat exchangers and may provide a means of reducing flow-induced noise in pipes and ducts. An understanding of the phenomena can also be useful to city planners who need to position buildings, bridges, towers and other structures in such a way that wind turbulence is minimised.

Neutron scattering developments

ANSTO is internationally recognised in the neutron science arena for its cost-effective approach and the technical expertise of its scientists, and has been compared favourably with competing laboratories in both Europe and the United States. The organisation attracted experienced neutron science job applicants from the top US and many of the top European neutron laboratories for positions in instrument development for the replacement reactor. Key factors in this have been ANSTO's high international profile, stemming in particular from the Replacement Research Reactor Project, its world-class modelling work, its focus on excellence and its high quality neutron web site (www.ansto.gov.au/ansto/neut/).

Four instrumentation workshops were run during the year, with excellent attendance by Australian and overseas scientists.

The Australian Neutron Beam Users Group (ANBUG), which consists of ANSTO neutron beam customers, now has a membership of 143. During the year the constitution was rewritten and submitted to the membership for approval. Other promotional activities resulted in an increase in both applications and new users for the neutron beam instruments at HIFAR.

Neutron scattering scientists attended and presented papers at various international conferences. These included the Advanced Science Research 2000 conference in Tokai, Japan, the XVth meeting of the International Collaboration on Advanced Neutron Sources, a meeting of the International Union of Pure and

Core nuclear facilities operation and development

Applied Physics and a meeting of the UK-Japan Collaboration on Neutron Scattering. There are moves to establish an Asia-Oceania Neutron Scattering Association as an umbrella embracing ANBUG and other regional user societies. A bid to hold the 2005 International Conference on Neutron Scattering in Sydney is receiving strong support from organisations in the SE Asian region. Staff also gave talks on the replacement reactor and the proposed Australian Synchrotron.

Considerable effort went into developing and expanding web pages on scientific computing. Topics included instrument control and data acquisition, data analysis, instrument simulation, support for visitors at ANSTO and International Standards. The HIFAR reactor schedule was made available on the web for external customers.

In terms of equipment development, the main achievement was the commissioning of ANSTO's Small Angle Neutron Scattering (SANS) instrument. Users of the SANS instrument included scientists from universities, industry and the Cooperative Research Centre for polymers. Key study subjects included bauxite, silica-coated porous carbon particles, inorganic polymers, cross-linked polyesters, polymer composites, erythrocytes (red blood cells), lung surfactants (associated with Sudden Infant Death Syndrome), talc and the hydration of paper. The latter is crucial to understanding how and why cardboard fruit boxes fail when humidity is cycled.

The extensive range of studies undertaken indicate the versatility of the SANS technique and the significant benefit of the facility to the Australian research community. (see also Nanostructure studies, page 40.)

Preliminary measurements were made on the new HIFAR reflectometer. Neutron reflectometry is used to probe the structure of surfaces, thin films or buried interfaces and to investigate processes occurring at surfaces and interfaces, for example adsorption, corrosion, adhesion and interdiffusion. In recent years there has been an explosion of interest in the use of this technology

for study in the biosciences and the emerging field of nanotechnology. Full commissioning of the reflectometer is expected in the coming year.

Improvements to ANSTO's long wavelength polarised diffractometer (LONGPOL) instrument were completed. Its eight supermirror analysers provide a major improvement in data quality. Experiments that used to be impractical because of time or statistical limitations are now being carried out. ANSTO's neutron powder diffraction work continued to attract international attention, with publications in high-profile journals such as *Physical Review Letters*. A major achievement was ANSTO's pioneering use of joint neutron/x-ray powder diffraction to determine crystal structure. Examples of areas where this knowledge can be used include understanding the atomic structure of amino acids and minerals.

Scientists from ANSTO and collaborators at Sydney University and the University of Technology, Sydney, worked towards achieving a better understanding of the detailed structure of cement components. ANSTO's neutron scattering experts also continued their collaboration with Monash University on better understanding magnetic structures in simple compounds.

Using in-situ neutron diffraction at high temperatures, ANSTO and University of Newcastle scientists successfully monitored the process by which a recently developed ceramic, layered titanium silicon carbide, is produced. This ceramic has an unusual combination of electrical, thermal and mechanical properties, including the lowest coefficient of sliding friction of any solid, and has potentially important industrial uses. Collaborators at Curtin University of Technology are studying the mechanical properties of this material at different temperatures and textures.

REPLACEMENT RESEARCH REACTOR

ANSTO's replacement research reactor project, scheduled for completion in 2005, proceeded to schedule and within budget.

The project is being managed in three phases. Phases 1 and 2 involved the environmental assessment of the project and 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 Limited. Phase 3, currently underway, involves the detailed engineering, construction, commissioning and demonstration-of-performance of the replacement research reactor.

The main focus during the year was on completing the detailed design of the reactor and integrating this with the preparation of the Preliminary Safety Analysis Report. The agreed technology transfer program between INVAP, S.E. and ANSTO proceeded effectively during the design process. Details of expenditure to date are explained in Note 14 of the Financial Statements that accompany this Report.

Developing the detailed design and engineering documentation

Between July 2000 and April 2001 INVAP, S.E. developed the detailed design of the reactor. As part of this process it conducted a series of formal design reviews. ANSTO worked closely with INVAP, S.E. throughout this period. Detailed engineering work began in February 2001 and will continue until all engineering details have been completed to enable the construction, testing and commissioning of the facility.

Preparing the Preliminary Safety Analysis Report

The detailed design work was integrated with the development of a Preliminary Safety Analysis Report (PSAR), required as part of ANSTO's Application for a Facility Licence, Construction Authorisation for the Replacement Research Reactor. The role of the PSAR is primarily to describe and verify the safety of the design so that ARPANSA can assess it as part of the licensing process. The development

of the PSAR involved a broad range of ANSTO's multidisciplinary staff resources to address such areas as the neutronic and thermal hydraulic performance of the replacement reactor, the performance of the neutron beam facilities and cold neutron source, the safety systems and the detailed engineering design.

In June 2001, following the submission of the PSAR to ARPANSA and as part of ARPANSA's evaluation process, the report was reviewed by an international team of nuclear experts selected by ARPANSA. The group included representatives from the United States, Turkey, France, South Africa and Denmark, and was led by the International Atomic Energy Agency, which subsequently reported its findings to ARPANSA in July 2001.

The licence application evaluation process by ARPANSA, which includes significant interaction with and input from the public, is scheduled for completion by February 2002.

Environmental Impact Assessment requirements

Two progress reports on the recommendations arising from the environmental assessment of the replacement research reactor were submitted to the Minister for the Environment and Heritage and made publicly available on the ANSTO web site. ANSTO is required to produce these reports at six monthly intervals, and these were the first to be produced. The most recent report is published in Appendix 4 of this Report.

Two six-monthly status reports were also forwarded to the Parliamentary Public Works Committee as required.

There were two Government Facilitation Group meetings during the year. These meetings provide an opportunity for representatives of interested Commonwealth Government departments and agencies to review progress and future actions relating to the project.

Core nuclear facilities operation and development

Senate Inquiry into the Contract for the Replacement Research Reactor

In August 2000 the Senate established a Select Committee to inquire into a number of issues relating to the need, and the contract, for the replacement research reactor.

ANSTO provided the Committee with detailed submissions and ANSTO officers gave evidence to the Inquiry. Australia's peak scientific, educational, medical and industry bodies gave evidence strongly supporting the construction of the replacement reactor. The Committee reported on 23 May 2001. The Government will provide a response to the Report of the Committee addressing each of the recommendations.

Completion of this second Senate Committee inquiry, together with the Parliamentary Public Works Committee process, the environmental assessment procedure, and the ARPANSA site licence process, means that the replacement reactor project has been the subject of five detailed review processes, each involving opportunity for public input, in the past four years.

MOATA

ARPANSA issued a Facility Licence for the care and maintenance phase of decommissioning the Moata nuclear reactor. The reactor will be maintained in a long-term storage state, with a nominal date for dismantling of 2006, subject to the opening of the National Low Level Waste Repository.

ACCELERATORS FOR MEDICAL PRODUCTS AND SCIENTIFIC AND INDUSTRIAL RESEARCH

National Medical Cyclotron

The National Medical Cyclotron (NMC) is a major national facility that 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 include fluorine-18 fluorodeoxyglucose (FDG), gallium-67, thallium-201, and iodine-123.

It can also produce research isotopes such as copper-64, fluorine-18 and nitrogen-13.

With the growth in demand for FDG for clinical application a significant investment in production facilities was undertaken. This included the installation and validation of larger fluorine-18 production targetry and an automated dispenser.

A review of the cyclotron control system recommended that obsolete and unsupported subsystems be replaced. This will allow offsite monitoring of systems, improve productivity and reduce staffing costs. New systems will be purchased during the next financial year.

Particle accelerators for research

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.

A small tandem accelerator is currently being purchased to replace the Van de Graaff accelerator and should be operational in 2003. These accelerators support two key research areas.

Accelerator mass spectrometry

The ANTARES Accelerator Mass Spectrometry (AMS) facility continued to deliver high quality analyses to Australian and other researchers working in fields such as global climate change, archaeology, landscape evolution, glaciology, and nuclear safeguards.

A total of 946 carbon-14 (radiocarbon) samples from approximately 30 university and collaborative projects were completed. A highlight of the carbon-14 dating program was a collaboration between Australian and Italian researchers to study the lagoon of Venice and date megafauna extinctions in Australia. The future of Venice and its many historical buildings is inextricably linked with the future of the lagoon.

In order to understand the processes and phenomena associated with this particular

ecosystem, foraminifera collected from sedimentary cores from the lagoon were radiocarbon dated at ANSTO's AMS facility. The main aim of the research is to determine the reservoir effect of the marine environment and resolve the mismatch between different chronologies. Ultimately the collaboration will provide an absolute timescale for the events that shaped the lagoon.

Radiocarbon dating of material associated with the megafauna remains in Wet Cave, Naracoorte World Heritage Area, South Australia, have placed the megafauna's extinction in Australia at about 45,000 calendar years ago.

These data complement previous studies conducted in the arid interior of Australia and provide a means of addressing regional variability in megafaunal disappearance.

Improved chronologies will contribute to the ongoing debate regarding the impact of indigenous human occupation on megafauna populations.

Radiocarbon studies of the carbon-containing gases carbon monoxide, carbon dioxide and methane have contributed to global warming studies. A collaboration between CSIRO Atmospheric Research and ANSTO resulted in new samples from the South Pole extending the radio-methane record back to the early 1900s. This work is enabling a fuller understanding of the anthropogenic contribution to global atmospheric methane levels, the second most important greenhouse gas after carbon dioxide.

A total of 242 samples were measured for beryllium-10 and 270 samples for aluminium-26 related to cosmogenic exposure age dating and determination of landscape erosion rates. Extensive collaboration with the Universities of Auckland, Newcastle and Melbourne resulted in scientists determining, for the first time, the timing of the Last Glacial Maximum - approximately 20,000 years ago - in New Zealand and Tasmania as well as the rate of the transition from full glacial to interglacial climatic conditions.

The Davenport Ranges in Central Australia has previously been assigned a Cambrian age (around 500 million years) that has arguably placed it amongst the oldest landforms on earth. ANSTO's studies, combining beryllium-10 AMS cosmogenic dating with fission track thermochronology (from the University of Melbourne) of bedrock samples from Central Australia, show a far more dynamic and younger evolution and are incompatible with this widely accepted picture.

This year, for the first time, ANSTO participated in two internationally conducted intercomparisons of AMS laboratories for carbon-14 and aluminium-26. ANSTO's results verified the high quality and reliability of the ANSTO facility for performing these measurements.

A total of 14 publications in international peer-reviewed journals and one review paper were published by the AMS team following participation at four international conferences, including the prestigious 8th International Conference on Accelerator Mass Spectrometry in Austria and the 17th Radiocarbon Conference in Israel.

Ion beam analysis

As part of a two-year Australian Coal Association Research Program (ACARP), fine particle dust sampling units were established around the Bengalla open cut coal mine in the Hunter Valley, New South Wales. Accelerator-based ion beam analysis methods together with other nuclear techniques were used to identify and quantify the airborne fine soil component related to mining activities around the town of Muswellbrook. The work is being carried out in collaboration with the University of Newcastle and mining companies in the area.

Two commercial air pollution projects were completed. One was a study of the concentrations of heavy metals in the air around Port Pirie, carried out for the South Australian Department of Human Services, Environmental Health Centre. ANSTO's highly sensitive nuclear

Core nuclear facilities operation and development

techniques were able to determine both the very low concentrations present and the distribution of trace elements such as cadmium, arsenic, antimony, silver and gold.

The second was a joint project with Placer Dome Mining International and Team Ferrari Environmental consultants on Marinduque Island in the Philippines. Tests carried out using nuclear techniques at ANSTO confirmed that airborne soil from the surface dumping of tailings from the Island's copper mine over the past 17 years was not a major problem for the surrounding inhabitants.

The heavy ion microprobe on ANSTO's Australian National Tandem for Applied Research (ANTARES) accelerator was further developed to improve its accuracy and sensitivity. Its improved capabilities were used to determine the distribution of lead in roots, leaves and stems of trees, leading to a better understanding of the uptake of these pollutants from the soil by plants being used to rehabilitate polluted environments.

ANSTO developed a novel gas detector that can simultaneously detect nuclear particles and map the elemental composition of materials in two dimensions at high resolution. The detector provides this information at a scale hitherto unattainable in Australia and will provide new insights into the micro-structure and composition of materials such as plants, animal tissue and minerals.

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 geo-physics. The other members of the ASRP are the Australian National University, the University of Sydney, the University of Canberra, the University of NSW, the University of Melbourne, Monash University, the University of Queensland, and CSIRO.

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 continued to grow, fostered by the ASRP. One hundred Australian research teams made use of the ASRP facilities during the year, and the community comprises scientists from twenty-one universities, four government laboratories including ANSTO, and five CRCs.

The final component of the ASRP's suite of synchrotron instrumentation, the ChemMatCARS beamline at the Advanced Photon Source, became operational in early 2001.

ChemMatCARS provides experimental capabilities for chemistry and materials science, including a state-of-the-art small angle x-ray scattering beamline, which will be utilised by ANSTO staff as part of their involvement with the CRC for Polymers.

The ASRP was funded for a 5-year period by the Major National Research Facilities (MNRF) program in 1996. A proposal for funding for an additional five years was submitted with the 2001 MNRF program in May, with ANSTO again acting as the principal proponent and managing agent. A decision on successful bids for the MNRF program is expected early in the new financial year.

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

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.

OUTCOMES*

* For the purposes of this report, outcomes are defined as the results, impacts or consequences of ANSTO's work on the Australian and international community.

- ANSTO together with the University of NSW Water Research Laboratory was awarded the Hong Kong Australia Business Association and HSBC Business Award 2000 in the category of "Export of Services". In the award-winning work radiotracers from HIFAR were used to assess the dispersal of effluent from sewage outfalls in Hong Kong Harbour.
- ANSTO's expertise in dating sedimentary archives was recognised by the award of a Special Monash University Research Fund (SMURF) grant for promoting collaborative programs in Victoria.
- Results of a study carried out by ANSTO last year contributed to a decision by the Board of the Kakadu National Park to ban the use of lead shot in the park. The work, which was an outcome of the Organisation's long standing involvement with environmental studies associated with the rehabilitation of uranium mines, showed that many crocodiles had unacceptably high lead levels in their blood as a result of eating wild geese killed with lead shot.

- Technical investigations led by ANSTO assisted the Commonwealth Government in its consideration of sites for Australia's national radioactive waste repository. Properties of representative soil samples from the area under investigation were measured in the organisation's laboratories to compare their capacity to retard the migration of radionuclides.

ACTIVITIES AND OUTPUTS

Radionuclide environmental pathways

The Radionuclide Environmental Pathways Project is a study of the biogeochemical processes that affect the migration and storage of radionuclides in the environment. The project focuses on the processes, or pathways, involved in areas such as ecologically sustainable development, sewage outfall and sediment dynamics, and on processes that are important for assessing the environmental impact of nuclear facilities in Australia and the Asia-Pacific region.

Several aquatic biota species were assessed to determine their effectiveness as bio-archives to measure the long-term impact of development on the aqueous environment. ANSTO has used the approach to help the mining industry establish an archival record of water quality against which current environmental performance can be assessed. For example, secondary ion mass spectrometry (SIMS) and ion beam analysis (IBA) have been used to analyse the concentration of metals in the annual laminations of freshwater bivalves, dugong tusks and the osteoderms (small bones along the back) of crocodiles. The levels of heavy metals in the laminations frequently indicate past environmental pollution trends.

The levels of natural uranium radionuclides in the ocean were measured to reveal how long particles containing trace elements and pollutants remain suspended before settling to

Nuclear science for environment and sustainability



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the seabed. This information is important in assessing the environmental impact of effluents from mining, industry and agriculture on the coastal zone. ANSTO analysed these natural radionuclides as part of a multi-lateral research project with Indonesia on the impact of tropical river systems on the coastal zone and as part of a project with France on natural radionuclides in marine plankton.

ANSTO and the Philippines Nuclear Research Institute (PNRI) used technetium from ANSTO Gentech® medical generators to evaluate a three-dimensional water circulation model of Manila Bay that had been developed by the UNSW Water Research Laboratory. The model is intended to provide an understanding of occurrences of harmful algal blooms. This is a further example of how ANSTO radiotracers can be used to validate complex numerical models of sediment and pollutant transport in the marine environment.

In another study, HIFAR-generated radioisotope-labelled sand was injected into the nearshore-inner shelf environment at McMasters Beach, NSW. This labelled sand is being monitored for six months to determine the effects of waves, currents, storms and rips on onshore-offshore sand exchange. The project is being undertaken in collaboration with the University of Sydney Coastal Studies Unit and the NSW Department of Land and Water Conservation, Centre for Natural Resources, in Newcastle.

HUMAN ACTIVITY AND CLIMATE VARIABILITY

The Human Activity and Climate Variability (HACV) project focuses on the Asia-Australasian region and consists of three parallel research streams looking at the past, present and future in terms of climate variation. The 'past' stream of the project is using natural archives to determine whether human impact can be distinguished from climate variability over the past 50 to 100 years. It is utilising various techniques, including isotope dating and microfossil, trace element and stable isotope analyses.

Research by ANSTO scientists into natural archives (sediment records from lakes, swamps and bogs) of past environmental change continued, with detailed studies being undertaken in Midge Lake, Tasmania. The results will provide a better general understanding of the impact of human activity on catchments. ANSTO is working with Monash University, the University of Tasmania, the University of Wollongong and the University of Technology, Sydney. Researchers and students are using ANSTO's radioactive dating facilities for this work.

As part of the 'present' stream of the HACV project, scientists are using ANSTO's accelerator-based facilities to characterise the physical and chemical properties of aerosols collected from sites in Australia and the Region. Several ANSTO fine particle sampling units

were established and calibrated at sites in Philippines, Korea, Vietnam, Japan and Hong Kong as part of the International Aerosol Characterisation Experiment (ACE) in Asia.

The aim of this multinational research is to identify the sources of soil, dust and industrial pollution within the Asia region and study its effects on global climate change. These aerosols are tracked using the atmospheric tracer, radon.

Within the 'future' stream of the project, ANSTO researchers, in collaboration with CSIRO and the Bureau of Meteorology, began a project that uses nuclear techniques to test data required by mathematical models used to predict climate change. A proposal to use naturally occurring isotopes as novel verification tools for the large scale movement of water in the environment was approved at the first meeting of the World Climate Research Programme's Panel on Global Land Atmosphere System Study (GLASS) hosted at ANSTO.

Integrated isotope technologies for groundwater management

Collaborative investigations into groundwater management were carried out with the NSW Department of Land and Water Conservation and several universities. These studies are contributing to knowledge of the sustainability of groundwater in Bega, New South Wales, and

the extent, causes and possible solution of salinity problems in the Gunnedah area, also in New South Wales. ANSTO is contributing isotope techniques to supplement conventional chemistry, and geophysical methods known as Electro-Kinetic Sounding and Electro-Kinetic Logging, which are used in mapping the structure of the water-bearing strata. The latter techniques are new and require validation, which is being accomplished using radiotracers.

Secondary Ion Mass Spectrometry

Secondary Ion Mass Spectrometry (SIMS), a technique widely used for the in-situ determination of the isotopic composition of materials on a microscopic scale, was used to characterise a variety of environmental and materials science derived specimens. For example, the enhanced elemental sensitivity of SIMS was used to assess the usefulness of glass as an environmental sensor in marine waters; and the in-situ imaging capabilities of SIMS were used thus: usefulness of a special type of glass as an environmental sensor to demonstrate that leaching of gold from ore samples takes place via adsorption onto carbon. Thirty-two university researchers completed AINSE projects utilising the SIMS facility and seven university students were awarded AINSE post-graduate scholarships associated with their research at the facility.

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

Drivers: Government, ANSTO and industry.

OBJECTIVES

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

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.

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

OUTCOMES*

** For the purposes of this report, outcomes are defined as the results, impacts or consequences of ANSTO's work on the Australian and international community.*

- A new solvent extraction process for the recovery of uranium from solutions containing high chloride concentrations was developed. Continuous pilot plant testing to integrate the various circuits involved was begun. This process will allow greater flexibility in water management/recycling for uranium milling operations.
- ANSTO's expertise in the area of uranium ore processing led to an invitation by Energy Resources Australia to be part of a Task Force to plan and oversee the implementation of the findings of a Whole of Mine Life Strategic Environmental Review. Following the Task Force recommendations, ANSTO was appointed a member of a Working Group to investigate new water treatment strategies at the Ranger uranium mine site in the Northern Territory.

- ANSTO's US subsidiary, ANSTO Inc, and COGEMA Inc, teamed with the architect/engineer, Burns & Roe and the Battelle Memorial Institute to submit a proposal to the US Department of Energy for the design of the Plutonium Immobilisation Plant at the Savannah River site in the United States.
- Approximately 2,400 litres of radioactive liquid waste have been solidified into 62 kilograms (approximately 23 litres in volume) of solid matter as part of an ongoing effort to reduce the volume of intermediate-level radioactive liquid waste from radiopharmaceutical production at Lucas Heights.

ACTIVITIES AND OUTPUTS

SYNROC-BASED WASTEFORMS

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 waste remediation market.

In February a further 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. This protocol follows visits last year to ANSTO by officials of the Ministry of Atomic Energy of the Russian Federation (MINATOM) and cooperation protocols signed in the 1990s.

A new Memorandum of Understanding was concluded with the UK company British Nuclear Fuels Ltd (BNFL) in order to provide a stronger business focus in future joint projects. The MOU recognises that ANSTO's expertise in wasteform development might be applied to BNFL's own projects as well as to projects

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

undertaken for third parties and provides for funding by BNFL for project work. The current focus is on immobilisation in ceramics of wastes and residues containing plutonium and other actinides.

In 1998 a synroc-based pyrochlore-rich titanate ceramic, developed by ANSTO and US collaborators, was chosen by the US Department of Energy (USDOE) for the immobilisation of some of the US surplus weapons plutonium. Since then ANSTO has participated in the integrated development and testing program for the plutonium immobilisation project (PIP) as a member of a team, led by Lawrence Livermore National Laboratory (LLNL), that also included the Westinghouse Savannah River Company, the Argonne National Laboratory and the Pacific Northwest National Laboratory (PNNL).

The final report of ANSTO's contribution to the program was sent to LLNL in October 2000. Total income from various contracts from LLNL for the USDOE's Office of Fissile Materials Disposition came to more than \$2 million. A joint patent with ANSTO's US colleagues on the specific ceramic wastefrom for immobilisation of plutonium and other actinides was awarded in October by the US Patent and Trademark office.

In April 2001 the USDOE announced that because of budgetary pressures it was suspending work on the immobilisation of excess plutonium and procurement process for the design of the PIP facility. The work will be resumed when the construction of the Mixed Oxide (MOX) Fuel Fabrication Facility and the Conversion Facility in the United States are further along. At the March 2001 debriefing by DOE Chicago Operations, the DOE noted that the ANSTO team presented a very good proposal with no major weaknesses. Burns & Roe have since expressed a wish to work with ANSTO again in the future.

The final report on a 3-year USDOE research project on radioactive waste forms involving PNNL, LLNL and the University of Michigan was

submitted to the USDOE by ANSTO in April 2001. Revenue from this project was about \$220,000.

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

The tripartite ANSTO, COGEMA, CEA collaboration is focused on potential commercial opportunities in waste remediation in the United States based on tailored titanate ceramic/glass composite waste forms that can be produced by cold-crucible melting.

Regulatory acceptance of titanate wastefroms requires a detailed scientific understanding of their long-term durability. To achieve this, ANSTO has been studying radiation effects and natural systems through international collaboration with Argonne National Laboratory, Purdue University and University of Michigan (USA), the Natural History Museum (London), the Swiss Federal Institute of Technology (ETH-Zürich), and the University of New South Wales. A major milestone was achieved with the publication of an invited review article on the behaviour of zirconolite, pyrochlore and other minerals in natural systems over geological timescales. Experiments completed at ETH-Zürich on zirconolite demonstrated resistance to dissolution in hydrothermal environments, in several different fluid systems, at temperatures up to 500°C.

ANSTO co-organised the technical program for the Symposium on Fundamental and Technological Advances and Chemistry of Actinides at Pacificchem 2000 in Hawaii in December.

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

A solid-state nuclear magnetic resonance facility obtained from CSIRO was successfully transferred to ANSTO and became operational in May 2001. The facility is used for solid state chemistry studies of radionuclide immobilisation in synroc phases and for projects sponsored by the Australian Institute of Nuclear Science and Engineering.

Refurbishment of laboratories for work on radioactive ceramics continued. A cold-crucible melter, commissioned last year, began routine operations. The materials research and development facilities received AS/NZS ISO 9001-2000 quality management certification.

INORGANIC ION EXCHANGERS

ANSTO scientists continued to work on developing and refining selective inorganic ion exchangers for removing caesium and strontium from acidic, radioactive waste streams, including the molybdenum-99 tank wastes at the Lucas Heights site. ANSTO has developed a family of ion exchangers that exhibit good selectivity for both caesium and strontium in acidic solutions. Under comparable conditions, competing commercial ion exchanger technologies are capable of removing either, but not both, elements. An additional important feature of the ANSTO ion exchangers is their ability to absorb heavy metal pollutants such as lead and silver in acidic solutions. A Patent Cooperation Treaty application embodying this ANSTO technology was filed.

REMOVAL OF RADIOACTIVITY FROM MINERAL PRODUCTS

ANSTO carried out studies for and gave advice to a broad range of mining companies on the distribution of naturally occurring radioactivity in a number of existing and proposed processes for the fertiliser, heavy and base metals and rare earth treatment industries.

An ANSTO pilot plant was used to develop processes for the extraction of rare earths from ore from Mt Weld in Western Australia. The focus was on the production of high purity rare

earth products. The A.J. Parker CRC for Hydrometallurgy collaborated with ANSTO on the development of a solvent extraction flowsheet for the project.

ANSTO scientists also carried out mineral characterisation work at the Argonne National Laboratory Advanced Photon Source facility in the United States. The focus was on the use of synchrotron radiation to determine the location and chemical structure of natural radionuclides in minerals and associated radioactive products. The information obtained will assist in improving processes to better manage the contained radioactivity. Two papers on the work were presented at two major international conferences held in Europe.

CLEANER TECHNOLOGY FOR URANIUM MINING AND MILLING

The first three stages of a collaborative research agreement between ANSTO and Orica Pty Ltd to develop a new Magnetic Resin-In-Pulp (RIP) process for uranium and gold applications were successfully completed. Application of RIP processes will allow elimination of costly solid/liquid separation steps and reduce water usage. Significant commercial interest in the project has been generated.

ANSTO completed two projects involving the Ranger uranium mine in the Northern Territory. One was a review of the process water system at the site, carried out for the Ranger Minesite Technical Committee. The findings are being used to improve the environmental performance of the water system. The other consisted of laboratory and continuous mini-plant investigations to assess the performance of water treatment processes for application at the Ranger minesite. The findings are being applied to the design of a larger scale demonstration plant for on-site operation in the next financial year.



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

WASTE MANAGEMENT ACTION PLAN

ANSTO's 5-year Waste Management Action Plan ended on 1 July 2001 with the completion of research and development activities that required cross-divisional input. Technologies arising from this research have been transferred

to ANSTO's Waste Operations and Technology Development Section. The Action Plan, which was launched to ensure ANSTO's legacy wastes were managed in accordance with international best practice, established projects for tasks such as the safe treatment and storage of radioactive wastes, maintenance of waste inventories, waste minimisation, and upgrading of waste management facilities. These projects are reported upon below.

Waste inventory and database

A system for a comprehensive database for radioactive waste inventory has been established. The system will allow 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.

Monitoring of the spent fuel storage facility

The environmental monitoring capability for the dry spent fuel storage facility was upgraded to allow direct data logging. Monitored results continued to be favourable for this facility.

With the shipment of 360 spent fuel elements in January, a further nine spent fuel storage tubes were emptied, bringing the total number of empty storage tubes to 20 out of 50.

Intermediate-level liquid waste treatment

In addition to the solidification and volume reduction of liquid waste described on page 33 staff carried out research to refine a process to immobilise the solidified waste from molybdenum-99 production in a form suitable for long-term storage in the national store for long-lived intermediate-level radioactive waste. Staff demonstrated production of a ceramic waste-form suitable for this application at hot-cell scale.

Solid waste management

All low-level solid waste generated during the year was safely transferred to ANSTO's gamma scanning and storage facility. The gamma scanning system identifies the radionuclides



Fuel Management and Active Handling staff raise a loaded spent fuel cask from the loading pond in preparation for the cask's shipment to France. In January 2001, 360 HIFAR spent fuel elements (approximately 30% of the remaining site inventory) were safely transported to France for reprocessing.

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

present in the waste and provides a precise inventory of waste materials destined for the planned national radioactive waste repository.

Staff made significant progress in the ongoing program to strengthen management arrangements for historical solid radioactive wastes. Potential recovery and treatment technologies for intermediate level solid wastes were assessed and a number of overseas nuclear engineering companies that could provide the appropriate technology and equipment were identified. 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.

Waste water

A new Trade Waste Agreement was signed with Sydney Water, effective from 1 July 2001. The new agreement resulted from the release of the new Sydney Water 2001 Trade Waste Policy and Management Policy document. The Australian Radiation Protection and Nuclear Safety Agency (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, with the purchase and commissioning of a pilot membrane plant. The pilot plant will be used in assessing the feasibility of using membrane technology to remove trace levels of radionuclides from low-level radioactive liquid waste streams.

Waste treatment and packaging

The design of a new waste treatment and packaging building was completed and construction tenders were requested. The new building is designed to treat and package the low-level and short-lived intermediate-level radioactive wastes for disposal in the proposed national waste repository. Construction of the new building is expected to begin in the latter half of 2001.

Waste operations and technology development

Certification of the ANSTO's Waste Operations and Technology Development Quality Assurance System to the AS/NZS ISO 9001:2000 standard was achieved.



Chemical engineer Lynn Tan checks ANSTO's new water treatment pilot membrane plant. The pilot plant will be used in assessing the feasibility of using membrane technology to remove trace levels of radionuclides from low-level radioactive liquid waste streams at the Lucas Heights site.

Drivers: Government and industry.

OBJECTIVES

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.

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

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

OUTCOMES*

** For the purposes of this report, outcomes are defined as the results, impacts or consequences of ANSTO's work on the Australian and international community.*

- Sales of radiopharmaceuticals and radioisotopes for medical, industrial and research purposes produced revenue of \$17.99 million, an increase of \$2 million over the previous year. Export sales grew by 19% to \$2.5 million to make up 14.2% of total revenue from these products.
- ANSTO assisted a Queensland power industry customer to assess the remaining life of several of their large, high capital cost components. These components are reaching the end of their original design life and without detailed assessment would have to be replaced at significant capital cost and downtime. ANSTO performed destructive tests of samples from these components, using its expertise in miniaturised creep testing, to derive accurate material properties. It was shown by testing and analysis that the service life of these components could be safely extended.

- ANSTO technology will be used in China by an Australian mining company to prevent arsenic or mercury being released to the environment during processing of gold ore. The technology is a product of ANSTO's extensive research and development work on the stabilisation of arsenic and other toxic inorganics in complex waste mixtures.
- An ANSTO business unit called Sulfide Solutions was established to derive value from ANSTO's previous research efforts in the Managing Mine Wastes Project (MMWP). Sulfide Solutions is now the vehicle for the delivery of tools and technologies developed with the Sulfide Solutions Research group (formerly MMWP). In operation since July 2000, the business unit has significantly broadened the client base serviced by ANSTO and established industry recognition in its professional delivery of services and underpinning technologies.

ACTIVITIES AND OUTPUTS

ENVIRONMENTAL MANAGEMENT

The Sulfide Solutions Research Project (SSRP) continued to develop cutting edge technologies in response to the needs of the global mining industry. Through the project, ANSTO is collaborating with CSIRO Energy Technology and ACIRL Limited in a research project on the rehabilitation of coal spoil piles that are prone to spontaneous combustion. The work is funded through the Australian Coal Association Research Program (ACARP).

In June, an SSRP scientist was invited by the Mining Minerals and Sustainable Development (MMSD) project of the International Institute for Environment and Development (IIED) to participate in the first Mining and Biodiversity Workshop, which was held in London. The aim of the workshop was to review key issues that surround mining in areas of valuable biodiversity.

Sustainability and international competitiveness of industry

ANSTO also presented a short course on Ecological Risk Assessment at the ACMER Hobart workshop on implementation of the new ANZECC/ARMCANZ (Australia and New Zealand Environment Conservation Council and Agricultural Research Management Council of Australia and New Zealand) water circulation guidelines for the management and treatment of mine water. In summary, SSRP continued to maintain and develop strong regional and international networks with the mining industry and research groups.

In other mining related work, ANSTO and Earth Systems Pty Ltd obtained funding under the National Heritage Trust funded RIVERWORKS program to use a jointly developed and novel technique called the Gas Redox and Displacement System (GaRDS), suitable for the prevention of acid mine drainage problems from underground mines post closure. A field trial of the GaRDS technique was begun at a small abandoned underground mine in Tasmania. This acid mine drainage (AMD) prevention technique offers the potential for passive, low cost and effective control of acid drainage from underground mines via oxygen displacement.

ANSTO and a coalition of several US universities and contract engineers were awarded a grant of US\$200,000 by the American Water Works Association Research Foundation (AwwaRF). The grant will enable the sulfite-UV technology that was jointly patented by ANSTO and the CRC for Waste Management and Pollution Control to be independently assessed against other technologies for arsenite oxidation.

INDUSTRY

Minerals processing

ANSTO held a workshop for representatives of WMC, including WMC Resources Ltd, Group Technology, Olympic Dam Operations (WMC ODO) and other WMC operations and ANSTO scientists in order to discuss common interests and research areas. As a minerals producer,

WMC Resources Ltd were particularly interested in ANSTO's expertise in environmental impact monitoring and solutions, water treatment, waste management and process optimisation. Several projects with WMC Divisions resulted and other joint initiatives were identified.

Radiation technology

ANSTO continued to provide a traceable high-dose dosimeter supply, measurement and calibration service to commercial radiation services in Australia and the Asia-Pacific region.

The organisation's gamma irradiation facilities are used to process materials such as medical devices, human tissue grafts, microbiological test kits, tropical fruit, and polymers and for sterilising up to 14 million Queensland fruit fly pupae per week for the agriculture industry.

ANSTO's main irradiation facility, the Gamma Technology Research Irradiator (GATRI) was issued with a facility licence by ARPANSA. ANSTO also maintained its licences from the Therapeutic Goods Administration and the Australian Quarantine and Inspection Service.



Postgraduate student Vanessa Peterson adjusts ANSTO's Small Angle Neutron Scattering (SANS) instrument. The instrument is used to probe the nanostructure of materials in order to gain a better understanding of their properties.

Sustainability and international competitiveness of industry

Nanostructure studies

ANSTO has a range of skills and facilities that are ideally suited to studies of the structure of materials on the nanoscale - on the scale of molecular assemblies or macromolecules.

Collaborative research with Australian industry was undertaken on problems ranging from the ranking of coal for blast furnace charcoal to the hydration of cellulose fibres used in the manufacture of fibreboard. Scientists used Small and Ultra Small Angle Neutron Scattering and other techniques to probe the nanostructure of materials in order to gain a better understanding of their properties. One highlight of this work was the correlation between the porosity of charcoal and its efficiency in purifying metal in a blast furnace.

Staff also worked on collaborative projects to obtain insights into the structural evolution of sols and gels for the production of nanostructured materials. An important outcome of ANSTO's collaboration with the Commissariat à l'Energie Atomique (Saclay, France), which began in 1994, was the further development of scattering techniques and associated mathematical models for investigating the structure of porous materials.

ANSTO scientists used facilities at the Intense Pulsed Neutron Source at the Argonne National Laboratory in the United States to continue their study of mesostructured materials. They used small angle neutron scattering contrast variation techniques to investigate the mechanism by which mesostructured materials form via surfactant self assembly and templating.

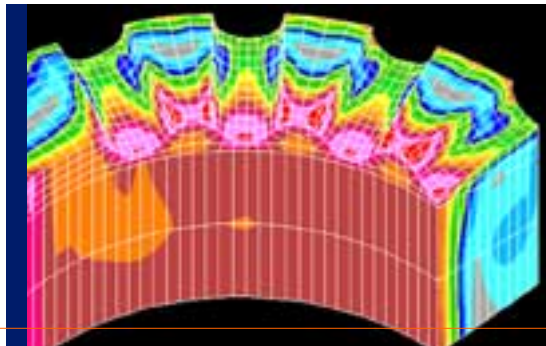
Such materials are currently the subject of intense Australian and international research efforts due to their potential applications in areas such as waste remediation, ion exchange and molecular separation, biomedicine/biosensors and catalysis. A provisional patent application embodying ANSTO's technology was filed.

The collaborative research agreement signed in 1998 with the US National Institute of Standards

and Technology (NIST) continued to provide access to world-class neutron scattering facilities that complement those at ANSTO. Studies initiated in 1997 with NIST on how shear forces can be used to control the nanostructure of gels, continued. A partnership with the Western Australian Petroleum Research Centre was developed to study the nanostructure of oil-bearing rocks to lead to a better understanding of oil recovery. ANSTO is a core participant in the Cooperative Research Centre for Polymers and continued to work with research and industry collaborators. ANSTO led studies on how polymer chains entangle during the complex manufacturing processes and how this entanglement influences the properties of the manufactured item.

Safety and life of welded structures

ANSTO helped develop a new program of six research projects for the power generation industry. The program, which will commence in July 2001, is a collaborative effort between several partners within the CRC for Welded Structures and was successful in attracting sponsorship from ten power generating companies across four States.



Computer simulation of a steel super heater header from a power station showing how the component is affected by the stress of changing operating temperatures.

Sustainability and international competitiveness of industry

A new technique developed for testing radioactive components

In 1999 ANSTO's materials scientists began developing a refinement of the 'small punch test', a miniature specimen testing technique used to determine the mechanical properties of nuclear components. The technique was originally developed to test nuclear components that were in service, and therefore radioactive.

The small punch test involves taking ultra-small samples that can be removed without damage to the component and that, because they are so small, give off only a small amount of radiation. ANSTO is refining the test and combining it with finite element computer modelling techniques to extract additional information about the strength and toughness of nuclear plant and components.

The new test was applied to safety studies on HIFAR. It was also tested on embrittled steels from coal fired power stations as part of a collaboration with the Department of Chemistry, Materials and Forensic Science at the University of Technology, Sydney and with the School of Physics and Materials Engineering at Monash University.

It also has potential as a useful tool to Australian industry for life consumption analysis of aging industrial components.

Areas of study will include the development of new weld repair techniques for extending the life of critical power plant components and the development of techniques for more accurately estimating the remaining life of high energy piping systems.

Remaining life assessment of power station components

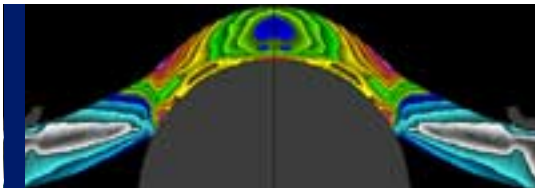
Through its operation of the HIFAR research reactor, ANSTO has developed a high level of expertise and skill in analysing and measuring the effects of extreme heat on materials and welds. Using this expertise, ANSTO assisted a Queensland Power Industry customer by developing algorithms for on-line computer calculation of consumed creep-fatigue life under changing operating conditions. These changing conditions have resulted from deregulation of the power industry, which has forced power suppliers to become more competitive and thus more adaptable to demand.

The on-line predictions can also be used to target important safety inspections, and to assess the true costs of differing operational regimes.

Interface engineering of multilayered structures

This project, which began in July 2000, is building on ANSTO's skills in sol-gel processing, plasma surface conditioning and atomic layer deposition for engineering thin oxide films and interfaces with applications in optics, optoelectronics, biomedical sensors and implantable devices for functional electrical stimulation. A particular emphasis of the project is to optimise the technology platform for applications relevant to Australian industry, in collaboration with selected CRCs and industry partners.

Research during the year focused on the development of novel processing techniques and new chemical precursors for producing engineered films of titania and lithium niobate, both of which are important materials in the areas of photonics and opto-electronics.



A computer simulation of the 'small punch test' showing the evolution of material plasticity in the sample as the spherical punch is pushed upwards through the sample. The sample is 0.5 mm thick.

Sustainability and international competitiveness of industry

Part of this work was undertaken by graduate students from Université Paris-Sud (France) and Ecole Polytechnique Fédérale de Lausanne (Switzerland) under the supervision of ANSTO staff. Collaboration was initiated with Centre Nationale de la Recherche Scientifique (France), to develop new methods for investigating the mechanical properties of thin films while simultaneously imaging the films under a microscope. ANSTO also began a collaboration with Chimie de la Matière Condensée, Université Pierre et Marie Curie/CNRS, France on the use of advanced spectroscopic techniques for investigating chemical interactions on the surface of sol-gel matrices.

Plasma Immersion Ion Implantation Process (PI³)

PI³ is a patented process developed at ANSTO to produce wear-resistant surfaces in metal components at low temperatures. PI³ systems have been sold by ANSTO to research organisations in Germany, the United Kingdom, Singapore and Australia. In order to establish the technology for industrial applications, expressions of interest were sought from Australian industry to license the technology. Of the 30 companies that responded, seven were asked to present proposals and one was selected to work with ANSTO in commercialising the technology for the industrial market.

SAFETY SERVICES

Radiation Standards

ANSTO continued to maintain traceability of calibration to a primary standard for the main medical radioisotopes.

ANSTO's Secondary Standard Dosimetry Laboratory (SSDL), which was commissioned late last financial year, conducted trial dosimetry measurements with Westmead Hospital. The results were successful and the facility began providing hospital dosimetry traceability and dosimetric measurements.

Digital Coincidence Counting

Digital Coincidence Counting (DCC) is a means of determining the activity of radioactive samples. Developed by ANSTO in collaboration with the National Physical Laboratory (NPL) in the United Kingdom, DCC provides faster and more reliable results than can be achieved with the older analogue technologies. As part of the ANSTO-NPL plan to jointly promote the technology, a demonstration DCC system was installed at the Bureau International des Poids et Mesures (BIPM) in Paris in July 2000. Feedback from the Bureau was used by ANSTO and NPL to update the system, and a new version was installed at the Bureau in March.

Radiation protection 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 104 instruments were calibrated. These included a range of gamma dose rate meters, neutron dose rate meters, personal electronic dosimeters and contamination monitors.

Radiation protection training

ANSTO provided 23 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, to specialist training for users of specific equipment such as moisture gauges. A total of 250 personnel from 49 organisations were trained, either at ANSTO or in the workplace.

Sustainability and international competitiveness of industry

Summary of commercial radiation protection training

Radiation Protection Course	Number	Participants
General Radiation Safety Officer (3 day)	3	37
Industrial Radiation Safety Officer (3 day)	3	23
Safe Use of Nuclear-type Soil Moisture and Density Gauges (1 day)	7	73
Safe Use of X-ray Equipment (1 day)	4	41
* Safe Use of X-ray Equipment (1/2 day)	2	28
Safe Use of Industrial Radiation Gauges (1 day)	2	24
* Safe Use of Industrial Radiation Gauges (1/2 day)	2	28
Laboratory Workers	2	24

* Courses included ANSTO staff as well as commercial clients

Radiation protection consultancies

Radiation protection consultancies were provided for external organisation on topics such as waste management, site remediation and general radiation protection. A number of consultancies were performed for CSIRO to provide inventories of radioactive sources and ensure they were packaged in an acceptable manner. ANSTO provided the services of a contract radiation safety officer, a statutory position at the Ranger uranium mine for Energy Resources of Australia. ANSTO continued to work with Energy Australia on the packaging of Zellweger relays and assisted Environment Australia in a radiological review of an environmental impact assessment for a sterilisation facility. ANSTO also provided a range of minor consultancies on radiation issues for industry and private concerns throughout Australia.

RADIOPHARMACEUTICALS AND RADIOISOTOPES

Production and marketing

ANSTO 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 the 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).

Production of the major radiopharmaceuticals increased steadily over the year, with a dramatic increase in the production of flurodeoxyglucose (FDG). Staff continued investigating ways of increasing production of gallium-67, molybdenum-99 and yttrium-90.

Administrative and accounting functions for radiopharmaceuticals were centralised, making it easier for staff to control stock and implement improved purchasing procedures.

Following the popularity of the new dry-bed technetium generator, Gentech®, released last year, a generator containing a higher activity of

Quadramet®

Quadramet® is a radiopharmaceutical currently registered for palliative relief of bone pain caused by the spread of prostate or breast cancer to the skeleton. Though currently approved for use in Australia as a palliative agent only, there has been interest in its use to improve treatment of patients with multiple myeloma who are undergoing stem cell transplantation. Results of an early clinical trial conducted by Drs David Macfarlane, Simon Durrant and James Morton at Royal Brisbane Hospital are expected to be reported shortly. The original animal studies investigating this approach were performed approximately 10 years ago at Fremantle Hospital.

Sustainability and international competitiveness of industry

molybdenum-99 was developed. A smaller dispensing vial is also being developed in order to provide customers with a greater choice of dose size. Both improvements have received approval from the Australian Therapeutic Goods Authority (TGA). Customer feedback on Gentech® has been extremely positive.

Other developments included the introduction of an additional dose size for gallium-67 and the extension of marketing rights for Quadramet® (samarium-153 labelled lexicidronam) to a number of additional countries in Asia. Marketing will begin when the product has been registered in these countries. General marketing approval was also received for the commercial sale of fluorine-18 fluorodeoxyglucose (FDG), which was registered under the trade name FDGen®. FDG is a very sensitive metabolic tracer used in the diagnosis and staging of cancer, in cardiac imaging and in imaging the effects of certain neurological conditions.

A marketing application was submitted to the TGA for Leukoscan, a diagnostic agent used to image infection and inflammation. Leukoscan provides a more accurate and rapid method of infection detection than is presently available and is safer to use than existing tests as the radiation dose is low, there is no blood handling and no risk of cross-contamination.

ANSTO Radiopharmaceuticals, which includes Radiopharmaceuticals Operations, Research and the National Medical Cyclotron, received ISO 9001:1994 certification from Standards Australia. Radiopharmaceuticals Operations is licensed by ARPANSA.

ANSTO manufactures radioactive microspheres containing yttrium-90 for SIRTeX Medical Ltd, a small biotechnology company committed to developing products to treat liver cancer. The two organisations have been working closely together to obtain approval from the US Federal Drug Administration for use of the product in the United States.

A new facility to manage inventory for pharmaceutical manufacture to Therapeutic Goods Administration standards was constructed.

The customer service monitoring system introduced last year was used extensively to monitor ANSTO's performance and provide statistics for management use. The system has been designed to ensure ANSTO meets its obligations with respect to regulatory requirements.

Research and development

Two new research projects were reviewed by ANSTO's Clinical Advisory Group (a panel of external medical experts) and, after acceptance by other ANSTO review processes, included in the organisation's project list. These projects now form the mainstay of research and development activities along with a pre-existing project to develop a new molybdenum processing operation. The first project involves investigating radiopharmaceuticals with potential for use in identifying and treating cancer secondary to malignant melanoma. The project includes a clinical trial comparing an existing product previously tested only in Europe, with fluorine-18 FDG for its specificity in malignant melanoma detection.

In the second project, ANSTO will collaborate with the Australian National University to develop a new method of manufacturing a radiopharmaceutical in particle form.

Molybdenum-99 is the parent radionuclide of technetium-99m, the workhorse of nuclear medicine. A major strategic project to develop a new process for molybdenum-99 production, aligned with the replacement research reactor project, continued. The new process will use low enriched uranium-235 foil targets in the reactor to improve yield.

Research and development staff also provided a small scale 'boutique' production service for specialised radiopharmaceutical products to support local nuclear medicine research.

Organisational development and support

OBJECTIVE

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

OUTCOMES*

* For the purposes of this report, outcomes are defined as the results, impacts or consequences of ANSTO's work on the Australian and international community.

- Employment conditions were formalised by the completion of an Enterprise Agreement between ANSTO and staff representatives, providing an environment for a stable industrial relationship.
- Funding by government is now packaged in a manner that is more appropriate to ANSTO's particular needs following the Government's acceptance of an Output Pricing Review undertaken by ANSTO with the Department of Finance.
- Staff recruitment and, in some divisions, consideration of progression and the associated remuneration, were converted to a competency-based framework during the year.
- Financial information management systems operated successfully following the introduction of the Government's Goods and Services Tax. This smooth transition was the result of a comprehensive testing program the previous year.
- The organisation initiated processes to underpin its claims for funding for the replacement of its fixed assets by carrying out an extensive revaluation using the deprival value method as prescribed in the Finance Minister's Orders. Approximately 6,000 items of plant and equipment and approximately 80 buildings were revalued and a total increment of \$99.5 million recognised against the valuation of those assets.

ACTIVITIES AND OUTPUTS

Our people

ANSTO recognises that it is its people who make ANSTO unique. Because they are ANSTO's most valuable resource, many of the organisational activities during the year were focussed on people issues. These included the Enterprise Agreement, initiatives in learning and knowledge, the Competency Program and moves to further community involvement.

In all projects the interests of the people who constitute ANSTO have been given priority. For example, the new Business Information System training programs are designed to enable staff to make an easy transition to new skills that will enable them to utilise new technologies and thus take on more interesting and rewarding roles.

Finance

Management control was enhanced by the continued development of accurate and timely accruals-based monthly accounts for consolidation into the Government's accounts.

Strategic advice and support continued to be provided to all business units and senior management on a wide range of issues including treasury, taxation, procurement, budgeting and financial management. Accounting services, including budgetary and financial reporting, were also provided to ANSTO's associate organisation, the Australian Institute of Nuclear Science and Engineering (AINSE), and to the Australian Synchrotron Research Program (ASRP).

Revenue

ANSTO is a signatory to a Triennium Funding Agreement between the science agencies (CSIRO, ANSTO and the Australian Institute of Marine Science) and the Government. Included in this Agreement is a required performance target to be met for generating external revenue from research and other services. In 2000-2001, ANSTO generated \$35.8 million (1999-2000 \$32.7 million) from external sources, which represented 29.5% of total income (excluding capital use charge).



Most incoming goods, whether an envelope or a steel girder, are processed through the Receiving Dock, where the staff deal with an average of 360 deliveries a week. The Stores team, from left to right: Peter Chilvers, George Dobson, Peter McClure and Peter Minigle.

Revenue generated from the sale of goods and services totalled \$31.8 million (1999-2000 \$27.6 million), and included \$17.9 million from the sale of radiopharmaceuticals, an increase of \$1.9 million over the previous year.

Expenditure

ANSTO continued to focus science and technology expenditure on the five core business areas described in this annual report. Expenditure was higher than last year as a result of increased regulatory costs and costs associated with an overseas shipment of spent fuel. Production costs associated with radiopharmaceutical operations also rose, as a result of a substantial increase in sales.

Overall, expenditure against the core business and support activities was broadly in line with budgeted expectations and accorded with the expected outcomes, which included a planned operating deficiency for 2000-2001. Following the Output Pricing Review, the Government agreed that ANSTO should be provided with

further funding to meet the increased costs associated with regulation.

The Government also recognised ANSTO's role in training and research and stated that funding for ANSTO's activities would be maintained at current levels in real terms.

Through its baseline funding, ANSTO maintains and manages its research infrastructure and major national facilities, which include HIFAR and the National Tandem Accelerator.

Output Pricing Review

During the year ANSTO successfully completed a review of the price paid by Government for the provision

of ANSTO's contribution to the community. The organisation has been increasing its external earnings and has made operational efficiencies, but in recent years increased regulatory demands, inadequate funding from parameter adjustments and the erosion of Appropriation Funding due to various dividends required by government had resulted in a substantial decline in the resources available for research expenditure.

The Review resulted in ANSTO and the Department of Finance recommending a new pricing structure for ANSTO's outputs and agreeing that further adjustments to annual depreciation and increased funding for asset management would be agreed prior to Additional Estimates amendments in October 2001. These recommendations were subsequently adopted by the Government.

Budget 2002

ANSTO is a Commonwealth authority. It operates under the Commonwealth Authorities and Companies (CAC) Act 1997 and receives government appropriation to carry out the majority of its activities. Funding for 2000-2001 was covered by the 2001-2004 Triennium Funding Agreement between ANSTO and the Government.

In support of the Government's decision to replace the HIFAR research reactor, ANSTO is receiving an equity injection over nine years to fund the design and construction of a replacement research reactor at Lucas Heights.

Spent fuel from the HIFAR research reactor has been stored in a safe, interim storage facility at Lucas Heights. Disposition of the inventory of spent fuel arising over the lifetime of HIFAR has been made possible through specific Government funding for this purpose.

Parliamentary appropriation, including equity injections, of \$180.963 million was received in 2000-2001 (1999-2000 \$104.641 million).

This amount included a capital use charge of \$40.213 million that was repaid to the Government in June. The amount of appropriation received was allocated as follows:

- \$57.099 million for the replacement research reactor project as an equity injection of \$50.017 million and a capital use charge of \$7.082 million.
- \$13.429 million to fund the disposition of HIFAR spent fuel elements as an appropriation of \$13.540 million minus a capital use charge of \$0.111 million.
- \$110.435 million in funding for core science and technology activities as an appropriation of \$77.193 million and a capital use charge of \$33.242 million.

Business Information System

During the year ANSTO documented its requirements for a new Business Information System. Tendering and selection was completed and a 3-year contract



Staff continued to take part in the staff development program Learning Environments for New Strategies (LENS), which was introduced last year. Nearly half ANSTO's 800 staff have now completed Phase 1, which concentrates on developing tools and techniques for team effectiveness.

was approved in June. The system will integrate processing and reporting capabilities across all divisions, providing the means to improve production, operational processes and management controls in all business areas.

Management and development of our people

The major focus during the year was on implementing the initial stages of ANSTO's new 3-year Human Resource Strategy, and in particular on improving workforce planning and performance management. Human resources staff continued to provide a high level of support to management and staff, which included increased emphasis on recruitment for positions associated with the beamlines for the replacement reactor.

Work on the Competency Framework Project, which is developing a competency-based human resource framework for the organisation, continued. A separate interim competency-based pay and progression model was developed and implemented for the crafts stream. Approximately 200 role profiles have been developed for the organisation and linked to competency standards.

The Learning Environments for New Strategies (LENS) Program, introduced last year, continued to be the main staff development mechanism during the year. Nearly half the workforce has now completed Phase 1 of the program, which concentrates on developing tools and techniques for team effectiveness.

The "Leadership in Innovation" program organised by the Business and Higher Education Round Table was again the focus of management development during the year. This program has proved valuable as a learning and development activity for middle level managers.

Training courses

Categories	No. of courses	Attendance
LENS program	28	406
Quality assurance courses	42	209
Health and safety courses	238	1150
Science and engineering courses and seminars (including HIFAR specific training)	128	421
All other management and competency-based courses	50	217

Scholarships and study support valued at \$466,000 were paid for undergraduate, postgraduate and year-in-industry scholarships.

Work experience

ANSTO's work experience program placed 31 secondary school students with the organisation during the year. In addition, 20 undergraduate students were provided with work experience during the university summer vacation.

Employee and industrial relations

A new Enterprise Agreement was certified in January. It remains in force for 12 months. Apart from some limited industrial action during negotiations for the agreement, the industrial

relations climate at ANSTO remained stable. Management continued to consult with staff representative bodies on industrial relations issues.

Engineering services

Engineering staff managed a range of infrastructure upgrades during the year and provided routine engineering support to site facilities and equipment.

Management of fixed assets

Following a revaluation of ANSTO's fixed assets, the organisation initiated an Asset Maintenance Plan. The plan, which will commence in the new financial year, will ensure that optimum efficiencies are built in to the planned maintenance of our buildings, plant and equipment.

Risk management

A structured whole-of-business approach provides ANSTO with a culture of risk management in all its activities. ANSTO has an internal audit program that is outsourced and reports quarterly to the ANSTO Board Audit Committee. The audit program covers all divisional activities including quality assurance, insurance, continuity of operations and fraud control and monitors risk management aspects of the Replacement Reactor Project and the organisation's new Business Information System. The Australian National Audit Office (ANAO) audits the statutory accounts and accounting process and carries out regular reviews of particular aspects of risk management. During the year, ANAO reviewed accounts payable and financial accounts and began reviewing fraud control.

ANSTO is a participant in the Commonwealth's managed fund for insurable risk, organised by Comcover. Under these arrangements, ANSTO is covered in general against claims for financial loss, death or personal injuries, or damage to property arising out of activities or products of the organisation. All areas of risk, including property, business continuity, professional

Organisational development and support

indemnity, Directors and officers, motor vehicles, personal injury, marine transit, medical malpractice, travel, and industrial special risk for a property used for commercial purposes are covered, with premiums, deductibles and insurable limits set on Comcover's normal terms and conditions. Medical expenses for staff posted overseas are covered under a separate insurance policy on normal commercial terms and conditions.

Worker's Compensation is covered by statute under the Safety Rehabilitation and Compensation Act 1988.

A Deed of Indemnity is in place between the Commonwealth of Australia and ANSTO to indemnify ANSTO, ANSTO Directors and officers and contractors from any loss or liability arising from claims caused by ionising radiation.

Regarding foreign exchange policy, ANSTO receives expert advice on maintaining its forward cover strategies in accordance with the changing international currency markets.

Data network and telephony enhancements

ANSTO's desktop computer system continued to be upgraded, with the latest improvements providing 10/100Mbit/sec switched ethernet to all desktops and 1Gbit/sec ethernet fibre links on strategic segments of the backbone.

Work began on setting up data and telephony services for INVAP, S.E. and the replacement reactor construction partners. Plans were completed and some equipment installed. Voice-over-IP telephony was trialed as a possible replacement for some of the services provided by ANSTO's current PABX, which is nearing the end of its useful life.

Computer services

A new Silicon Graphics scientific computer was purchased, together with two network-attached storage devices. ANSTO completed a self-audit of its PC software and signed a 3-year enterprise agreement with Microsoft for operating system upgrades. PC purchases for most of ANSTO are handled centrally through

its Information Management division, enabling standardisation and simplifying deployment.

Information technology outsourcing project

The Humphry report into Federal IT outsourcing recommended that ANSTO consider what if any of its IT infrastructure should be outsourced. ANSTO has decided that its internal data network will not be outsourced, because it carries both conventional data and other alarm and control traffic and passes through secure locations. External data traffic is already carried by AARNet at competitive rates. Computers attached to scientific instruments will be considered as part of the instruments, and not as pieces of IT infrastructure to be outsourced. Such computers and their software are usually covered by support agreements with the instrument suppliers. The control system, both hardware and software, for the replacement reactor will be provided under a turnkey arrangement, and supported by Foxboro. Internal service level agreements are being prepared and service statistics collected to enable the desktop support and server functions to be market tested by July 2002. The initial set-up and support for SAP during an extended implementation phase will be supplied by a third party on sub-contract to KPMG, ANSTO's implementation partners.

Library services

The library continued to move from paper to electronic delivery of ANSTO's journal collection, a process facilitated by its networking arrangements with CSIRO. Electronic delivery agreements are in place with Elsevier, Wiley, Kluwer, Springer, the American Chemical Society, CSIRO Publishing, and others. ANSTO scientists now have desktop access to over 2,900 e-journal (electronically published) titles and more than 80 scientific and technical databases.

The ANSTO library continued to supply abstracts and associated metadata of nuclear-relevant Australian literature to the International Nuclear Information System (INIS) database of the IAEA.

It also distributed the INIS database to Australian organisations, and participated in planning revised formats for the INIS data management system.

Paper file management

The latest TRIM paper file management system was installed, enabling staff to locate files via a web interface on their desktop PC.

A substantial file appraisal effort was initiated in response to changes in archiving policy by the National Archives of Australia.

Quality Assurance

A gap analysis of Quality Assurance programs for all ANSTO divisions was carried out during the year and a comprehensive report issued by the auditing consultants ARTCAN Management Services. Recommendations from the report are currently being considered for implementation. ANSTO is moving toward total accreditation across site during 2002.

Commercial leasing of ANSTO's property

ANSTO has a number of high technology tenants on site at the ANSTO Technology Park and plans are underway to further develop the park and facilities. Three tenants renegotiated their leases with ANSTO during the year. A list of current tenants can be found in Appendix 5.

Business development

A number of ANSTO technologies and services were marketed or negotiated for marketing during the year. These are described elsewhere in this report, mainly under the core business area Sustainability and International Competitiveness of Industry, pages 38-44.

Implementation of ANSTO's business guidelines and costing and pricing procedures throughout the organisation was supported by a half-day conference and by reviews with project leaders on a case-by-case basis.

Patents and intellectual property

ANSTO held solely or jointly 174 patents, registered designs, trademarks and applications at the close of the financial year.

These stem from 34 separate inventions of which 23 are presently being commercialised through collaborative projects, licence agreements and, in one case, development as a spin-off business. The remainder are currently being reviewed for commercial potential.



Water tunnel researcher David Wassink works on ANSTO's large-scale experimental water tunnel facility. The facility is used in the study of coolant flow around models of improved design isotope production cans, for increasing efficiency and safety. University scientists also use the water tunnel in studying near-wall turbulence phenomena to develop improved flow and heat transfer characteristics in areas such as water-based heat exchanger design.

ANSTO Annual Report 2000 - 2001



Safety and environmental protection arrangements at ANSTO facilities

Safety

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 impact on the external community or environment.

OBJECTIVES

- Ensure protection of human health and safety and the environment as the organisation's highest priority.
- Promote a positive safety culture and environmental awareness.
- Provide and maintain safety systems and assessment procedures that are in accordance with national and international standards.
- Strive for continual improvement in safe work practices and prevention of pollution to ensure that risks to staff and the public associated with ANSTO's operations are kept as low as is reasonably achievable.

OUTCOMES

- ANSTO continued to maintain a safe workplace for all staff, contractors and visitors. The effectiveness of the safety management system was recognised by Comcare as suitable for self-audit status.
- The ANSTO emergency management plans, revised to meet changes in the NSW State Emergency and Management Act 1989, as amended in 2000, were recognised by the NSW Emergency Service Organisations as adequately fulfilling the requirements of the Act.
- ANSTO's safety management system and overall safety arrangements were accepted by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) as a suitable basis for issuing licences, both for use of sources and for facilities. The majority of these licences were issued during the year.

- Continuing attention to the control of radiation exposures ensured that the highest dose to any employee was 8.6 mSv, less than one half of the occupational dose limit.
- Annual radiation doses to the public from ANSTO discharges remain less than 0.01 mSv, which is only 1% of the annual limit recommended by the National Health & Medical Research Council.
- The results for all liquid waste discharges to trade waste again demonstrated the effectiveness of ANSTO's liquid waste treatment facilities. All discharges for radioactive and non-radioactive substances were below the regulatory compliance levels. ANSTO is also in the process of further improving its liquid waste treatment facilities through the installation of new membrane technology.
- The report "Environmental and Effluent Monitoring at ANSTO Sites 1999" was approved by ANSTO's Health, Safety and Environment Committee and released to the public. It provides full details of environmental performance at the Lucas Heights Science and Technology Centre and at the National Medical Cyclotron and demonstrates that ANSTO was in compliance with all relevant regulations and guidelines.

ACTIVITIES AND OUTPUTS

ARPANSA LICENSING AND REGULATION

Considerable effort went into applying for licences under the Australian Radiation Protection and Nuclear Safety (ARPANS) Act 1998 and demonstrating compliance with licence conditions once licences were granted. Licences covering all the sources (controlled material and controlled apparatus) under the control of Engineering, Environment, Materials, and Safety Divisions (other than those covered under applications for facility licences) was

Safety and environmental protection arrangements at ANSTO facilities

granted by ARPANSA. The Physics Division licence is expected to be granted early in the next financial year. Sources covered by these licences are used in a wide variety of applications in industrial processes, tracer studies, calibration of equipment and process monitoring.

Facility Licences were granted for the operation of the National Medical Cyclotron, the GATRI irradiator, the Radiopharmaceuticals Production Facility, HIFAR and the Fuel Management Facility. A licence for the care and management of the shutdown reactor, Moata, was also granted.

SAFETY MANAGEMENT SYSTEM

The ANSTO Safety Management System is implemented through Safety Directives, which have evolved as ANSTO's research activities have changed. As ANSTO moves towards site-wide quality accreditation, these Directives are being restructured within the documentation hierarchy flowing logically from policy and delegation documents through to procedures and instructions. This work has resulted in the development of ANSTO's General Safety Arrangements, which formed the basis of the description of ANSTO's safety management system within the application to ARPANSA for source and facility licences. These general arrangements have been restructured to be consistent with the ARPANS Act and Regulations.

SAFETY ASSESSMENT

ANSTO Health, Safety and Environment Committee

The ANSTO Health, Safety and Environment Committee (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 Plan 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.

The Committee is chaired by an external member and provides advice to the Executive Director on the workings of the ANSTO safety management system and the licensing process. It also reviews any incidents with licensed facilities and ensures appropriate follow-up actions.

Facilities Safety Unit

The Facilities Safety Unit (FSU) continued to support the operation of the AHSEC. It reviewed submissions for modifications to plant and to operations of facilities, assisted in the development of safety directives for the Lucas Heights site and participated in the re-accreditation of facility operations staff. Its role was extended to include reviewing the safety of activities at all licensed facilities.

Safety Assessment Committee

For all activities not directly involving the routine operation of the HIFAR reactor where safety assessment is required, approval is given by the Safety Assessment Committee, which consists of representatives from a range of ANSTO Divisions and an external independent expert. During the year, one hundred and sixty-eight (168) submissions were assessed and approved by the Committee. The more noteworthy were those for the HIFAR Major Shutdown, the shipment of spent research reactor fuel overseas and the safety review of the molybdenum production process.

A major review of the ANSTO approval system resulted in the role of the Safety Assessment Committee and the Facilities Safety Unit being more closely integrated. Consistent with the ARPANS Regulations, the approval process is now based on safety analysis reports and a defined change modification process for all controlled facilities.

RADIATION PROTECTION

Radiation protection services in the form of operational health physics monitoring and advice, establishment of procedures for working in controlled areas and personal dose monitoring were provided to all ANSTO sites. Routine health physics monitoring of work areas ensures that a high standard of safe working conditions is maintained.

As part of the assurance of safety at work for all staff, the ANSTO Personal Dosimetry Service monitored 788 persons working at the Lucas Heights Science and Technology Centre and at the National Medical Cyclotron, which is located adjacent to the Royal Prince Alfred Hospital, Sydney. The highest effective dose for the year to any individual was 8.6 mSv, which is well below the annual dose limit of 20 mSv (averaged over five years).

Eighty per cent of workers monitored received less than 1 mSv and no worker received more than 9 mSv.

The highest dose was received by a radioisotopes production worker in ANSTO's Radiopharmaceuticals Division, and 18 of the 23 workers with doses between 5 and 10 mSv have been involved with radio-pharmaceutical production at the Lucas Heights site or the National Medical Cyclotron during the year. A comparison of the maximum and average effective doses for the past four years is shown in Figure 1.

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

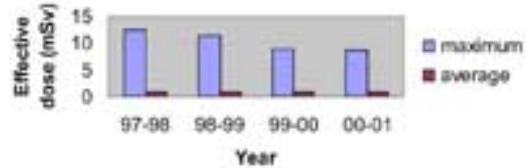


Table 1: Effective dose

		1997-98	1998-99	1999-2000	2000-01
Maximum effective dose	mSv	12.6	11.3	8.9	8.6
Average effective dose	mSv	1.0	1.0	0.8	0.8
Collective effective dose	Person mSv	811	772	617	630

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.

Table 2: Distribution of individual effective dose

Individual effective dose ranges (mSv)	1997-98	1998-99	1999-2000	2000-01
<2	670	665	669	700
>2 to 5	80	81	67	65
>5 to 10	29	25	26	23
>10 to 15	3	1	0	0
>15 to 20	0	0	0	0
>20	0	0	0	0

Safety and environmental protection arrangements at ANSTO facilities

The ANSTO Personal Dosimetry Service also measures shallow doses of all monitored workers. The highest shallow dose for the year to any individual was 15.5 mSv, which is well below the national and international annual dose limit of 500 mSv.

Doses to extremities such as hands and fingers are monitored for those workers handling radioisotopes and 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 350 mSv, which is also below the annual dose limit of 500 mSv. This dose was the estimated potential extremity dose incurred during the recovery of a dropped source, as discussed under "Accidents and incidents".

In addition to monitoring external exposures, ANSTO also routinely monitors 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 effective doses for reporting purposes.

OCCUPATIONAL HEALTH AND SAFETY

ANSTO gives high priority to the training of its employees. Occupational health and safety specialists ran 271 safety courses covering 30 different safety topics for Lucas Heights Science and Technology Centre staff and contractors. There has been a significant increase in the range of short induction courses for both new staff and contractors. Contractors are required to undergo appropriate training before a site pass is issued.

CD Roms of the Contractor Induction Training were provided to Contractor Supervisors to facilitate the induction process for all contractors.

ACCIDENTS AND INCIDENTS

The ANSTO Event Response System is the mechanism used to capture details of accidents and incidents (potential accidents or 'near misses'). The system addresses health, safety, plant damage and environmental impact.

All reportable incidents are categorised using the Comcare classifications.

Nine notifications to Comcare of reportable incidents were made during the year, one of which was subsequently withdrawn following rejection of a compensation claim by Comcare.

Of the remainder, five were as a result of more than 30 working days being lost, three of which were for incidents that occurred in the previous financial year. The five incidents were:

- An office-based employee was injured moving furniture and equipment between offices.
- An employee suffered a back injury moving a filter.
- An employee suffered a shoulder sprain moving an exhibit at a site remote to the Lucas Heights Science and Technology Centre.
- An employee suffered an elbow injury while trying to prevent a gas cylinder falling.
- An employee suffered a groin injury following repetitive lifting of lead shielding.

One "serious personal injury" occurred to a contractor servicing a gas water heater. He received a flash burn to the face.

In each case, a full investigation was carried out and actions were taken to rectify the situation or change the procedures.

Two "dangerous occurrences" were reported. These were:

- A small radioactive source was accidentally dislodged and fell to the floor. The source was quickly recovered but an unplanned extremity radiation exposure occurred to one staff member. The dose was below the annual occupational exposure limit. The direct cause was a problem with lifting equipment. Other contributory causes were identified. A detailed report was provided to both ARPANSA and Comcare. A full review of lifting equipment and its approval for use on site is being undertaken.

- An electrical shock was received by an employee when the wing nut on the end of a hacksaw penetrated insulation of an electrical cable. A cover on the cable tray had not been replaced. "Toolbox" meetings are being held to reinforce safe electrical work practices.

To reduce manual handling injuries, safety staff began issuing "Safe Work Method Statements", which require task planning and consideration of safety issues.

ENVIRONMENTAL PROTECTION ARRANGEMENTS

Environmental Management Action Plan

The Environmental Management Action Plan (EMAP) is a 5-year project initiated in 1999 to ensure that environmental management at ANSTO is consistent with emerging environmental practices and appropriate for future operations. This requires external certification for the International Standards Organisation (ISO) 14001 standard for environmental management systems. The project covers all areas of potential environmental impact, including airborne and liquid discharges from the site, transport of materials through the environment, monitoring of radionuclide concentrations in the environment, and their effects on the public and on the general environment. The project is also examining the underlying systems used to protect the environment with the objective of ensuring continual improvement in ANSTO's environmental performance.

Over 50 ANSTO staff members were trained by the National Association of Testing Authorities in implementing Environmental Management Systems as specified by the international standard ISO14001. The training provided information on the requirements of the standard with a strong focus on implementation strategies currently under development at ANSTO.

In accordance with the requirements for environmental management under ISO 14001, a database was designed to systematically record environmental aspects of ANSTO's activities, products and services. Data collection began during the year. The data will be analysed in terms of risk assessment and the results used in setting environmental objectives and targets for the organisation.

Following a tender evaluation process, an environmental gamma monitoring system was purchased and is currently undergoing testing. This system will consist of a three-station network in the Lucas Heights region, which will allow radionuclide data to be radio telemetred back to a central location for display and comparison with the current meteorological data. This will greatly enhance ANSTO's ability to directly measure ANSTO's small contribution to public dose and will facilitate evaluation of the performance of the atmospheric impact models.

Airborne emissions

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

The results of discharge monitoring and dose assessments showed that annual radiation doses to the public due to the discharges were less than 0.01 mSv, which is only 1% of the annual limit recommended by the National Health and Medical Research Council. The maximum potential public dose determined by the atmospheric dispersion model, PC-CREAM, was 0.005 mSv for the year. Details of the dose calculation and quarterly dose results are provided in the Annual Environmental and Effluent Monitoring report (Hoffman et. al. 2000, 2001).

Safety and Environmental Protection

Safety and environmental protection arrangements at ANSTO facilities

The doses are a small fraction of the average dose of 2 mSv per year received from natural background radiation. A dose of 0.01 mSv corresponds to the dose received from a return commercial airline flight from Sydney to Melbourne.

Detailed investigations were undertaken into noble gas emissions produced during radiopharmaceutical production to determine how emissions could be reduced. This involved monitoring the gaseous emissions every fifteen minutes and correlating the results with the operating practices being performed at the time. On the basis of this information, modifications to the production process were undertaken. This work significantly reduced the emissions during radiopharmaceutical production for this financial year, with noble gas releases reduced by almost a factor of ten. This process modification will ensure noble gas emissions from radiopharmaceutical production remain low, even if production rates increase in the future.

Liquid effluent discharges

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.

EMERGENCY RESPONSE

A 24-hour emergency response capability was provided at the Lucas Heights Science and Technology Centre. Additionally, emergency arrangements were maintained in conjunction with the appropriate State agencies.

Emergency planning at the Lucas Heights Science and Technology Centre was conducted under the provisions of the NSW State Emergency and Management Act 1989, as amended 2000. This Act requires that a range of plans, generally known as DISPLANS, are in place for potential emergencies. The purpose of these plans is to allow for emergencies to be controlled at the lowest appropriate level. The arrangements make provision for assistance to be provided should the incident escalate. This assistance is a staged process and provides for escalation of emergency control from local to district to State level.



ANSTO carries out regular emergency exercises to confirm the capability of ANSTO health physics teams to provide monitoring in the unlikely event of an emergency with off-site consequences. Health physicist Alison Parkes is seen here checking health physics surveyor John Saratsopoulos's environmental dose measurements.

Safety and environmental protection arrangements at ANSTO facilities

For the arrangement to be effective, all involved agencies are required to have in place appropriate internal instructions and/or standing operating procedures and to make resources available when required. Plans that have a direct bearing on activities at the Lucas Heights Science and Technology Centre are explained below.

Accidents, incidents or emergencies with on-site consequences are covered by two plans. The Lucas Heights Science and Technology Centre Emergency Plan describes the on-site emergency arrangements that can be handled by ANSTO personnel. The ANSTO Emergency Plan (DISPLAN) provides for the on-site emergency arrangements that require assistance and control from the NSW combat agencies. ANSTO personnel provide full technical support to this plan.

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

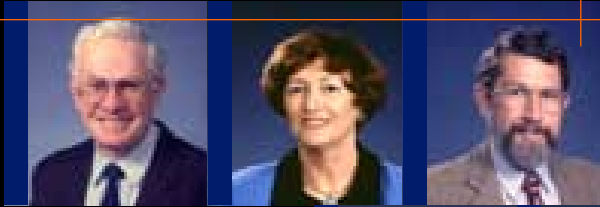
The ANSTO Local Liaison Working Party (LLWP) is responsible for preparing the ANSTO Emergency Plan (DISPLAN). ANSTO's Safety Division and the LLWP prepare the Lucas Heights Science and Technology Centre Emergency Plan. Membership of the LLWP consists of representatives of ANSTO, NSW Emergency Services 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 NSW Emergency Services Organisations.

Both plans were revised during the year in line with amendments to the Act. The majority of the Standing Operating Procedures for ANSTO personnel have been reviewed in detail and some revised to implement improvements identified in exercises.

The consolidation of all emergency response equipment and facilities into one area at the gatehouse was completed, making emergency response procedures easier.

A HIFAR fenced area evacuation exercise was conducted to ensure the current arrangements worked smoothly.

ANSTO Annual Report 2000 - 2001



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
- 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 hereafter 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 the next page. 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 this section.

Board membership

During the 2000-2001 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 2000-2001 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.

Seven Board meetings were held during the 2000-2001 financial year. Details of the number of Board meetings attended by each member follow.

Member	Board meetings attended
S M Richards (Chair)	7
M H Codd AC	7
F A Khafagi	7
J M Craker	6
C Hillyard	4
J Spasojevic	4
H M Garnett (Executive Director)	7

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 format and content of the 2000-2001 Annual Report addresses this requirement in general. In particular the Board reports that:

- ANSTO's mission has not changed from that reported for the previous financial year and continues to be managed through six core business areas

- each core business area is reported against in terms of its outputs and contribution to outcomes
- 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.

In the opinion of management and the Board, at the time of making this report, adequate cash resources are, and will continue to be, available to cover the entity'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 practices in safety and environmental protection.

The Board continued to attach priority to the recommendations on safety made by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Under the ARPANSA Regulations 1999, ANSTO has submitted licence applications for all ANSTO facilities and radioactive sources.

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

The Board receives regular reports on health and safety issues. ANSTO was granted occupational health and safety self audit status

for two years by Comcare in 1999. The second year's audit programme was successfully completed, with the results reported to the Board Audit Committee, the Board and Comcare. This self audit status was renewed by Comcare for a further two years to 2003.

Audit Committee

The Audit Committee, a formal sub-committee of the Board, comprised Mr M. H. Codd (Chairman), Mr J. M. Craker and a member external to ANSTO, Mr J. Bergman. 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. Currently this includes the oversight of the Replacement Research Reactor Risk Management Plan.

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.

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 on the following page.

Member	Audit Committee meetings attended
M H Codd AC (Chair)	4
J M Craker	4
J Bergman (External Member)	4

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 2001) of the committee are Professor Joan Dawes (Australia), Professor Alan Leadbetter (United Kingdom), Dr Dan Shochat (United States) and Dr John W Zillman AO (Australia).

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
- 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 formally constituted in October 1996 and is required to meet at least once per year. It met once during the 2000-2001 financial year and presented a formal report to the Board.

Risk management

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

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

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

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

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

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

Ethical standards

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 guidelines set out by the Commonwealth Law Enforcement Board.

External audit

Under the Commonwealth Authorities and Companies Act, the Commonwealth Auditor General, through the ANAO, is the external auditor for ANSTO. The Audit Committee reviews the ANAO audit plan and reports and meets with ANAO representatives prior to recommending to the Board that the annual Financial Statements be accepted and the Statement by Directors signed.

Internal audit

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

Internal control

The Board is responsible for ensuring that appropriate policies and internal controls are in place and operating. Compliance and review are monitored through the Audit Committee and the Internal Audit function.

Information technology outsourcing initiative

The Commonwealth Government decided in 1997 that IT infrastructure and services across all budget-funded Government Agencies would be outsourced subject to the outcome of a competitive tendering process.

In March 2000, a science cluster comprising the Australian Antarctic Division, the Australian Geological Survey Organisation, the Australian Institute of Marine Science, ANSTO and CSIRO began the process for the organisations concerned. In December 2000 the Government announced that the cluster approach was to be replaced by a system where individual agencies, through their Chief Executives, were to be responsible for the outsourcing initiative. ANSTO has established a project to progress this task.

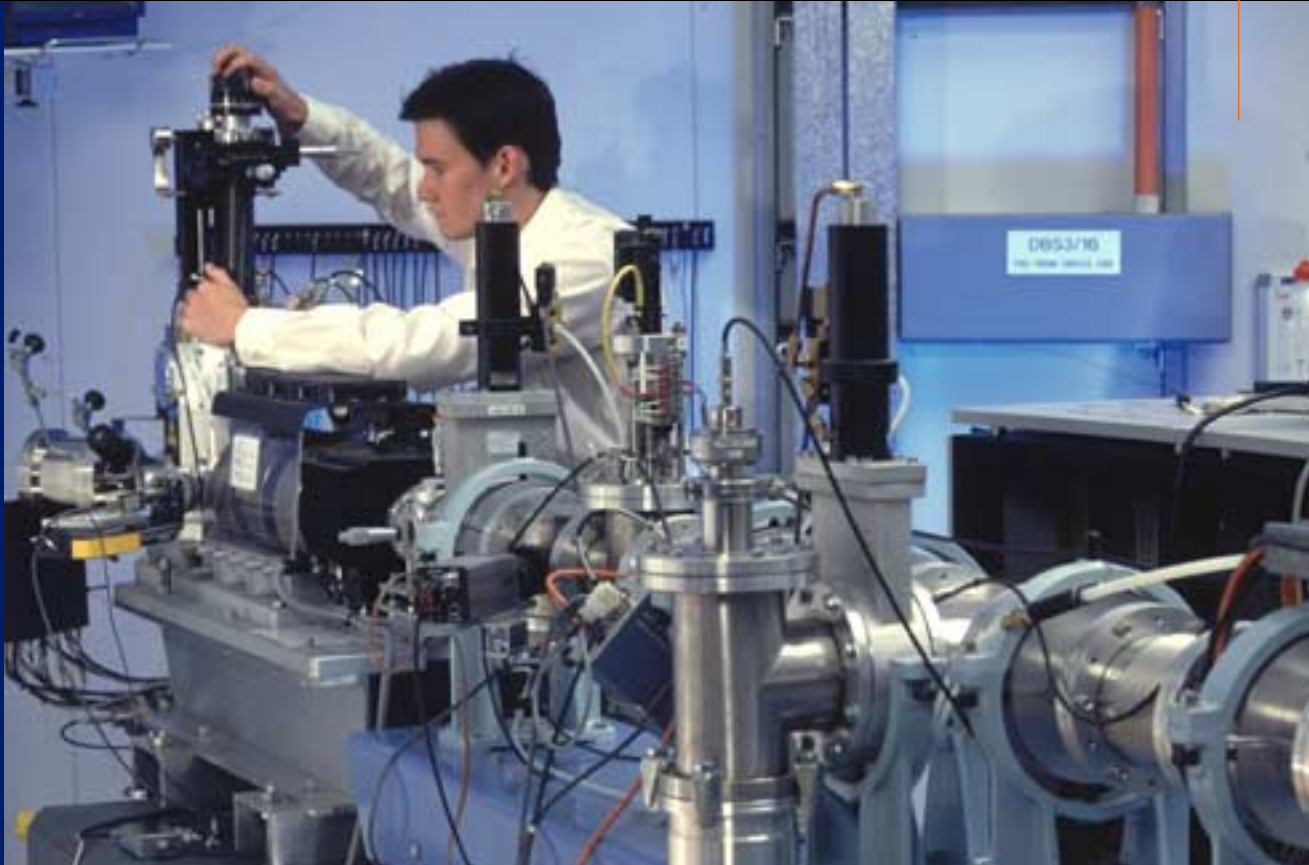
Goods and Services Tax

The introduction of the Goods and Services Tax occurred on 1 July 2001. All ANSTO systems were compliant from that date.

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. During the year, ANSTO recorded 300 complaints, pertaining mainly to the supply of radiopharmaceuticals. Most of the non-technical complaints were resolved within twenty-four hours.

ANSTO Annual Report 2000 - 2001



Australian Institute of Nuclear Science and Engineering Incorporated (AINSE)

OBJECTIVES

The objectives of the Australian Institute of Nuclear Science and Engineering Incorporated (AINSE) are:

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

Overview

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 and was established by the Commonwealth Government in 1958 to conduct research into nuclear energy and to provide training in the nuclear field. It is located with ANSTO at the Lucas Heights Science and Technology Centre and has four full time staff.

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 the Directors of ANSTO's seven scientific and technical Divisions.

AINSE operates on a calendar-year basis and this report covers 1 January to 31 December 2000. Income of \$2,726,847 was made up of \$1,237,421 from ANSTO, \$638,656 from university subscriptions, \$585,691 from external grants, and \$247,310 from interest on investments and \$17,769 from other sources, mainly conference registrations.

Core business 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 the year, 201 university projects were supported and 31 postgraduate student supplements awarded, representing \$1,324,396 in total. Some 15% of these researchers had not previously had access to ANSTO's facilities, and for sixteen of the postgraduates, the 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 three conferences and three workshops during the year. The three conferences were Radiation 2000, Plasma 2000 and the 18th Nuclear and Particle Physics Conference. The workshops, which were held at AINSE, consisted of the 2nd AINSE Symposium on Neutron Scattering Powder Diffraction, a Neutron Scattering Workshop and a Bio/SIMS workshop. Some \$57,234 in travel and accommodation subsidies was provided for member university participants who presented papers or contributed in some other way to the conferences and workshops. There were 222 participants at the conferences and 105 at the workshops and symposia.

Australian Institute of Nuclear Science and Engineering Incorporated (AINSE)

The 4th AINSE Winter School was held in July 2000. A scholarship was offered to every member university to enable a nominated third-year student to participate, and 36 attended. Feedback judged this program to be an outstanding success and it will be held again in 2001. AINSE is very grateful to the staff at ANSTO who give their time and expertise to this important program. 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.

Additional projects

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

Two grant applications to the Australian Research Council (ARC) Research Infrastructure and Equipment Fund were successful.

One, for membership of the UK facility ISIS, the world's most powerful pulsed neutron source, attracted \$255,000. It is supplemented by \$90,000 from universities, \$25,000 from ANSTO and \$30,000 from AINSE.

The other application, for a new accelerator, attracted \$1 million from ARC, \$559,000 from universities, \$600,000 from ANSTO and \$600,000 from AINSE. The University of Wollongong is the lead institution for this project, contributing \$100,000, and the University's Professor Allan Chivas will chair the Stakeholders Committee.

Recognition of outstanding people

The AINSE Gold Medal for 2000 was awarded to Professor Jim Camakaris from the University of Melbourne for his work using copper radioisotopes to investigate copper metabolism in normal and mutant cultured cells.

The Student Gold Medal was awarded to Darren Goossens, who worked under Dr Trevor Hicks at Monash University, for his work on magnetic ordering, utilising ANSTO's polarised neutron spectrometer at Lucas Heights.



AINSE researcher Iwan Cornelius working with the heavy ion microprobe on ANSTO's accelerator, ANTARES. Iwan's work involves characterising radiation detectors with applications in cancer therapy.

The microprobe is also used for tasks such as determining the distribution of lead in trees so as to better understand the uptake of these pollutants from the soil by plants being used to rehabilitate polluted environments.

Australian Institute of Nuclear Science and Engineering Incorporated (AINSE)

Key officers

The President of AINSE in 2000 was Professor Ron MacDonald from the University of Newcastle. In 2001 Associate Professor Ron Cooper from the University of Melbourne became President and the position of Vice President was filled by Professor Hans Coster from the University of New South Wales. Dr Dennis Mather continued as Scientific Secretary.

Member organisations of AINSE as at 31 December 2000

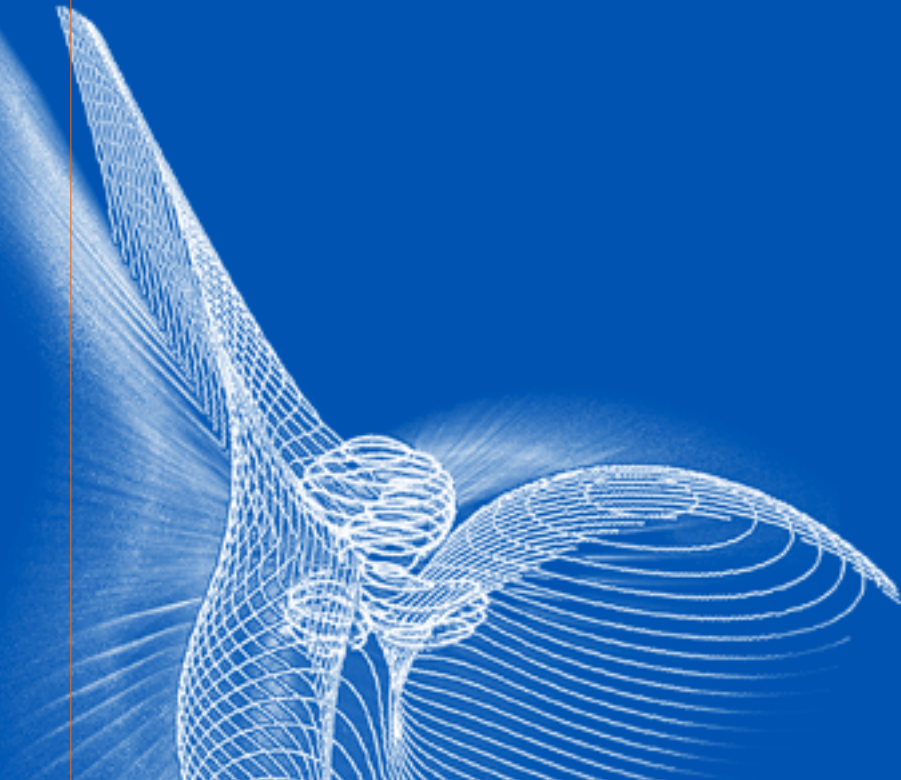
ANSTO
University of Adelaide
University of Auckland
Australian National University
University of Ballarat
University of Canberra
Central Queensland University
Charles Sturt University
Curtin University of Technology
Deakin University
Edith Cowan University
Flinders University of South Australia
Griffith 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
University of Technology, Queensland
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>.

Statement of Financial Performance

ANSTO Annual Report 2000 - 2001



In our opinion, the attached financial statements give a true and fair view of the matters required by Schedule 1 of the *Commonwealth Authorities and Companies (Financial Statements 2000-2001) Orders*.

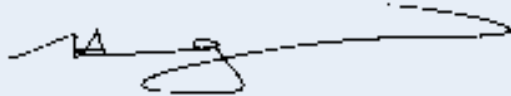
Signed in accordance with a resolution of the members of the Board.



MICHAEL H CODD

Director

14 August 2001
Sydney



PROFESSOR HELEN GARNETT

Chief Executive and Executive Director

14 August 2001
Sydney



INDEPENDENT AUDIT REPORT

To the Minister for Industry, Science and Resources

Scope

I have audited the financial statements of the Australian Nuclear Science and Technology Organisation for the year ended 30 June 2001. The financial statements include the consolidated financial statements of the economic 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 year. The statements comprise:

- Statement by Directors;
- Statement of Financial Performance;
- Statement of Financial Position;
- Statement of Cash Flows;
- Schedule of Commitments;
- Schedule of 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 whether, in all material respects, the financial statements are presented fairly in accordance with Australian Accounting Standards, other mandatory professional reporting requirements and statutory requirements in Australia so as to present a view which is consistent with my understanding of the Australian Nuclear Science and Technology Organisation and the economic entity's financial position, the results of their operations and their cash flows.

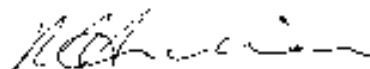
The audit opinion expressed in this report has been formed on the above basis.

Audit Opinion

In my opinion,

- (i) the financial statements have been prepared in accordance with the Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2000-2001) Orders; and
- (ii) the financial statements give a true and fair view, in accordance with applicable Accounting Standards, other mandatory professional reporting requirements and Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2000-2001) Orders, of the financial position of the Australian Nuclear Science and Technology Organisation and the economic entity as at 30 June 2001 and the results of their operations and their cash flows for the year then ended.

Australian National Audit Office



P Hinchey
Senior Director
Delegate of the Auditor General

Sydney
16 August 2001

Statement of Financial Performance

		Consolidated		Parent
	Note	2001 \$'000	2001 \$'000	2000 \$'000
Revenue from ordinary activities				
Revenues from government	2(P), 4A	125,946	125,946	101,641
Sales of goods and services	4B	31,834	31,834	27,621
Grants	4B	600	600	948
Interest on deposits	4B	2,530	2,530	1657
Proceeds from disposal of assets	4C, 4F	633	633	951
Net foreign exchange gains - non speculative	4D, 5D	-	-	667
Other	4E	198	198	872
Total revenues from ordinary activities		161,741	161,741	134,357
Operating expenses				
Employees	5A	50,833	50,783	48,930
Suppliers	5B	51,333	51,197	46,216
Depreciation and amortisation	5C	21,494	21,494	16,218
Write down of assets	5D	691	691	171
Grants	5E	1,937	1,937	1,521
Disposal of assets	4F, 5F	136	136	499
Total expenses from ordinary activities		126,424	126,238	113,555
Borrowing cost expense	5G, (c)	383	383	-
Net operating surplus from ordinary activities	(b)	34,934	35,120	20,802
Net surplus attributable to the Commonwealth	9(d)	34,934	35,120	20,802
Net credit to asset revaluation reserve	9	99,529	99,529	71,090
Total revenues, expenses and valuation adjustments recognised directly in equity		99,529	99,529	71,090
Total changes in equity other than those resulting from transactions with owners as owners		134,463	134,649	91,892

Notes:

- There are no consolidated financial accounts for the previous year so consolidated comparatives for 1999/2000 do not appear in these statements.
- The above Net Surplus, after allowance for payment of the Capital Use Charge to Government, represents an operating deficit of \$5.279 million. The 2000/2001 Commonwealth Government Budget provided for an operating deficit of \$4.997 million, and provides for up to \$5 million to be made available as a Government equity injection.
- 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.

	Note	Consolidated		Parent
		2001 \$'000	2001 \$'000	2000 \$'000
Assets				
Financial assets				
Cash	6A	39,008	39,008	6,049
Receivables	6B	6,186	6,185	7,715
Investments	6C	-	-	10,100
Total financial assets		45,194	45,193	23,864
Non-financial assets				
Land and buildings	7A	157,291	157,291	152,424
Infrastructure, plant and equipment and major facilities	7B	247,168	247,168	115,120
Inventories	7C	6,328	6,328	7,020
Intangibles	7D	1,307	1,307	309
Other	7E	1,049	1,049	574
Total non-financial assets		413,143	413,143	275,447
Total assets	3	458,337	458,336	299,311
Liabilities				
Interest bearing liabilities				
Other	8A	2,070	2,070	-
Total interest bearing liabilities		2,070	2,070	-
Provisions and payables				
Capital use charge	8B	1,355	1,355	339
Employees	8C	19,934	19,934	18,597
Suppliers	8D	6,453	6,266	2,262
Other payables	8E	228	228	773
Other provisions	8F	3,940	3,940	2,250
Total provisions and payables		31,910	31,723	24,221
Total liabilities		33,980	33,793	24,221

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

Statement of Financial Position

	Note	Consolidated	Parent	
		2001 \$'000	2001 \$'000	2000 \$'000
Equity	9			
Capital		64,017	64,017	9,000
Reserves		284,259	284,259	178,330
Accumulated surpluses		76,081	76,267	87,760
Total equity		424,357	424,543	275,090
Total liabilities and equity		458,337	458,336	299,311
Current liabilities		20,455	20,268	12,495
Non-current liabilities		13,525	13,525	11,726
Current assets		48,219	48,218	26,225
Non-current assets		410,118	410,118	273,086

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

Statement of Cash Flow



	Note	Consolidated	Parent	
		2001	2001	2000
		Inflows (Outflows) \$'000	Inflows (Outflows) \$'000	Inflows (Outflows) \$'000
Operating Activities				
Cash received				
Sales of goods and services		35,595	35,595	28,577
Interest received		2,456	2,456	1,904
GST recovered from taxation authority		5,896	5,896	-
Parliamentary appropriations	4A	125,946	125,946	101,641
Total cash received		169,893	169,893	132,122
Cash used				
Employees		(56,547)	(56,547)	(53,755)
Suppliers		(46,813)	(46,813)	(50,637)
Total cash used		(103,360)	(103,360)	(104,392)
Net cash from operating activities	10	66,533	66,533	27,730
Investing Activities				
Cash received				
Proceeds from sales of property, plant and equipment		633	633	432
Total cash received		633	633	432
Cash used				
Purchase of property, plant and equipment	*	(60,127)	(60,127)	(14,072)
Total cash used		(60,127)	(60,127)	(14,072)
Net cash used in investing activities		(59,494)	(59,494)	(13,640)

* The major portion of the figure in 2001 relates to the cash flow impact of the Replacement Research Reactor of \$ 44.319 million.

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

Statement of Cash Flow

	Note	Consolidated	Parent	
		2001	2001	2000
		Inflows (Outflows) \$'000	Inflows (Outflows) \$'000	Inflows (Outflows) \$'000
Financing Activities				
Cash received				
Equity appropriation		55,017	55,017	3,000
Total cash received		55,017	55,017	3,000
Cash used				
Capital use charge paid		(39,197)	(39,197)	(24,233)
Total cash used		(39,197)	(39,197)	(24,233)
Net cash from/(used in) financing activities		15,820	15,820	(21,233)
Net increase/(decrease) in cash held		22,859	22,859	(7,143)
Cash at 1 July		16,149	16,149	23,292
Cash at 30 June		39,008	39,008	16,149
Cash at bank and on hand	6A	39,008	39,008	6,049
Fixed term investment	6C	-	-	10,100
Total cash		39,008	39,008	16,149

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

Statement of Commitments



	Note	Consolidated	Parent	
		2001 \$'000	2001 \$'000	2000 \$'000
By Type	(a)			
CAPITAL COMMITMENTS				
Property, plant and equipment		7,452	7,452	5,617
Waste treatment and disposal project		4,318	4,318	5,000
Fuel elements purchase		1,885	1,885	5,000
Total capital commitments		13,655	13,655	15,617
OTHER COMMITMENTS				
Replacement Research Reactor Project	(c)	301,347	301,347	-
Disposition of spent fuel	(b)	54,919	54,919	62,858
Total other commitments		356,266	356,266	62,858
Total commitments payable		369,921	369,921	78,475
Commitments receivable				
Replacement Research Reactor Project	(c)	301,347	301,347	-
Disposition of spent fuel	(b)	54,919	54,919	62,858
Major international design and construction contract	(d)	-	-	16,687
Total commitments receivable		356,266	356,266	79,545
Net commitments payable/(receivable)		13,655	13,655	(1,070)
By Maturity				
Commitments payable				
One year or less		8,137	8,137	13,179
From one to five years		5,518	5,518	1,575
Over five years		-	-	863
		13,655	13,655	15,617

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

Statement of Commitments

	Note	Consolidated	Parent	
		2001 \$'000	2001 \$'000	2000 \$'000
Commitments receivable				
One year or less		-	-	(6,110)
From one to five years		-	-	(4,680)
Over five years		-	-	(5,897)
		-	-	(16,687)
Net commitments		13,655	13,655	(1,070)

- (a) All 2000/2001 commitments are GST inclusive where relevant.
- (b) In 1997-1998 the Government determined to provide \$91.7 million in 2001 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 \$36.8 million has been received as at 30 June 2001. The remaining \$54.9 million will be drawn down by year 2020 in accordance with a schedule agreed with Government. The amount of \$54.9 million is not included in the commitment by maturity figures as the commitment payable is fully offset by the commitment receivable.
- (c) A contract was executed on 13 July 2000 between ANSTO and INVAP S.E. for the design, construction and commissioning of a replacement research reactor at Lucas Heights. The amount of \$301.347 million (excluding GST) is not included in the commitment by maturity figures as the commitment payable is fully offset by the commitment receivable.
- (d) The commitment shown for 2000 relates to the value of a major international design and construction contract to design, manufacture, install and commission a radioisotope production facility in Thailand.

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

	Note	Consolidated	Parent	2000 \$'000
		2001 \$'000	2001 \$'000	
Contingent Losses		-	-	-
Total contingent losses		-	-	-
Contingent Gains		-	-	-
Total contingent gains		-	-	-
Net contingencies		-	-	-

There were no known contingencies at 30 June 2001.

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

Note Description

- 1 Economic dependency
- 2 Summary of significant accounting policies
- 3 Segment and outcomes reporting
- 4 Revenue
- 5 Operating expenses
- 6 Financial assets
- 7 Non-financial assets
- 8 Liabilities
- 9 Equity
- 10 Cash flow reconciliation
- 11 Extraordinary items
- 12 Remuneration of members of the Board
- 13 Remuneration of Executives
- 14 Replacement Research Reactor Project costs
- 15 Insurance
- 16 Remuneration of auditors
- 17 Board membership
- 18 Related party disclosures
- 19 Trust money
- 20 Financial instruments

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 Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2000-2001) Orders and are presented as 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:
 - Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2000-2001) Orders for the preparation of Financial Statements in relation to financial years ending on or after 30 June 2001
 - Australian Accounting Standards
 - Other authoritative pronouncements of the Australian Accounting Standards Boards; and
 - Consensus views of the Urgent Issues Group.

The statements have been prepared having regard to:

- Statements of accounting concepts
- The explanatory Notes to Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2000-2001) Orders; and
- Guidance Notes issued by that Department.

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 liabilities can be reliably measured. Assets and liabilities arising under agreements equally proportionately unperformed are however not recognised unless required by an Accounting Standard. Liabilities and assets which 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 (K)

(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 are 20.1% of salary (CSS) and 11.2% 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

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

(K) BUILDINGS, INFRASTRUCTURE, PLANT AND EQUIPMENT AND MAJOR FACILITIES

Acquisition

Items of buildings, infrastructure, plant and equipment and major facilities are recorded at cost 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 2000-2001) 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 2000-2001) 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 class of assets: buildings, infrastructure, 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, which has been 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 the following useful lives:

	2001	2000
Buildings on freehold land	30 years	30 years
Plant and equipment	2 to 30 years	2 to 30 years
Infrastructure	20 years	20 years
National and major facilities	5 to 30 years	5 to 30 years

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

The aggregate amount of depreciation allocated for each class of asset during the reporting period is disclosed in Note 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. Software transferred out of plant and equipment in 2000 has been reported under a separate heading "software" with no change in value or expected useful life.

There is no material internal software development.

Software was revalued at 30 June 2001 using the deprival method of valuation by independent quantity surveyors, Currie & Brown (Australia) Pty Ltd (refer (K)).

Licences

Licences were revalued in 1999.

Amortisation

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

Amortisation rates applying to intangibles are as follows:

	2001	2000
Purchased software	2 - 7 years	2 - 7 years
Licences	3 years	3 years

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

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

Recoverable amount test

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 2001 there were 174 patents, trademarks, design and applications (168 at 30 June 2000) registered to ANSTO and no associated costs are recognised as an asset (nil at 30 June 2000).

(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 12% imposed by the Commonwealth on the budgeted estimate of net assets of ANSTO for the 2000/2001 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 8A).

(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 2000 to 30 June 2001 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.

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

Reporting by Outcomes for 2000-2001

	Outcome 1		Outcome 2		Outcome 3		Total	
	Budget \$'000	Actual \$'000	Budget \$'000	Actual \$'000	Budget \$'000	Actual \$'000	Budget \$'000	Actual \$'000
Net cost of entity outputs	-	-	13,429	13,351	77,301	77,661	90,730	91,012
Net cost to budget outcome	-	-	13,429	13,351	77,301	77,661	90,730	91,012
Total consolidated assets that are outcome specific	59,017	58,698	71	663	290,283	398,976	349,371	458,337

NB. The net cost to the budget outcome includes intra-government costs that are eliminated in calculating the overall budget outcome.

Notes:

- 1) The value of total assets shown as Actual in Outcome 3 includes the unbudgeted impact of the revaluation of buildings, plant and equipment, electrical facilities and the HIFAR reactor.
- 2) All net expenditure attributable to Outcome 1 is capitalised and shown at Note 7.

	Note	Consolidated	Parent	
		2001 \$'000	2001 \$'000	2000 \$'000
4 Revenue				
4A. Revenues from Government				
Appropriation Act No.1 Operating		105,798	105,798	100,598
Appropriation Act No.3 Operating		20,148	20,148	1,043
		125,946	125,946	101,641
4B. Operating revenue from independent sources				
SALES OF GOODS AND SERVICES:				
Radioisotope sales		17,910	17,910	15,976
Services and contract research		4,923	4,923	3,382
Silicon irradiation		3,745	3,745	1,988
CSIRO site support		968	968	903
Training courses		68	68	111
Land management		2,314	2,314	3,560
Synchrotron project		809	809	758
AINSE interactions		1,097	1,097	943
Total sales of goods and services		31,834	31,834	27,621
Grants		600	600	948
Interest on deposits		2,530	2,530	1,657
4C. Proceeds from disposal of assets		633	633	951
4D. Net foreign exchange gains - non speculative		-	-	667
4E. Other revenue:				
Prior year adjustments		-	-	92
Nuclear material stock revaluation		190	190	-
Resources received free of charge		-	-	780
Other		8	8	
Total other revenue		198	198	872
Total operating revenue from independent sources		35,795	35,795	32,716
Total revenues from ordinary activities		161,741	161,741	134,357

	Note	Consolidated	Parent	
		2001 \$'000	2001 \$'000	2000 \$'000
4F. Proceeds from disposal of assets				
Revenue from sale of assets	4C	633	633	951
Expense from sale of assets	5F	(136)	(136)	(499)
Profit on disposal of assets		497	497	452
5 Operating expenses				
The breakdown of operating expenses is:				
5A. Employee expenses:				
Salaries		37,508	37,467	36,824
Superannuation		7,371	7,362	6,697
Annual leave		3,609	3,609	4,246
Long service leave		2,159	2,159	714
Separation and redundancy		186	186	449
Total employee expenses		50,833	50,783	48,930
5B. Supplier expenses:				
Operating expenses		17,242	17,125	12,940
Stores		5,275	5,275	5,448
Maintenance and external services		9,686	9,667	7,010
Power and water		1,675	1,675	1,693
Reactor supplies		1,246	1,246	984
Disposition of spent fuel rods		12,409	12,409	11,344
Variable production costs		3,756	3,756	6,693
Operating lease rentals		44	44	104
Total supplier expenses		51,333	51,197	46,216

		Consolidated	Parent	
	Note	2001 \$'000	2001 \$'000	2000 \$'000
5C. Depreciation and amortisation:				
Depreciation of property, plant and equipment (a)	7B	21,276	21,276	16,042
Amortisation of intangible assets - licence	7D	126	126	103
Amortisation of intangible assets - software	7D	92	92	73
Total depreciation and amortisation		21,494	21,494	16,218
5D. Writedown of assets				
Financial assets:				
Receivables for goods and services		500	500	140
Unrealised foreign exchange loss	20	72	72	2
Non financial assets:				
Loss on disposal of plant and equipment		111	111	7
Nuclear material stock devaluation		8	8	22
Total other expenses		691	691	171
5E. Grants		1,937	1,937	1,521
5F. Expense on sale of asset		136	136	499
Total operating expenses		126,424	126,238	113,555
5G. Borrowing costs expense		383	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	5,216	5,216	3,963
Plant and equipment	6,971	6,971	7,814
Infrastructure	3,313	3,313	2,201
National and major facilities	5,776	5,776	2,064
Total allocated	21,276	21,276	16,042

	Note	Consolidated	Parent	
		2001 \$'000	2001 \$'000	2000 \$'000
6 Financial assets				
6A. Cash				
Cash at bank and on hand		39,008	39,008	6,049
<p>The variance in the value of Cash at bank and on hand includes the sum of \$10.1 million which was converted from an Investment in securities since the prior year. 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.</p>				
6B. Receivables				
Goods and services (trade debtors)	(a)	4,722	4,722	7,734
Less provision for doubtful debts		302	302	315
		4,420	4,420	7,419
Advance held by Dept of Industry Science and Resources		20	20	60
Interest accrued		119	119	45
Unrealised foreign exchange gain		-	-	61
Other		14	13	118
GST Receivables		1,613	1,613	12
		6,186	6,186	7,715
(a) GOODS AND SERVICES (TRADE DEBTORS)				
Age analysis of trade debtors				
Current		2,445	2,445	2,862
Overdue:				
Less than 30 days		1,516	1,516	1,230
30 to 60 days; and		403	403	379
60 to 90 days		156	156	172
More than 90 days		202	202	3,091
		4,722	4,722	7,734

		Consolidated	Parent	
	Note	2001 \$'000	2001 \$'000	2000 \$'000
6C. Investments				
Fixed term investment		-	-	10,100
<p>The amount of \$10.1 million in bank securities has been realised and reinvested as short term bank deposits at 30 June 2001, and is shown under the heading of cash at bank and on hand.</p>				
6D. Investment in subsidiary				
<p>ANSTO Inc. was incorporated in Delaware, USA on 27 October 1999. At 30 June 2001, US\$100 of capital has been invested in this wholly owned subsidiary. At 30 June 2001, the contribution of ANSTO Inc. to consolidated net surplus is a loss of \$A185,856.</p>				
7 Non-financial assets				
7A. Land and buildings				
Land - at Independent valuation - 30 June 2000	(b)	52,180	52,180	52,202
Buildings - at cost		-	-	511
Less accumulated depreciation		-	-	158
				353
Buildings - at Directors' valuation - 30 June 2001	(a)	133,201	133,201	-
Buildings - at Independent valuation - 30 June 2000	(b)	-	-	99,869
Less accumulated depreciation	(c)	28,090	28,090	-
Total buildings		105,111	105,111	99,869
		105,111	105,111	100,222
Total land and buildings		157,291	157,291	152,424

	Note	Consolidated	Parent	
		2001 \$'000	2001 \$'000	2000 \$'000
7B. Infrastructure, plant, equipment and major facilities				
7B (I). PLANT AND EQUIPMENT				
Plant and equipment - at cost		217	217	18,311
Less accumulated depreciation		-	-	13,256
		217	217	5,055
Additions - at cost		7,045	7,045	7,918
Less accumulated depreciation		1,226	1,226	535
		5,819	5,819	7,383
Plant and equipment - at Directors' valuation - 30 June 2001	(a)	206,372	206,372	-
Plant and equipment - at Independent valuation - 30 June 2000	(b)	-	-	22,846
Less accumulated depreciation	(c)	99,635	99,635	5,066
		106,737	106,737	17,780
Plant and equipment under construction		6,144	6,144	3,832
Total plant and equipment		118,917	118,917	34,050
7B (II). INFRASTRUCTURE				
Electrical /site services				
Electrical /site services facilities - at cost		-	-	-
Less accumulated depreciation		-	-	-
		-	-	-
Electrical /site services facilities at Directors' valuation - 30 June 2001	(a)	24,082	24,082	-
at Independent valuation - 30 June 2000	(b)	-	-	19,043
Less accumulated depreciation	(c)	8,312	8,312	-
Total infrastructure		15,770	15,770	19,043

	Note	Consolidated	Parent	2000 \$'000
		2001 \$'000	2001 \$'000	
7B (III). MAJOR NATIONAL AND MAJOR RESEARCH FACILITIES				
Major national research facilities - at cost		340	340	1,008
Less accumulated depreciation		36	36	497
		304	304	511
Major national research facilities				
at Directors' Valuation - 30 June 2001 *	(a)	111,111	111,111	-
at Independent valuation - 30 June 2000 *	(b)	-	-	35,391
at Independent valuation - 30 June 1999		-	-	8,329
less accumulated depreciation	(c)	69,773	69,773	539
		41,338	41,338	43,181
Major research facilities				
at Directors' Valuation - 30 June 2001	(a)	18,203	18,203	-
at Independent valuation - 30 June 1999		-	-	7,667
Less accumulated depreciation	(c)	5,818	5,818	279
		12,385	12,385	7,388
Research facility under construction - at cost		-	-	187
Research facility under construction				
at Directors' Valuation - 30 June 2001	(a)	5,000	5,000	-
at Independent valuation - 30 June 1999		-	-	1,668
Replacement Research Reactor Project capitalised cost		53,454	53,454	9,092
Total major national and major research facilities		112,481	112,481	62,027
Total infrastructure, plant, equipment and major facilities		247,168	247,168	115,120
Total land, buildings, infrastructure, plant, equipment and major facilities		404,459	404,459	267,544

* Includes \$17,133 (2000 \$15,599) buildings on leasehold land.

**MOVEMENT SUMMARY 2000-2001 FOR ALL CONSOLIDATED ASSETS IRRESPECTIVE OF VALUATION BASIS
(EXCLUDING INTANGIBLES)**

	Land	Buildings	Total Land and Buildings	Infrastructure, plant, equipment national and major facilities	Total
	\$'000	\$'000	\$'000	\$'000	\$'000
Gross value as at 1 July 2000	52,202	100,380	152,582	135,292	287,874
Additions - new assets					
Additions - replacements		4,769	4,769	54,325	59,094
Revaluations	(22)	28,052	28,030	244,254	272,284
Disposals				(1,903)	(1,903)
Gross value as at 30 June 2001	52,180	133,201	185,381	431,968	617,349
Accumulated depreciation/ amortisation 1 July 2000	158	158	20,172	20,330	
Depreciation/amortisation		5,215	5,215	16,061	21,276
Revaluations		22,717	22,717	150,212	172,929
Adjustment for disposals				(1,645)	(1,645)
Accumulated depreciation/ amortisation 30 June 2001	28,090	28,090	184,800	212,890	
Net book value as at 30 June 2001	52,180	105,111	157,291	247,168	404,459
Net book value as at 30 June 2000	52,202	100,222	152,424	115,120	267,544

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 2000-2001) 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.

7 Non-financial assets (continued)
MOVEMENT SUMMARY 2000-2001 FOR ALL CONSOLIDATED ASSETS AT VALUATION

	Land	Buildings	Total Land and Buildings	Infrastructure, plant, equipment national and major facilities	Total
	\$'000	\$'000	\$'000	\$'000	\$'000
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
As at 30 June 2000					
Gross value	52,202	99,869	152,071	94,944	247,015
Accumulated depreciation/amortisation				(5,884)	(5,884)
Net value	52,202	99,869	152,071	89,060	241,131

SUMMARY OF ALL CONSOLIDATED ASSETS UNDER CONSTRUCTION AS AT 30 JUNE 2001

	Land	Buildings	Total Land and Buildings	Infrastructure, plant, equipment national and major facilities	Total
	\$'000	\$'000	\$'000	\$'000	\$'000
As at 30 June 2001					
Gross value				64,598	64,598
Accumulated depreciation/amortisation					
Net value as at 30 June 2001				64,598	64,598
Net value as at 30 June 2000				14,779	14,779

	Note	Consolidated	Parent	
		2001 \$'000	2001 \$'000	2000 \$'000
7C. Inventories				
Raw materials and stores-not held for resale				
Stores - at cost		1,582	1,582	970
Cobalt-60 sources - at net realisable value		501	501	508
Reactor fuel and heavy water - at average purchase price		3,709	3,709	4,847
Nuclear materials - at net realisable value		698	698	607
Provision for stock diminution		(162)	(162)	-
		6,328	6,328	6,932
Work in progress				
Work in progress - at cost		-	-	88
		6,328	6,328	7,020
7D. Intangibles				
Licences - at cost		132	132	-
Less accumulated amortisation		23	23	-
		109	109	-
Licences - at valuation - 30 June 1999		290	290	290
Less accumulated amortisation		193	193	97
		97	97	193
Design fees - at cost		19	19	19
Less accumulated amortisation		13	13	6
		6	6	13
Software at cost		910	910	38
Less accumulated amortisation		7	7	12
		903	903	26
Software at Directors' Valuation - 30 June 2001	(a)	603	603	-
Software at Independent valuation - 30 June 1999		-	-	140
Less accumulated amortisation	(c)	411	411	63
		192	192	77
Total intangibles		1,307	1,307	309

MOVEMENT SUMMARY 2000-2001 FOR ALL CONSOLIDATED INTANGIBLES IRRESPECTIVE OF VALUATION BASIS

	Licences	Software	Total
	\$'000	\$'000	\$'000
Gross value as at 1 July 2000	309	178	487
Additions - new assets	132	910	1,042
Revaluations		425	425
Gross value as at 30 June 2001	441	1,513	1,954
Accumulated depreciation/amortisation 1 July 2000	103	75	178
Depreciation/amortisation	126	92	218
Revaluations		251	251
Accumulated depreciation/amortisation 30 June 2001	229	418	647
Net book value as at 30 June 2001	212	1,095	1,307
Net book value as at 30 June 2000	206	103	309

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'000
7E. Other			
Prepayments	1,049	1,049	574
	1,049	1,049	574
Total non-financial assets	413,143	413,143	275,447

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'000
8 Liabilities			
8A. Interest bearing liabilities			
Other - (a)	2,070	2,070	-
Total interest bearing liabilities	2,070	2,070	-
Provision and payables			
8B. Capital use charge payable (refer Note 2(P))	1,355	1,355	339
8C. Liabilities to employees			
Accrued salaries and wages	1,597	1,597	1,383
Annual leave	6,850	6,850	6,571
Long service leave	11,487	11,487	10,643
	19,934	19,934	18,597
8D. Suppliers			
Trade creditors	6,453	6,266	2,262
	6,453	6,266	2,262
8E. Other payables			
Revenue received in advance	228	228	773
	228	228	773
8F. Other provisions			
HIFAR spent fuel rods - (b)	1,000	1,000	1,000
HIFAR routine maintenance shutdown (c)	1,140	1,140	-
Foreign currency fluctuation	1,296	1,296	-
Common law and other claims	500	500	500
Other	4	4	750
	3,940	3,940	2,250
Total provisions and payables	31,910	31,723	24,221
Total Liabilities	33,980	33,793	24,221

Notes:

- (a) Relates to the reinstatement of prepaid revenue under a lease of property that was renegotiated.
- (b) Provision for HIFAR spent fuel rods.
In 1995 ANSTO created a provision of \$6.6 million, for the overseas transport and reprocessing of HIFAR spent fuel rods. No expenses were incurred against the provision during 2000-2001 and following 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) Provision for HIFAR routine maintenance shutdown.
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.

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'000
9 Equity			
Reserves, including movements			
Asset revaluation reserve			
Balance 1 July	170,330	170,330	99,240
Net revaluation increases	99,529	99,529	71,090
Balance 30 June	269,859	269,859	170,330
Fuel elements reserve			
Balance 1 July	5,000	5,000	-
Transferred from accumulated surpluses - (a)	600	600	5,000
Transferred to accumulated surpluses	-	-	-
Balance 30 June	5,600	5,600	5,000
Instrumentation reserve			
Balance 1 July	3,000	3,000	1,400
Transferred from accumulated surpluses - (b)	1,500	1,500	1,600
Balance 30 June	4,500	4,500	3,000
Waste treatment reserve			
Balance 1 July	-	-	-
Transferred from accumulated surpluses - (c)	4,300	4,300	-
Balance 30 June	4,300	4,300	-
Total reserves	284,259	284,259	178,330

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'000
Accumulated surpluses			
Accumulated surpluses 1 July	87,760	87,760	98,130
Transfers to instrumentation reserve	(1,500)	(1,500)	(1,600)
Transfer to fuel elements reserve	(600)	(600)	(5,000)
Transfers to waste treatment reserve	(4,300)	(4,300)	-
Operating surplus - (d)	34,934	35,120	20,802
Capital use charge	(40,213)	(40,213)	(24,572)
Accumulated surpluses 30 June	76,081	76,267	87,760
Capital			
Capital 1 July	9,000	9,000	6,000
Equity injections from Government - Appropriation Act Nos.2 & 4 (e)	55,017	55,017	3,000
Balance 30 June	64,017	64,017	9,000
Total equity	424,357	424,543	275,090

(a) Fuel elements reserve

A transfer has been made to this reserve 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 Research 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) Operating surplus

The operating surplus is derived before deducting the capital use charge of \$40,213,000 which is repayable to the Government as shown above (2000 \$24,572,000)

(e) Equity Injection

The draw down of \$55,017,000 is for expenditure on capital projects.

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'000
10 Cash flow reconciliation			
Reconciliation of operating surplus to net operating cash flows			
Operating surplus before extraordinary items	34,934	35,120	20,802
Extraordinary items (refer to Note 11)	-	-	-
Operating surplus after extraordinary items	34,934	35,120	20,802
(Increase) in prepayments	(474)	(474)	(456)
Decrease in inventories	789	789	829
(Decrease) in provision for waste treatment and disposal	-	-	(965)
Increase/(decrease) in creditors	4,191	4,005	(5,838)
Increase in employee entitlements	1,337	1,337	870
Increase in other provisions	1,690	1,690	790
(Decrease) in HIFAR spent fuel provision	-	-	(553)
(Increase)/decrease in accrued interest	(74)	(74)	252
(Increase) in assets under construction	-	-	(1,655)
Decrease in receivables	2,999	2,999	1,077
Foreign exchange (gain)	-	-	(666)
Nuclear materials (devaluation)/revaluation	(97)	(97)	22
(Increase) in plant and equipment	-	-	(774)
Depreciation/amortisation	21,494	21,494	16,218
Gain on disposal of assets	(386)	(386)	(452)
Loss on disposal of assets	-	-	7
Increase in capital use charge	-	-	339
Increase/(decrease) in revenue in advance	1,525	1,525	(1,947)
(Increase)/decrease in other receivables	206	206	(78)
(Increase) in GST receivables	(1,601)	(1,601)	-
(Decrease) in prior year adjustment	-	-	(92)
Net cash provided by operating activities	66,533	66,533	27,730

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 2001 (\$nil 2000).

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'000
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	32,221	32,221	29,050
Other remuneration received, or due and receivable by the members of the Board	347,614	347,614	325,946
	379,835	379,835	354,996
The number of members included in these figures is shown below in each relevant remuneration band:			
Remuneration between	Number	Number	Number
\$Nil and \$9,999	1	1	1
\$10,000 and \$19,999	2	2	2
\$20,000 and \$29,999	1	1	1
\$30,000 and \$39,999	-	-	1
\$40,000 and \$49,999	2	2	1
\$220,000 and \$229,999	-	-	1
\$260,000 and \$269,999 *	1	1	-
	7	7	7

* Includes payment of special allowances including allowances of the prior year.

	Consolidated	Parent	
	2001	2001	2000
	\$'000	\$'000	\$'000
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.	1,963,444	1,963,444	1,952,422
The number of Executives included in these figures is shown below in each relevant remuneration band:			
Remuneration between	Number	Number	Number
\$100,000 and \$109,999	-	-	2
\$110,000 and \$119,999	3	3	1
\$120,000 and \$129,999	1	1	-
\$130,000 and \$139,999	2	2	4
\$140,000 and \$149,999	5	5	3
\$150,000 and \$159,999	1	1	2
\$160,000 and \$169,999	1	1	1
\$170,000 and \$179,999	1	1	-
\$200,000 and \$209,999 *	-	-	1
	14	14	14

* Includes retirement lump sum component.

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 S.E. 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.

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'000
16 Remuneration of auditors			
Remuneration to the Auditor-General for auditing the financial statements for the reporting period	90,000	90,000	89,280

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

17 Board membership

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

Member	Appointed	Term Concluded	Term Concludes
H M Garnett	11 May 2000		10 May 2005
I D Blackburne	1 July 2001		30 June 2006
M H Codd AC	21 July 1999		31 December 2001
S M Richards	5 July 1996	30 June 2001	
F A Khafagi	1 January 2000		30 June 2002
J M Craker	2 June 1998		31 December 2002
C Hillyard	21 July 1999		21 July 2004
J Spasojevic	21 July 1999	23 March 2001	
G Cook	13 June 2001		4 April 2006

For the 2000-2001 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 \$32,221 (1999-00 \$29,050).

18 Related party disclosures

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

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'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	2,642	2,642	2,435
Add: receipts	2,765	2,765	2,182
interest received	139	139	88
Deduct: payments	2,240	2,240	2,063
Balance 30 June	3,306	3,306	2,642
Represented by the following:			
ANSTO RPAH joint account			
Being moneys 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	252
interest received	9	9	3
Deduct: payments	615	615	-
Balance 30 June	-	-	255
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	20
Add: receipts	-	-	2
interest received	-	-	-
Deduct: payments	-	-	17
Balance 30 June	5	5	5

	Consolidated	Parent	
	2001 \$'000	2001 \$'000	2000 \$'000
MNRF Program			
The Australian Synchrotron Research Program Incorporated			
Balance 1 July	2,365	2,365	2,395
Add: receipts	2,414	2,414	1,928
interest received	129	129	85
Deduct: payments	1,625	1,625	2,043
Balance 30 June	3,283	3,283	2,365
NEDO grant			
ANSTO is the research coordinator in the “Interface Properties of Ceramics and their Impact on Materials Functions” project under the NEDO International Joint Research Program. The NEDO Grant Trust account was established in 1995 to fund the operations of the project.			
Balance 1 July	-	-	3
Add: receipts	-	-	-
interest received	-	-	-
Deduct: payments	-	-	3
Balance 30 June	-	-	-
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	17	17	17
Add: receipts	-	-	-
interest received	1	1	-
Deduct: payments	-	-	-
Balance 30 June	18	18	17

20 Financial Instruments
(a) Terms, conditions and accounting policies

Financial Instruments	Notes	Accounting Policies and Methods (including recognition criteria and measurement basis)	Nature of underlying instrument (including significant terms & conditions affecting the amount, timing and certainty of cash flow)
Financial assets		Financial assets are recognised when control over future economic benefits is established and the amount of the benefit can be reliably measured.	
Cash at bank	6A	Cash is recognised at cost. Interest is accrued as it is earned.	All Australian dollar cash balances are with the Commonwealth Bank of Australia and Westpac Banking Corporation. At 30 June current rates were 3.75%pa (2000 4.5%pa), calculated daily.
Fixed term investment	6C	The deposit is recognised at cost. Interest is accrued as it is earned.	The deposit is with the Commonwealth Bank of Australia earned an effective rate of interest of 4.85%pa and (2000 6.19% pa) payable monthly.
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 the Bank of America, and earn an effective rate of interest of 3.50%pa (2000 2.58%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 (2000 - 30 days).
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 on a monthly basis.
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 (cont.)

(b) Interest rate risk - consolidated

Financial Instruments	Notes	Floating Interest Rate		Fixed Interest Rate		Non-Interest Bearing		Total		Weighted Average Effective			
		1 year or less		2 - 5 years				Interest Rate		Interest Rate			
		2001 \$'000	2000 \$'000	2001 \$'000	2000 \$'000	2001 \$'000	2000 \$'000	2001 \$'000	2000 \$'000	2001 \$'000	2000 \$'000	2001 \$'000	2000 \$'000
Financial assets (recognised)													
Cash at bank	6A	27,013	5,578	-	-	-	-	-	-	27,013	5,578	3.75%	4.50%
Cash on hand	6A	-	-	-	-	17	20	-	-	17	20	n/a	n/a
Fixed term investment	6C	-	-	-	10,100	-	-	-	-	-	10,100	4.85%	6.00%
Foreign exchange holdings	6A	11,978	451	-	-	-	-	-	-	11,978	451	3.50%	2.80%
Receivables for goods and services	6B	-	-	-	-	6,033	7,431	-	-	6,033	7,431	n/a	n/a
Loans	6B	-	-	-	-	20	60	-	-	20	60	n/a	n/a
Interest accrued	6B	-	-	-	-	119	45	-	-	119	45	n/a	n/a
Unrealised foreign exchange gain	6B	-	-	-	-	-	61	-	-	-	61	n/a	n/a
Other	6B	-	-	-	-	14	118	-	-	14	118	n/a	n/a
Total financial assets (recognised)		38,991	6,029	-	10,100	-	-	6,203	7,735	45,194	23,864		
Total assets								458,337	299,311				
Total financial liabilities (recognised)													
Trade creditors	8D	-	-	-	-	6,453	2,262	-	-	6,453	2,262	n/a	n/a
Unrealised foreign exchange losses	8E	-	-	-	-	-	-	-	-	-	-	n/a	n/a
Revenue received in advance	8E	-	-	-	2,070	228	773	-	-	2,298	773	6%	n/a
Other provisions	8F	-	-	-	-	3,940	2,250	-	-	3,940	2,250	n/a	n/a
Total financial liabilities (recognised)		-	-	-	2,070	10,621	5,285	-	-	12,691	5,285		
Total liabilities						33,980	24,221						

20 Financial instruments (cont.)

(c) Net fair values of financial assets and liabilities

	Note	Consolidated		Parent			
		2001		2001		2000	
		Total carrying amount	Aggregate net fair value	Total carrying amount	Aggregate net fair value	Total carrying amount	Aggregate net fair value
		\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
Financial assets (recognised)							
Cash at bank	6A	27,013	27,013	27,013	27,013	5,578	5,578
Cash on hand	6A	17	17	17	17	20	20
Fixed term investments	6C	-	-	-	-	10,100	10,100
Foreign exchange holdings	6A	11,978	11,978	11,978	11,978	451	451
Receivables for goods and services	6B	6,033	6,033	6,033	6,033	7,746	7,746
Interest accrued	6B	119	119	119	119	45	45
Unrealised foreign exchange gain	6B	-	-	-	-	61	61
Loans	6B	20	20	20	20	60	60
Other	6B	14	14	13	13	118	118
Total financial assets		45,194	45,194	45,193	45,193	24,179	24,179
Financial liabilities (recognised)							
Trade creditors	8D	6,453	6,453	6,266	6,266	2,262	2,262
Unrealised foreign exchange loss	8E	-	-	-	-	-	-
Revenue received in advance	8A, 8E	2,298	2,298	2,298	2,298	773	773
Other provisions	8F	3,940	3,940	3,940	3,940	2,250	2,250
		12,691	12,691	12,504	12,504	5,285	5,285

20 Financial instruments (cont.)

(c) Net fair values of financial assets and liabilities (cont.)

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

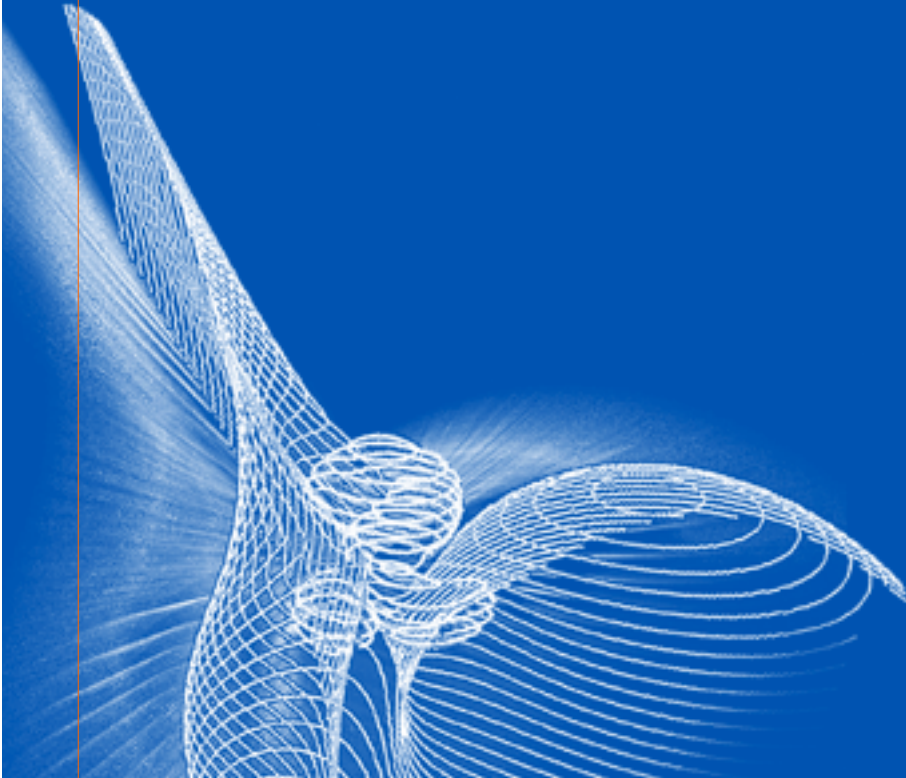
The net fair values for trade creditors and revenue received in advance, all of which are short-term in nature, are in accord with their carrying amounts.

(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.

ANSTO Annual Report 2000 - 2001



Equal Employment Opportunity

OBJECTIVES

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

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

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

STATISTICS

Corporate Executive information

		Male	Female
Band 3	Corporate Executive	3	
Band 2	Corporate Executive	10	1
Band 1	Corporate Executive	1	2

Staff numbers as at 30 June 2001

	Full-time		Part-time	
	M	F	M	F
Executive Director		1		
Corporate Executives	13	3	1	
Professional Officers	174	45	0	6
Research Scientists	91	23	2	0
Technical Officers	245	19	0	4
Administrative Service Officers	32	63	1	14
Craftpersons	63	3	3	3
Totals	618	157	7	27
Grand Total				809

Summary of EEO statistics as at 30 June 2001

Total staff 809	Number employed	Percentage of total staff	Average salary
Female	184	23	\$46,839
Male	625	77	\$56,813

Staff in specific employment categories (based on specific data voluntarily provided by 318 staff)

	Number employed	Average salary
People with disabilities	19	\$49,766
Aboriginal and Torres Strait Islanders	2	\$50,074
Non-English speaking background	126	\$50,475

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.

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

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, NSW Ambulance, NSW Fire Brigades, NSW State Emergency Services, NSW Environment Protection Authority, NSW Department of Health, Australian Protective Services, Sutherland Shire Local Emergency Management Committee, St George - Sutherland District Emergency Management, the Sutherland Shire Council and ANSTO, as well as an observer from ARPANSA.

The LLWP reviews procedures applicable to a potential accident at the Lucas Heights Science and Technology Centre that could have implications for the public. A Central Safety Coordinating Committee assists in developing, reviewing and implementing ANSTO's occupational health and safety policies. Membership includes representatives of unions and staff associations, the NSW Labor Council and ANSTO.

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 print outs, 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 print-outs; 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

FOI reading facilities can be provided 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, Corporate Services, and the Director, Government and Public Affairs, have been appointed as authorised officers under Section 23 of the FOI Act.

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).

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

Functions and Powers of the Organisation under the ANSTO ACT

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

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

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

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

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

- (a) the Commonwealth Government’s national science, technology and energy policy objectives; and
- (b) the Commonwealth Government’s commercialisation objectives for public research institutions.

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.

Section 4 (3) of the ANSTO Amendment Act provides that on and after 5 February 1995, the above provision does not apply to any radioactive material or radioactive waste that is the subject of order 3 of the orders made in the Land and Environment Court of New South Wales on 5 February 1992 in the matter of the Council of the Shire of Sutherland v. the Australian Nuclear Science and Technology Organisation.

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

Functions and Powers of the Organisation under the ANSTO ACT

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.

SECOND 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 2001.

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 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 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 second 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, S.E. was signed on 13 July 2000. INVAP, S.E. is undertaking the project in an alliance with an Australian joint venture between John Holland Construction and Engineering Pty Ltd and Evans Deakin Industries Ltd as subcontractor to INVAP, S.E.. Compliance with the EIS conditions forms a contractual requirement.

Since the previous report, submitted in August 2000, work has continued on the detailed engineering design and architectural design work for the reactor and on preparation for the construction phase. A construction Environmental Management Plan is under development, and baseline environmental data has been collected. Detailed examination of the timing of emissions from radiopharmaceutical production has facilitated process modifications, resulting in significant reductions in airborne emissions. In the last six months of 2000, total noble gas emissions from radiopharmaceutical production were 86% less than for the same period in 1999, despite an increase in production. Emergency plans associated with the Lucas Heights Science and Technology Centre have been externally reviewed and updated.

Of the 29 conditions, none were required to be completed prior to signature of the contract for the replacement reactor. Six conditions (conditions 2, 3, 5, 6, 11 and 26) must be completed prior to the commencement of construction. Some approval conditions (conditions 1, 4, 10, 24, 27 and 29) require a long term commitment by ANSTO or the Government and these will continue beyond the completion of the reactor into the operational phase.

Individual conditions

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

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

Compliance with all undertakings and commitments given by ANSTO within the EIS was a mandatory component of the tender process. INVAP, S.E. 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.

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). This report must be submitted to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and the Department of the Environment and Heritage for agreement.*

The contract requires INVAP, S.E. to prepare the construction environmental management plan (EMP) prior to the commencement of construction on site. The preparation of the EMP is currently under way, as part of detailed engineering design and architectural design work. We anticipate that the EMP will be submitted to the Minister for the Environment and Heritage for approval at approximately the same time as ANSTO applies to ARPANSA for a construction licence – that is prior to the submission of the next six-monthly report.

The collection of baseline information prior to the commencement of construction is continuing. As stated in the previous report, ground water baseline monitoring commenced during the year 2000. Stormwater monitoring is dependent on receiving sufficient rainfall to provide a consistent surface flow of water from

the site. Following high rainfall in late January/ early February, three stormwater monitoring points were identified and sampled. Further monitoring will take place following significant rainfall events that generate surface flow. This monitoring is in addition to the monitoring of surface water run off for radiological contamination, which has been occurring for over 10 years.

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.

A review of traffic densities at the intersection of New Illawarra Road and the LHSTC entrance has been completed and is awaiting final approval by the NSW Roads and Traffic Authority. Based on the outcomes of this review, a decision will be made on the necessity for upgrading the intersection and, if so, the type of junction.

4. Monitoring of water quality must continue into the operational phase until sufficient data has been collected to indicate that the site, and stormwater run-off, has stabilised.

This condition flows on from Condition 2. The water quality-monitoring program will continue into the operational phase until sufficient data has been collected to indicate that the site, and stormwater run-off, has stabilised.

5. A Stormwater Control Plan must be developed during the design stage to ensure that the site system is constructed to current best practice and in accordance with NSW EPA guidelines. The plan will also consider options for containment of one-off larger volume spills, such as fire fighting foams. The plan must be prepared to the satisfaction of the Department of the Environment and Heritage.

As indicated above, the engineering and architectural design work is now in progress. This will include a Stormwater Control Plan, which we expect to submit to the Department of the Environment and Heritage for approval during the course of this year.

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.

ANSTO has commenced a review of the Lucas Heights Buffer Zone Plan of Management (1986) as part of its Environmental Management Action Plan (EMAP). ANSTO is using EMAP to develop an environmental management system for the Lucas Heights Science and Technology Centre which is consistent with ISO 14001, incorporates national and international best practice, and complies both with ARPANSA's requirements and with ANSTO's commitments in the EIS for the project. The review will cover all land use in the buffer zone and the impacts of the LHSTC within this zone. The revised management plan will be discussed with relevant stakeholders, and subsequently submitted to the Department of the Environment and Heritage for approval, prior to the commencement of construction.

7. Radioactive gaseous emissions discharged via stacks from buildings associated with radiopharmaceutical production (primarily Buildings 23 and 54) must not increase above existing levels regardless of any future production increases. This requirement should be recognised by ARPANSA as part of its licensing of emissions from radiopharmaceutical facilities at the LHSTC. The objective of this

approach is to ensure implementation of existing and emergent technologies to further contain or reduce such emissions.

As part of an ARPANSA process for setting notification levels for airborne discharges, ANSTO has submitted details of the emissions from radiopharmaceutical production to ARPANSA for review. This provides a benchmark for measuring compliance with this condition.

Since the completion of the Environmental Impact Statement for the replacement reactor, new monitoring techniques have been used to measure the noble gas emissions from Building 54. This monitoring provides full details of the emissions on a 15-minute basis, with direct feedback to the operational area. By reviewing the process on the basis of the emission data, procedures and equipment have been modified. Arising from this work, substantial reductions in noble gas emissions have been realised.

The total noble gas emission from Building 54 has been significantly reduced - by an average of 86% over the past year (i.e. reduced by a factor of approximately seven). This reduction, as measured in the six-month period July to December 2000 in comparison with the same time in the previous year, was despite an increase in radiopharmaceutical production. The most significant reductions were for the radionuclides Xenon-135 and Xenon-135m, where emissions of both radioisotopes dropped by over 90% (i.e. emissions are now less than a tenth of those during 1999). The improvement in emission control will ensure that the EIS condition will be complied with. Detailed monitoring of the emissions will continue, as will work to ascertain the scope for further improvement of the process.

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. It is also investigating new monitoring techniques that will be geared to provide real time information to operators. An example of this is the work performed in Building 54, as detailed in the response to Condition 7. ARPANSA are aware of the changed processes in Building 54 and have full access to the monitoring data demonstrating the reduction in emissions.

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 commenced 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 project is scheduled for completion in 2002. 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.

A new trade wastewater agreement was concluded with Sydney Water in June 1999. ARPANSA was involved in these negotiations and agreed to the appropriateness of the discharge levels for radionuclides. The trade wastewater agreement requires that, by the time discharges from Lucas Heights reach the sewage treatment plant at Cronulla, the levels of radioactivity comply with the World Health Organisation's derived concentration limits for drinking water.

The trade wastewater agreement will be reviewed periodically to ensure that it takes into account any changes in operation both within the LHSTC and within the sewage handling system. As part of its EMAP, ANSTO is in the process of characterising its liquid discharges in terms of internal sources and their contribution to the discharge to sewer.

This assessment will be prepared to the satisfaction of ARPANSA, and prior to reactor operations commencing. Further, ANSTO plans to construct a new liquid waste treatment plant by the end of 2003, which will result in further reductions in discharges of radioactivity to the sewer. Design and operation of the plant must meet ARPANSA's requirements.

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

This condition has been completed and baseline monitoring is occurring. ARPANSA will review the results of the baseline monitoring. Also see response to Condition 2.

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.

A preliminary review of current environmental monitoring has been undertaken during the development of ANSTO's EMAP as the basis for an initial site characterisation. This covers all ANSTO discharges, including airborne releases and liquid discharges. Investigation of new techniques to measure the environmental gamma radiation in the local area has commenced. These techniques, using ultra sensitive radiation detectors, have the potential to separate the small contribution arising from ANSTO's operations from the much larger contribution from natural background radiation. This work will be submitted to ARPANSA.

ANSTO has been undertaking a program of systematic monitoring of the Lucas Heights site and its surroundings since the mid-1960s. Cumulatively, this data provides a valuable source of information in the development of a radiological site characterisation. The monitoring program is set out in detail in the annual ANSTO Environmental Monitoring Reports. This Report covers not only the ANSTO site and the buffer zone, but also the National Medical Cyclotron and off-shore near the sewage outfall at Potter Point.

The monitoring program includes airborne discharges, storm water, soil and sediments as well as effluents discharged to the sewer. The program is designed to maximise the

probability of detecting any radionuclides resulting from ANSTO's activities. The sampling points for routine monitoring have been carefully targeted with this in mind. Supplementary work is being planned to further extend the coverage of the radiological sampling program.

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.

This work will be undertaken during the current detailed design phase of the project. The PSAR will comply with relevant International Atomic Energy Agency Guidelines. The contractor will provide the PSAR in a manner that facilitates a peer review. Arrangements for the peer review will be made by ARPANSA. It is anticipated that the PSAR will be submitted to ARPANSA, as part of the application for a construction licence, prior to the submission of the next six-monthly report.

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 site licence issued by ARPANSA requires that the design meet the assumptions used in deriving the Reference Accident, and that prior agreement be sought from the Minister for the Environment and Heritage and the CEO ARPANSA to any major design changes such that the Reference Accident described in the Licence application may no longer be valid. It is also a condition of the contract that ARPANSA be satisfied that the Reference Accident assumptions have been incorporated

in the design. At this stage, it is not envisaged that there will be changes in the assumptions used in deriving the Reference Accident such that the Reference Accident might be invalidated.

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 is being addressed in the PSAR. The status of the PSAR has been discussed in the response to Condition 13.

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 is being addressed in the PSAR. The status of the PSAR has been discussed in the response to Condition 13.

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 is being addressed in the PSAR. The status of the PSAR has been discussed in the response to Condition 13.

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 will be undertaken in the current detailed

design phase and addressed in the PSAR. The status of the PSAR has been discussed in the response to Condition 13.

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 is being addressed in the PSAR. The status of the PSAR has been discussed in the response to Condition 13.

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.

Should a period of dual operation longer than six months be required, it will be subject to authorisation by ARPANSA. However, it is unlikely that a requirement for any such extension would 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 will be analysed in the PSAR and the Final Safety Analysis Report and at regular intervals during operation. These results 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.

Periodic review of emergency management plans will continue throughout the life of the replacement reactor. The contract for the replacement reactor has made review and acceptance 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.

On 15 February 2001, the LHSTC Emergency Plan was updated, endorsed and signed by the ANSTO Local Liaison Working Party. Also on that date, the Sutherland Local Emergency Management Committee endorsed the ANSTO Emergency Plan DISPLAN.

A review of emergency planning in relation to ANSTO has been conducted by a consultant, Mr Brian Carr, at the request of the NSW Minister for Emergency Services. The terms of reference were "to review the emergency management arrangements which apply to a radiation leak from the Lucas Heights Nuclear Reactor". A description of the report and of its findings can be found in ANSTO's supplementary submission to the Senate Select Committee for an Inquiry into the Contract for a New Reactor at Lucas Heights. The report is publicly available and copies have been provided to Sutherland Shire Council.

The proposed emergency arrangements will be described in the PSAR (see condition 13). In addition, ANSTO will invite an independent review by Emergency Management Australia.

23. The emergency management plan must also include a specific plan aimed at facilitating community understanding of credible hazards and risks from the reactor, mitigation measures, emergency arrangements and implications for the community. The plan should consider the

best combination of media to achieve the above objectives. The plan must be prepared to the satisfaction of the Minister for the Environment and Heritage, in consultation with the Minister for Industry, Science and Resources and the Minister for Health, prior to the reactor being commissioned.

ANSTO regularly distributes information to the local community on credible hazards and emergency planning arrangements. In addition, these plans are available in local libraries. ANSTO is also discussing with the emergency service organisations the most appropriate means for enhancing community understanding of these plans. The local Emergency Management Committee has formed a working group to review its role in providing information to the public, following a recommendation of the Carr report. ANSTO will be contributing to this working group.

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.

ANSTO has an extensive community information program in relation to its ongoing activities. In addition, in consultation with INVAP S.E. and its alliance partners, ANSTO has prepared a program embracing community consultation and the dissemination of information during all phases of the reactor project. The issues are soon to be discussed in focus groups, before finalisation of the program.

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.

ANSTO engaged a respected and experienced mediator, Mr John Woodward, to seek a mutually satisfactory resolution of the Community Right to Know Charter between ANSTO and the local community. Mr Woodward devoted considerable time and effort to the task of achieving an agreed resolution on the Community Right to Know Charter. Despite Mr Woodward's best efforts, final agreement on a Charter did not prove possible. As Mr Woodward reported to Senator Hill in May 2000, the stumbling block to agreement was the extent of information to be provided under a Charter. Senator Hill has written to ANSTO and the Sutherland Shire Council inviting comment on Mr Woodward's report. ANSTO replied in July 2000. We await the result of ministerial consideration of this issue.

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 will form part of the PSAR to be submitted to ARPANSA (see Condition 13). It will also be taken up with the Minister for the Environment and Heritage at approximately the same time.

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 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.

Senator Minchin ruled out co-location of the national intermediate level radioactive waste store with the national low level repository in South Australia. In his announcement, the Minister indicated that an independent, expert advisory committee has been established to oversee the site selection process for the national store, and that the earliest the preferred site for a national store could be announced would be late 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.

As indicated in the response to Condition 6, all facets of ANSTO's environmental management are being reviewed within ANSTO's EMAP and will be upgraded as necessary to be compliant with ISO 14001. Initial staff training in ISO 14001, provided by the National Association of Testing Authorities (NATA), was conducted at ANSTO in October 1999. Training was provided to members of ANSTO's EMAP team, key environmental monitoring staff, operational staff and divisional directors.

Representatives of ARPANSA attended the first session of the training to obtain an overview of ANSTO's approach to the implementation of ISO 14001. Further training in ISO 14001 has continued and a procedure for the determination and documentation of ANSTO's significant environmental aspects has been

trialed. The environmental management system will undergo accreditation, using the services of an accredited external organisation. ANSTO anticipates that full ISO 14001 certification will be achieved at least a year prior to the commissioning of the replacement reactor.

The implementation of ISO 14001 will provide a framework for ongoing review and re-assessment of ANSTO's environmental management systems.

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 second report to the Minister for Environment and Heritage as provided by this condition.

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 66.

Australian Synchrotron Research Incorporated

ABN: 26 937 362 431

The Australian Synchrotron Research Program (ASRP) provides Australian researchers with access to state-of-the-art synchrotron radiation research capabilities at overseas synchrotron light source facilities. These are the Australian National Beamline Facility (ANBF) at the Photon Factory, Tsukuba Science City, Japan, and the Advanced Photon Source, recently completed at the Argonne National Laboratory in Chicago, the United States.

The ASRP currently supports around a hundred experiments per year by researchers from 23 universities, four government agencies (including ANSTO) and five Cooperative Research Centres. The ASRP was funded for five years under the Major National Research Facilities (MNRF) program, announced in December 1996. An application has been submitted to the MNRF 2001 round for funds for a further five years operation of the ASRP.

The ASRP maintains staff at both the Photon Factory and the APS, and provides travel and subsistence funding to Australian researchers using the facilities. Access is via a peer reviewed proposal system.

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 Limited

ABN: 96 003 908 414

Bilyara is a privately owned Australian company providing high technology goods and services to the aviation industry in Australia, China and the Pacific Rim.

Shire of Sutherland Credit Union

ABN: 89 087 650 708

The Sutherland Shire Credit Union was formed by ANSTO staff some 25 years ago. It 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.

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 the world leader in industrial process diagnostics, helping to solve practical on-line problems that relate to plant operation and maintenance.

United Pistol Club Inc

The United Pistol Club operates a target shooting range on land in the ANSTO buffer zone. The range is also used by police.

**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 recent major consultancy project was the remediation of Homebush Bay in Sydney.

Ecologically Sustainable Development and Environmental Performance

This appendix constitutes ANSTO's report on its performance in relation to Ecologically Sustainable Development (ESD) 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 has been 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 the 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 33 and "Safety and environmental protection

arrangements at ANSTO facilities", page 52, 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.

Index of compliance with reporting guidelines

Enabling legislation	iv
Responsible Minister	iv
Location of major activities and facilities	iv
Powers, functions and objectives of the organisation	A5
Activities and reports	13
Service Charter	64
Membership and staff	A2
Financial statements	F1
Ecologically sustainable development and environmental performance	A21

AAD	Australian Antarctic Division
ACARP	Australian Coal Association Research Program
ACMER	Australian Centre for Mining Environmental Research
AGSO	Australian Geological Survey Organisation
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
ANBUG	Australian Neutron Beam Users Group
ANTARES	Australian National Tandem for Applied Research
ARC	Australian Research Council
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASNO	Australian Safeguards and Non-proliferation Office
ASRP	Australian Synchrotron Research Program
BATAN	Indonesian National Atomic Energy Agency
BIOMASS	Biosphere Modelling and Assessment
BIPM	Bureau International des Poids et Mesures
BNFL	British Nuclear Fuels Ltd
BNL	Brookhaven Research Laboratory
CEA	French Atomic Energy Commission
COGEMA	Compagnie Generale des Matieres Nucleaires
CRC	Cooperative Research Centre
CRP	Coordinated Research Programs
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCC	Digital Coincidence Counting
DRAM	Dynamic Random Access Memory
EMAP	Environmental Management Action Plan
EMP	Environmental Management Plan
EPA	Environment Protection Authority
FDG	Fluorine-18 fluorodeoxyglucose

FNCA	Forum for Nuclear Cooperation in Asia
GATRI	Gamma Technology Research Irradiator
GLASS	Global Land Atmosphere System Study
GST	Goods and Services Tax
HACV	Human Activity and Climate Variability project
HIERDA	Heavy Ion Elastic Recoil Detection Analysis
IAEA	International Atomic Energy Agency
IARC	International Agency for Research on Cancer
IBA	Ion Beam Analysis
INIS	International Nuclear Information System
ISO	International Standards Organisation
LDV	Laser Doppler Velocimetry
LENS	Learning Environment for New Strategies program
LHSTC	Lucas Heights Science and Technology Centre
LLNL	Lawrence Livermore National Laboratory
LLWP	Local Liaison Working Party
LONGPOL	Long Wavelength Polarized Diffractometer Instrument
MOU	Memorandum of Understanding
MOX	Mixed Oxide (fuel)
mSv	millisieverts
NEA	Nuclear Energy Agency
NMC	National Medical Cyclotron
NOAA	(US) National Oceanographic and Atmospheric Administration
NPL	National Physical Laboratory
NPW	Nuclear-powered Warships
OAEP	Thai Office of Atomic Energy for Peace
OECD	Organisation for Economic Cooperation and Development
PI ³	Plasma Immersion Ion Implantation
PIP	Plutonium Immobilisation Project
PNNL	Pacific Northwest National Laboratory
PSA	Probabilistic Safety Assessment and Remaining Life Study
RCA	Regional Cooperative Agreement
RIEF	Research Infrastructure, Equipment and Facilities

RNCA	Regional Nuclear Cooperation in Asia
SAC	Safety Assessment Committee
SAGNA	Standing Advisory Group for Nuclear Applications
SAGTAC	Standing Advisory Group on Technical Assistance and Cooperation
SANS	Small Angle Neutron Scattering instrument
SIMS	Secondary Ion Mass Spectrometry
TGA	Therapeutic Goods Association
UNDP	United Nations Development Program
USDEO	United States Department of Energy
VSP(N)	Visiting Ships Panel (Nuclear)
WATAC	IAEA International Radioactive Waste Technology Advisory Committee
WMPC	Waste Management and Pollution Control
XAFS	X-ray Absorption Fine-structure Spectroscopy

A

AARNet, 49
 Aboriginal shelter site, A8
 accelerators, 19, 27-29
 access to facilities, A4
 accidents and incidents, 55-56
 acid mine drainage, 39
 ACIRL Ltd, 38
 Advanced Photon Source, 29
 air pollution, 22, 28, 33
 Air Quality Management Plan, A9
 airborne emissions, 56
 algal blooms, 31
 aluminium-26, 22, 28
 American Water Works Association, 8, 39
 ANSTO, iv
 enabling legislation, iv
 functions under the ANSTO Act, A5-A7
 highlights, 5-8
 Minister responsible, iv
 mission, iv, 61
 organisation chart, v
 powers under the ANSTO Act, A5-A7
 ANSTO Technology Park tenants, A18-A20
 Antarctica, 28
 Argonne National Laboratory, 7, 34, 35, 40
 arsenic, 39
 AS/NZS ISO 9001:2000, 8, 23, 35
 AS/NZS ISO 9002:1994, 8
 Asia, nuclear power capacity, 15
 asset management, 48
 associated organisations, 65-68
 ATA Scientific Pty Ltd, A18
 atomic layer deposition, 41
 Attorney-General's Department, 19
 audits, 19, 48, 61, 62, 64
 AusAID, 16
 Australian Centre for Mining Environmental
 Research, 8
 Australian Coal Association Research Program,
 28, 38
 Australian Communications Authority, A18
 Australian Institute of Nuclear Science and
 Engineering (AINSE), 22, 35, 66-68, A18
 Australian Maritime Safety Authority, 24

Australian National Audit Office, 48
 Australian National Tandem for Applied
 Research (ANTARES), 22, 27, 29
 Australian National University, 29, 44
 Australian Neutron Beam Users Group
 (ANBUG), 24
 Australian Nuclear Science and Technology
 Organisation Act 1987 (the ANSTO) Act, iv
 Australian Protection Service (APS), 19
 Australian Quarantine and Inspection Service, 39
 Australian Radiation Protection and Nuclear
 Safety Agency (ARPANSA), 5, 24, 37, 52-53,
 62, A21
 Australian Research Council, 67
 Australian Safeguards and Non-Proliferation
 Office, 5, 18, 19, 24
 Australian Synchrotron Research Program
 (ASRP), 25, 29, A18
 awards and prizes, 9, 30

B

Bangladesh, 15
 Battelle Memorial Institute, 2, 33
 Becquerel Laboratories Pty Ltd, A18
 beryllium-10, 22
 bilateral cooperation, 18
 Bilyara Aviation Services Pty Ltd, A18
 bio-archives, 30
 Board, v, vi, 60-64
 British Nuclear Fuels Ltd (BNFL), 33
 budget, 47
 Bureau of Meteorology, 32
 Burns and Roe, 2, 33, 34
 business development, 50
 business information system, 45, 47

C

caesium, 34, 35
 calibration service, 42
 Canada, 8
 cancer, 20, 43
 carbon-14, 27, 28
 cement, 25
 Chairman, ii, 1-2
 ChemMatCARS beamline, 29
 Chernobyl, 18, 19

- China, 15, 17, 38
 chlorine-36, 19
 climate change, 7, 28, 31-32
 coal, 38, 40
 coastal and marine environment, 31
 Cogema, 2, 6, 24, 33
 cold-crucible technology, 34, 35
 COMCARE, 52, 55, 62
 common mode failure, A14
 Commonwealth Acts and Awards, 60
 Commonwealth Protective Security Manual, 20
 communications, 20-21
 community consultation, 14, 45, A3
 Community Right to Know Charter, A15
 competency program, 45, 47
 complaints, 64
 compliance, iv, 60
 Comprehensive Nuclear Test Ban Treaty (CNTBT), 18
 computational fluid dynamics, 15
 computer services, 49
 Construction Environment Management Plan, A9
 contracts completed, 12
 Cooperative Research Centre (CRC)
 Hydrometallurgy, 35
 Welded Structures, 40
 Polymers, 25, 40
 Waste Management and Pollution Control, 8
 cooperative research, international nuclear safety, 18-19
 copper isotopes, 67
 copper mining, 29
 copper-64, 27
 core business areas, 13-50
 core nuclear facilities operation and development, 22-29
 international strategic relevance of nuclear science and technology, 14-21
 nuclear science for environment and sustainability, 30-32
 organisational development and support, 45-50
 sustainability and international competitiveness of industry, 38-44
 treatment and management of man-made and naturally occurring radioactive substances, 33-37
 core nuclear facilities operation and development, 5
 Corporate Executive statistics, A2
 Corporate Governance, 60-64
 Counsellors, 18
 credible hazards and risks, A15
 crocodiles, 30
 Cronulla Sewage Treatment Plant, 57, A12, A21
 crystal structure, 25
 CSIRO, 28, 29, 32, 34, 38, 43, A19
 Curtin University of Technology, 25
 customer satisfaction, 12
- D**
- dangerous occurrences, 55
 data network, 49
 Deed of Indemnity, 49
 Department of the Environment and Heritage, A10
 Department of Foreign Affairs and Trade, 15
 Digital Coincidence Counting (DCC), 42
 directors, v
 DISPLANS, 57-58
 dispute resolution, A16
 distance learning materials, 17
 documents held - FOI, A3-A4
 dosimetry, 42
 Downreay UK, 24
- E**
- Earth Systems Pty Ltd, 39
 electro-kinetic sounding and logging, 32
 emergencies, 17-18, 52, 57-58, A14
 Energy Resources Australia, 33, 43
 engineered films, 41
 engineering services, 23, 48
 enterprise agreements, 45, 48
 Environment Australia, 24
 environment and sustainability, 6-7, 30, A21
 environmental gamma monitoring system, 56
 environmental impact
 nuclear facilities Asia/Pacific, 30
 replacement reactor, 26, A8-A17
 Environmental Management Action Plan, 53, 56, A16
 Environmental Monitoring Committee, 53, A13
 environmental protection arrangements, 38-39, 56-58

environmental sampling, 18, 19
 environmental signatures, 5
 epidemiological study, 20
 Equal Employment Opportunity (EEO), A2
 Erosion and Sedimentation Control Plan, A9
 ethical standards, 63-64
 evacuation exercises, 58
 Evans Deakin Industries Limited, 2, 5, A8
 Event Response Team, 55
 Executive Directors, v, 3-4
 expenditure, 1, 46
 external representation, 18
F
 Facilities Safety Unit, 53
 FAO/IAEA, 16
 FDGen see fluorine-18 fluorodeoxyglucose
 finance, 45
 Financial Information Management System (FIMS), 45
 financial performance, F2-F41
 fluorine-18 fluorodeoxyglucose, 7, 27, 43, 44
 Forum for Nuclear Cooperation in Asia, 17
 Foxboro, 49
 France, 16, 23, 31, 34, 40, 42
 fraud control, 64
 Freedom of Information (FOI), A3-A4
 funding, 9, 11, 29, 39, 45, 47, 66, 67

G
 gallium-67, 27, 43, 44
 gamma ray scanning technology, 36
 Gamma Technology Research Indicator (GATRI), 39
 gas detection, 29
 Gas Redox and Displacement System (GaRDS), 39
 Gentech, 43
 Georges River Disaster Plan (DISPLAN), 58
 glaciation studies, 28
 glossary, A23-A25
 gold, 32, 35, 38
 Goods and Services Tax, 64
 government, advice and services, 11, 15
 groundwater management, 32, A10, A12

H
 health physics services, 54

Health, Safety and Environment Committee, 53
 heavy ion microprobe, 29
 heavy metals, 30
 HIFAR (High Flux Australian Reactor), iv, 22-26
 replacement reactor, 1, 5, 15, 25-27, A8-A17
 shutdown, 23, 53
 historical waste, A21
 Holland, John Construction & Engineering Pty Ltd, 2, 5, A8
 Hong Kong, 30
 hot-isostatic pressing, 7
 Human Activity and Climate Variability (HACV), 31-32
 hydrothermal environments, 34

I
 Indonesia, 17, 31
 industrial pollution, 6
 industrial relations, 48
 industry competitiveness and sustainability, 38-44
 information technology outsourcing project, 49, 64
 information technology system, 8, 49
 inorganic ion exchangers, 35
 Institute of Nuclear Materials Management, 19
 integrated isotope technologies, 32
 internal control, 64
 International Aerosol Characterisation Experiment (ACE), 6, 32
 International Agency for Research on Cancer (IARC), 20
 International Atomic Energy Agency (IAEA), 5, 15-16, 18, 19, A13
 Regional Cooperative Agreement (RCA), 6, 14, 16
 International Conference on Nuclear Cooperation in Asia (ICNCA), 17
 International Institute for Environment and Development (IIED), 38
 International Network for Acid Prevention (INAP) Ltd, 2, 8
 International Nuclear Information System (INIS), 49
 INVAP S.E., 1, 5, 26, 49, A8
 iodine-129, 19, 27
 ion beam analysis, 28-29, 30
 ionising radiation, 20

- ISO 9001:1994, 44
 ISO 14001, 56, A11, A21
 isotope production, 27
- J**
 Japan, 15, 17, 24, 29
- K**
 Kakadu, 30
 key performance indicators, 9-12
 Korea, 15, 17, 18
- L**
 landform dating, 28
 Lawrence Livermore National Laboratory, 34
 Learning Environments for New Strategies, 48
 leasing, ANSTO property, 50
 Leukoscan, 44
 liaison and collaboration, 10
 library services, 49
 licensing, 5, 26, 52, 53
 liquid waste, 15, 36, 52, 57
 lithium niobate, 41
 Local Liaison Working Party (LLWP), 58, A3
 LONGPOL instrument, 25
 Lucas Heights Buffer Zone Plan of Management, A11, A21
- M**
 magnetic ordering, 67
 magnetic structures, 25
 Major National Research Facilities (MNRF), 29
 Malaysia, 17
 marine coastal environment, 16, 31
 marine sediments, 8
 meetings and conferences, 7, 24, 34, 38, 66
 megafauna, 27
 mesostructured materials, 40
 Minchin, Senator N, v, A13, A16
 mining and minerals processing, 8, 15, 28, 30, 33, 35, 39
 Minister, v, A13, A16
 MOATA research reactor, 27
 molybdenum-99, 2, 35, 36, 43, 44, A12
 Monash University, 25, 29, 30, 31, 41
- MOU, 6
 multilayered structures, 41-42
- N**
 nanostructure studies, 40
 National Association of Testing Authorities (NATA), 56, A16
 National Health and Medical Research Council (NHMRC), 52, 56
 National Low Level Waste Repository, 27, A16
 National Medical Cyclotron, iv 25, 43, 53, 54
 National Oceanographic and Atmospheric Administration, 8
 National Physical Laboratory UK, 42
 National Radioactive Waste Repository, 30
 Natural History Museum (London), 34
 neutron scattering, 24-25
 nitrogen, 15, 27
 noble gas emissions, 57, A8, A11
 Noise Management Control Plan, A9
 nominations as host agency, 9
 Northern Territory, 33
 Noumea, 6
 NSW Department of Land and Water Conservation, 31, 32
 NSW Emergency Services Organisations, 58
 NSW Roads and Traffic Authority, A10
 NSW State Disaster Plan, 58
 nuclear accidents, 16
 nuclear magnetic resonance facility, 34
 Nuclear Non-Proliferation Treaty, 14, 16, 17, 18
 nuclear power, 15
 nuclear reprocessing, 19
 nuclear safeguards, 19
 nuclear signatures, 14
- O**
 occupational health and safety, 55
 OECD, 17-18
 online information service, 21
 organisational development and support, 8, 45-50
 Orica Pty Ltd, 35
 Output Pricing Review, 46
- P**
 Pacific Northwest National Laboratory (PNNL), 34

paper file management, 50
 parliamentary appropriation, 1, 47
 Parliamentary Public Works Committee, 27
 particle accelerators for research, 27
 patents, 34, 35, 40, 50
 personal dosimetry service, 54, 55
 Philippines, 6, 16, 17, 29, 31
 Photon Factory, Japan, 29
 Physics Division, 53
 plasma immersion ion implantation process, 42
 plasma surface conditioning, 41
 plutonium immobilisation, 33, 34
 Power Reactor Status Summary, 15
 power station components, 41
 Preliminary Safety Analysis Report, A13
 publications, 7, 9, 17, 20, 25, 28, 34, A3-A4
 publicity, 21
 pyrochlore, 34

Q

Quadramet, 43, 44
 quality assurance, 8, 23, 35, 50
 Queensland Power Industry, 38, 41

R

radiation doses, 52, 54
 radiation protection, 16-17, 54-55
 consultancies, 43
 training, 42-43
 radiation standards, 42
 radiation technology, 39
 radio-methane record, 28
 radioactive components testing, 41
 radioactive gaseous emissions, A11
 radioactive waste management, 15, 17, 33-37
 radiocarbon dating, 22, 28
 radioisotopes, 1, 38, 43-44
 radionuclides, 19, 30-31, A11
 radiopharmaceuticals, 33, 38, 43-44, 57, A11
 radon, 6
 Ranger uranium mine, 33, 35, 43
 rare earths, 35
 reflectrometry, 25
 Regional Nuclear Cooperation in Asia (RNCA), 17
 Remedial Action Plan, A9
 replacement reactor see HIFAR

reporting requirements, A17, A22
 reprocessing spent fuel, 23
 research and development, 9, 10
 residence time distribution tracing, 15
 revenue, 1, 11, 22, 34, 38, 45-46
 risk assessment and management, 48, 63
 RIVERWORKS program, 39
 Royal Prince Alfred Hospital, iv, 54
 Russia, 33

S

safeguards, 5, 19
 Safety Analysis Report, A14
 Safety Assessment Committee (SAC), 53
 safety, environmental protection ANSTO, 8, 42-43, 51-58, 62
 samarium-153 see Quadramet
 scholarships, 48
 Second Status Report, A8-A17
 secondary ion mass spectrometry, 30, 32
 Secondary Standard Dosimetry Laboratory, 42
 security, 19-20
 Senate enquiry, 27
 Service Charter, 64
 Shire of Sutherland Credit Union, A19
 Silex Systems Ltd, A19
 SIRTeX Medical Ltd, 44
 Small Angle Neutron Scattering (SANS) facility, 25
 small punch test, 41
 soil dust pollution, 6
 sol-gel science, 40, 41
 solid waste management, 36-37
 solvent extraction, 33
 South Australia, 28
 spent fuel, 2, 6, 24, 36, 47, A14
 staff, iv, 45, 47-48, A2
 standards, 8, 23, 40, 44, 56
 Stormwater Control Plan, A10, A11
 strategic relevance, 6, 14-21
 strontium, 35
 students supervised by ANSTO, 10, 66
 Sulfide Solutions, 38
 sulfidic mine waste, 8
 sulfite-UV technology, 8
 sustainable development, 6-7, 38-44

Sutherland Shire Local Disaster Plan, 58
 Switzerland, 34, 42
 Sydney Water, 37, 57
 synchrotron x-ray research, 29
 synroc-based wasteforms, 7, 33-35
 Syria, 15

T

Tasmania, 31
 Technical Advisory Committee, 63
 technology transfer and commercialisation, 11
 technetium-99m, 31, 44
 telephony facilities, 49
 tendering, 2, A8
 Thailand, 17
 thallium-201, 27
 Therapeutic Goods Administration (TGA), 7, 39, 44
 thin films, 42
 titanate glass wasteforms, 34
 titania, 41
 Trade Waste Agreement, 37, 57, A12
 traffic density, A10
 training courses, staff, 48
 transport of radioactive materials, 17
 Triennium Funding Agreement, 45
 Tru-Tec Australasia, A19

U

United Pistol Club Inc, A19
 United States, 24, 33, 34, 40
 University of Auckland NZ, 28
 University of Canberra, 29
 University of Melbourne, 28, 29
 University of New South Wales, 20, 29, 31, 34
 Water Research Laboratory, 6, 16, 30, 31
 University of Newcastle, 25, 28
 University of Queensland, 29
 University of Sydney, 25, 29
 University of Tasmania, 31
 University of Technology, Sydney, 25, 31, 41
 University of Wollongong, 31, 67
 uranium, 6, 14, 19, 30
 mining, 15, 33, 35
 uranium, depleted, 19

V

Venice, 27
 Vietnam, 15, 17
 visitors, 20, 21
 Vita Medical Ltd, A19

W

warships, nuclear-powered, 14, 20
 waste management, 27, 36-37
 Waste Operations and Technology
 Development, 53
 Waste Service NSW, A20
 waste water, 37
 water tunnel laboratory, 24
 website, iv, 21, 24, 25
 welded structures, 40
 Western Australia, 35, 40
 Westinghouse Savannah River Company, 34
 WMC Resources Ltd, 39
 work experience, 48
 Workers Compensation, 49
 World Climate Research Programme, 32
 World Health Organization, 57, A12

X

x-ray analysis software, 22
 Xenon-135, 135m, A11

Y

yttrium-90, 43, 44

Z

zirconolite, 34

ANSTO

Lucas Heights Science and Technology Centre
New Illawarra Road, Lucas Heights
New South Wales 2234

Postal address

ANSTO Private Mail Bag 1
Menai NSW 2234

Telephone

(02) 9717 3111

Facsimile

(02) 9543 5097

Email

enquiries@ansto.gov.au

Home Page

<http://www.ansto.gov.au/>

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ANSTO REPRESENTATIVES

Canberra

ANSTO Representative
Department of Industry, Science and Resources
20 Allara Street
Canberra City
ACT 2600
Australia

London

Counsellor (Nuclear)
Australian High Commission
Australia House
The Strand
London WC2B 4LA
United Kingdom

Vienna

Counsellor (Nuclear)
Australian Embassy
Mattiellistrasse 2-4
A-1040 Vienna
Austria

Washington

Counsellor (Nuclear)
Australian Embassy
1601 Massachusetts Ave, NW
Washington DC 20036
United States of America

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