AUSTRALIAN SAFEGUARDS AND NON-PROLIFERATION OFFICE

ANNUAL REPORT 2001-2002

Director of Safeguards

Director, Chemical Weapons Convention Office

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Cover (clockwise, from top left):

ASNO Safeguards Training Course, August 2001; Satellite image of Ranger uranium mine; Infrasound Detector, Warramunga, Northern Territory; Chemical laboratory fume cupboard and shower facilities; Histoplasma Capsulatum cells (a fungal pathogen); UNSCOM inspection of Iraqi pharmaceutical plant, 1998; Nuclear fuel cask with fuel elements (photograph courtesy of INVAP).

FOREIGN
AFFAIRS
AND TRADE

AUSTRALIAN SAFEGUARDS
AND NON-PROLIFERATION
OFFICE

22 October 2002

The Hon. Alexander Downer MP
Minister for Foreign Affairs
Parliament House
CANBERRA ACT 2600

Dear Mr Downer,

Pursuant to section 51 of the *Nuclear Non-Proliferation (Safeguards) Act 1987*, and to section 96 of the *Chemical Weapons (Prohibition) Act 1994*, I submit my Annual Report covering the operations of the Australian Safeguards Office and the Chemical Weapons Convention Office for the financial year ended 30 June 2002. This Report also covers the operations of the Australian Comprehensive Test-Ban Office for the same period.

As outlined in this Report, all relevant statutory and treaty requirements were met. In particular, all requirements under Australia's safeguards agreement with the International Atomic Energy Agency and under the Chemical Weapons Convention were met, and activities required in anticipation of the entry-into-force of the Comprehensive Nuclear-Test-Ban Treaty were carried out. ASNO found no indication of unauthorised access to or use of nuclear materials or nuclear items in Australia, and all Australian Obligated Nuclear Material was accounted for (as explained in the Report, the inventory of AONM under the Australia/United States agreement is based on provisional information).

During the year ASNO continued our substantial contribution to the development and strengthening of international verification regimes concerned with weapons of mass destruction (WMD). Domestically, ASNO conducted, or contributed to, review of WMD-related legislation and administration, amending permits to enhance security arrangements, and beginning development of supporting legislative changes. Another major area of work is the replacement research reactor project, where ASNO has been closely involved through safeguards and security aspects.

Yours sincerely,

John Carlson
Director General

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General enquires relating to ASNO functions, activities or responsibilities should be directed to the Director General, Australian Safeguards and Non-Proliferation Office.

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SCOPE OF THIS ANNUAL REPORT

The position of Director General, Australian Safeguards and Non-Proliferation Office (ASNO), combines the statutory office of Director of Safeguards with that of Director, Chemical Weapons Convention Office (CWCO). The Director General also performs the functions of the Director, Australian Comprehensive Test-Ban Office (ACTBO) on an informal basis, as the relevant legislation has not yet come into effect.

This report covers the activities of ASNO and is prepared pursuant to the requirements of section 51 of the *Nuclear Non-Proliferation (Safeguards) Act 1987* and section 96 of the *Chemical Weapons (Prohibition) Act 1994*.

Section 71 of the *Comprehensive Nuclear Test-Ban Treaty Act 1998* also requires preparation of an annual report. That Act will have effect at entry into force of the CTBT following ratification by the 44 states specified in the Treaty. Although the Treaty, and therefore the Act, is not yet in effect, States Signatories are co-operating, in accordance with the provisions of the Treaty, to develop CTBT verification infrastructure ahead of the Treaty's entry into force. ASNO's activities in this regard are included in this Report.

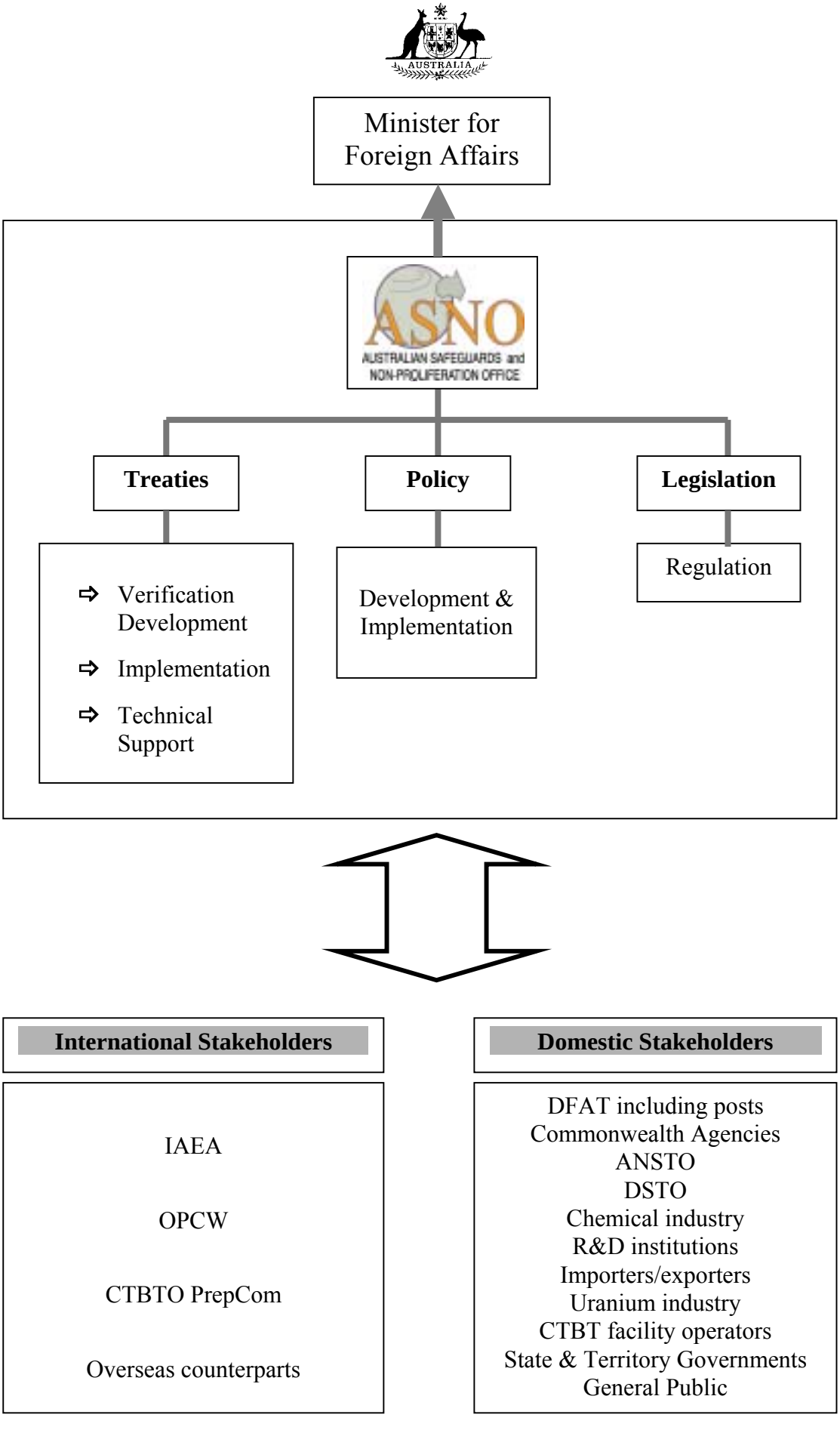

Figure 1—ASNO's operating environment

ASNO OUTCOMES AND OUTPUTS

OUTCOME 1

Australian and international security enhanced through activities which contribute to effective regimes against the proliferation of nuclear, chemical and biological weapons.

Outputs

A. Operation of Australia's national system of accounting for, and control of, nuclear material and items subject to IAEA (International Atomic Energy Agency) safeguards, including promotion and regulation, within Australia, of effective measures for the physical protection of nuclear facilities and material.

B. Development and implementation of bilateral safeguards measures that ensure nuclear material and associated items exported from Australia remain in exclusively peaceful use.

C. Contribution to the development and effective implementation of international safeguards and non-proliferation regimes, including participation in international expert groups and provision to the IAEA of consultancies, assessments, support in R&D and training; and evaluation of the effectiveness of IAEA safeguards and related regimes.

D. Operation of the national authority for implementation of the Chemical Weapons Convention (CWC), including contribution to the effective international implementation of the CWC, particularly in Australia's immediate region.

E. Operation of the national authority for implementation of the Comprehensive Test Ban Treaty (CTBT), including development of CTBT verification systems and development of arrangements in support of Australia's CTBT commitments.

F. Contribution to the development of new and strengthened WMD (weapons of mass destruction) non-proliferation regimes and supporting domestic arrangements for the Biological Weapons Convention (BWC) verification measures and the Fissile Material Cut-off Treaty (FMCT).

G. Provision of high quality, timely and relevant professional advice to Government on non-proliferation matters.

OUTCOME 2

Knowledge about Australia's efforts to prevent the proliferation of WMD enhanced through public advocacy.

Output

H. Provision of public information on the development, implementation and regulation of WMD non-proliferation treaties, and Australia's role in these activities.

AUSTRALIAN SAFEGUARDS AND NON-PROLIFERATION OFFICE 2001-2002

MINISTER

Administration of the legislation under which ASNO operates, the *Nuclear Non-Proliferation (Safeguards) Act 1987* (the Safeguards Act), the *Chemical Weapons (Prohibition) Act 1994* and the *Comprehensive Nuclear Test-Ban Treaty Act 1998*, is the responsibility of the Minister for Foreign Affairs, the Hon. Alexander Downer MP.

DIRECTOR GENERAL, ASNO

The position of Director General, ASNO, incorporates the functions of Director of Safeguards, Director, Chemical Weapons Convention Office, and Director, Australian Comprehensive Test-Ban Office. Background to the formation of ASNO, established in 1998, is set out in the ASNO Annual Report 1999-2000 (page 106).

Director of Safeguards

The Australian Safeguards Office, ASNO's predecessor, was established in 1974. The position of Director of Safeguards was created in 1987 as a statutory office, appointed by the Governor-General, in order to ensure the independence and integrity of Australia's domestic and bilateral safeguards functions. The Director of Safeguards reports directly to the responsible Minister, who since 1994 has been the Minister for Foreign Affairs. The Safeguards Act requires the Director of Safeguards to prepare an Annual Report for presentation to Parliament.

Mr John Carlson was initially appointed as Director of Safeguards in 1989, and was appointed as Director General, ASNO, on 31 August 1998 when ASNO was established. Mr Carlson was re-appointed on 7 June 2000 for a further term of three years.

Director, CWCO

The *Chemical Weapons (Prohibition) Act 1994* provides that the Minister may designate a particular office within a Department or agency for which the Minister is responsible, or a statutory office under legislation for which the Minister is responsible, as the office whose occupant is the Director, Chemical Weapons Convention Office (CWCO). On 11 March 1995 the Minister for Foreign Affairs designated the office of Director of Safeguards for this purpose.

The Director, CWCO, is required to prepare an Annual Report for presentation to Parliament, and this has been combined with the Annual Report of the Director of Safeguards.

Director, ACTBO

The Director, Australian Comprehensive Nuclear Treaty Test-Ban Office (ACTBO), is likewise to be designated by the Minister under the *Comprehensive Nuclear Test-Ban Treaty Act 1998*. As currently drafted, this Act will have effect when the CTBT enters into force. Accordingly, at present the Director, ACTBO cannot be formally designated, and the requirement to produce an annual report has not formally taken effect. However, as

described in this Annual Report, ASNO is already carrying out many of the tasks required of Australia's CTBT National Authority, and a report on these activities is included here.

FUNCTIONS

The functions of the Director General, ASNO, include:

- ensuring the effective operation of the *Nuclear Non-Proliferation (Safeguards) Act 1987* and the *Chemical Weapons (Prohibition) Act 1994*, and fulfilment of Australia's obligations under the treaties these Acts implement;
- ensuring fulfilment of Australia's obligations under nuclear safeguards agreements, including the agreement with the International Atomic Energy Agency (IAEA) for the application of safeguards pursuant to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT);
- monitoring compliance with the provisions of bilateral nuclear safeguards agreements by Australia's treaty partners;
- undertaking, coordinating and facilitating research and development (R&D) in relation to nuclear safeguards;
- ensuring the timely and effective establishment of CTBT International Monitoring System (IMS) facilities in Australia, and undertaking preparations to meet the full range of Australia's obligations under the CTBT when it enters into force; and
- advising the Minister on nuclear non-proliferation and safeguards matters, and on issues related to CWC implementation and CTBT verification.

OVERVIEW OF SAFEGUARDS ROLE

On safeguards, ASNO has four main areas of responsibility:

- the application of safeguards within Australia;
- ensuring the physical protection and security of nuclear items in Australia;
- the operation of Australia's bilateral safeguards agreements; and
- contribution to the operation and development of international (IAEA) safeguards and the strengthening of the international nuclear non-proliferation regime.

IAEA safeguards are a key element in international action against the spread of nuclear weapons. Effective IAEA safeguards are of vital interest to Australia because of their contribution to global and regional peace and security. They are also important because they underpin Australia's stringent uranium export policies.

Key safeguards functions are:

- ensuring that nuclear material, associated material, equipment and technology in Australia is properly accounted for and controlled, and ensuring that requirements are met under Australia's safeguards agreement with the IAEA and bilateral agreements applying to nuclear material and items in Australia;
- pursuant to obligations under the Convention on the Physical Protection of Nuclear Material (CPPNM), and following IAEA guidelines, ensuring that appropriate security measures are applied to nuclear items in Australia;

- ensuring Australia's bilateral safeguards agreements are implemented satisfactorily, that is, to guarantee Australia's nuclear exports remain in exclusively peaceful use; ensuring that conditions which Australia places on the use of Australian Obligated Nuclear Material (AONM), additional to IAEA safeguards, are met (these conditions are outlined on page 75);
- ensuring that all AONM is subject to IAEA safeguards, and verification of non-diversion is carried out by the IAEA;
- ensuring that any nuclear items other than nuclear material (i.e. associated material, equipment and technology) transferred to other countries are properly accounted for, and that the relevant records of Australia's partners are consistent with ASNO records;
- contributing to the development and effective implementation of IAEA safeguards through activities such as participation in expert groups and international meetings on safeguards, field testing of new safeguards methods in Australia, and presentation of regional training courses on safeguards techniques;
- managing Australia's Support Program for IAEA safeguards, which embraces R&D work and includes consultancy tasks for the IAEA;
- evaluation of the effectiveness of IAEA safeguards, and evaluation of non-proliferation aspects of nuclear fuel cycle developments, as a basis for advising Government;
- contributing to the development of Australia's policies in the area of disarmament and non-proliferation by colleagues in the International Security Division (ISD) of DFAT; and
- working closely on technical issues of common interest with agencies such as the Australian Nuclear Science and Technology Organisation (ANSTO), the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), the Defence Intelligence Organisation (DIO), and the Office of National Assessments (ONA).

OVERVIEW OF CWC ROLE

ASNO is the focal point in Australia for liaison between stakeholders involved with CWC implementation, such as operators of declared facilities, the Organisation for the Prohibition of Chemical Weapons (OPCW), and the national authorities of other States Parties. ASNO's role also includes facilitation to ensure that Australia's international obligations under the CWC are met while at the same time making certain that the rights of facility operators are protected. ASNO seeks to promote effective international implementation of the CWC, particularly in Australia's immediate region, by working with the OPCW and other States Parties in the resolution of outstanding verification issues and providing practical implementation assistance to regional countries, upon request.

ASNO is responsible for ensuring that the requirements of the *Chemical Weapons (Prohibition) Act 1994* are met. It has the right to conduct national compliance inspections of relevant chemical facilities. While the Act makes provision for national inspectors to obtain mandatory access to sites, it is expected such powers will be exercised only in exceptional circumstances. ASNO has an extensive on-site consultation and outreach program aimed at raising awareness of affected parties of CWC obligations, collecting information necessary for declarations and preparing sites for routine compliance inspections by the OPCW.

ASNO is responsible for ensuring that the requirements of Regulation 5J of the *Customs (Prohibited Imports) Regulations* are met by regulating the importation of CWC Scheduled chemicals through operation of an import permit system.

ASNO provides technical support to DFAT in multilateral efforts to strengthen the Biological and Toxin Weapons Convention (BWC). If such measures are agreed, it is envisaged that ASNO would undertake BWC responsibilities similar to those it holds under the CWC.

Key CWC functions are:

- identifying and gathering information on industrial chemical facilities and activities required to be declared to the OPCW;
- working with declarable facilities to prepare for the possibility of OPCW inspection;
- increasing awareness of the CWC and Australia's obligations by disseminating information on the Convention and the *Chemical Weapons (Prohibition) Act 1994* to the chemical industry and other domestic entities likely to be affected, including through on-site consultations;
- administering and developing regulatory, administrative and logistical mechanisms to enable Australia to fulfill its CWC obligations;
- liaising with overseas counterpart organisations and with the Technical Secretariat of the OPCW in connection with technical and practical implementation issues;
- conducting research directed towards improving the effectiveness of the CWC's verification regime;
- assisting, upon request, other States Parties to implement the CWC, particularly in Australia's immediate region; and
- providing technical advice to support Australia's delegation at the negotiations to strengthen the BWC.

OVERVIEW OF CTBT ROLE

While the CTBT is not yet in force, the Treaty expressly provides (Article IV) that its verification system (the International Monitoring System—IMS) is to be capable of meeting the requirements of the Treaty upon entry into force. The Preparatory Commission for the CTBT Organisation (CTBTO), with the CTBTO Provisional Technical Secretariat (PTS) and States Signatories, are therefore engaged in major tasks even before the Treaty has come into force. This includes the establishment and/or upgrading of 337 monitoring facilities around the world, as well as the development of detailed procedures for the operation of these facilities and for the conduct of other verification activities such as On-Site Inspections.

ASNO is Australia's designated National Authority for the CTBT. Overall, the role is one of liaison and facilitation to ensure that the International Monitoring System is established efficiently and relevant domestic arrangements are in place.

Key CTBT functions include:

- being the national point of contact for liaison on CTBT implementation;

- establishing and maintaining legal, administrative and financial mechanisms to give effect to the CTBT in Australia;
- participating in development and implementation by DFAT and other agencies of Australian policy relevant to the CTBT;
- promoting an understanding in Australia of CTBT verification, including by acting as an interface between technical and policy specialists; and
- contributing to the development of treaty verification, through the CTBTO Preparatory Commission and its working groups.

ADVICE TO THE GOVERNMENT

The staff of ASNO has substantial experience in international and bilateral safeguards, nuclear technology, CWC and BWC verification issues, and CTBT processes and procedures. Drawing on this expertise and an international network of contacts in other governments and organisations, ASNO provides technical and policy advice to the Government and non-government bodies.

LEGISLATION

Nuclear Non-Proliferation (Safeguards) Act 1987

The *Nuclear Non-Proliferation (Safeguards) Act 1987* took effect on 31 March 1987. This Act establishes the statutory office of Director of Safeguards and forms the legislative basis for ASNO's nuclear safeguards activities.

The Safeguards Act gives effect to Australia's safeguards obligations under:

- the NPT;
- Australia's NPT safeguards agreement with the IAEA;
- agreements between Australia and various countries (and Euratom) concerning transfers of nuclear items, and cooperation in peaceful uses of nuclear energy; and
- the Convention on the Physical Protection of Nuclear Material (CPPNM).

Control over nuclear material and associated items in Australia is exercised under the Safeguards Act by a system of permits for their possession and transport. Communication of information contained in sensitive nuclear technology is controlled through the grant of authorities.

The Safeguards Act empowers the Minister to grant, vary or revoke permits or authorities, to make declarations or orders in relation to material, equipment or technology covered by the Act, and to appoint inspectors to assess compliance with the Act and with Australia's NPT safeguards agreement with the IAEA. The Minister has delegated most of these powers (with certain exceptions such as granting of permits to uranium mines and for nuclear activities) to the Director of Safeguards.

Regulations and declarations under this Act are listed under the *Freedom of Information Act 1982* statements on page 81 of this Report.

Nuclear Non-Proliferation (Safeguards) (Consequential Amendments) Act 1988

The *Nuclear Non-Proliferation (Safeguards) (Consequential Amendments) Act 1988* took effect on 24 May 1988. It amended the *Patents Act 1952* to allow referral from the Patent Office (now IP Australia) to the Director of Safeguards of patent applications which might constitute 'associated technology' under the Safeguards Act. The amendments give the Director of Safeguards the power to direct that such a patent application lapse if the applicant does not hold an appropriate authority under the Safeguards Act to communicate sensitive information at the time of making the application for the patent. These amendments were consolidated into the *Patents Act 1990*.

Nuclear Safeguards (Producers of Uranium Ore Concentrates) Charge Act 1993

In conjunction with an amendment to the Safeguards Act, this legislation imposes an annual charge on uranium producers corresponding to a proportion of ASNO's operating costs. Further details are on page 25.

South Pacific Nuclear Free Zone Treaty Act 1986

The *South Pacific Nuclear Free Zone Treaty Act 1986* (the SPNFZ Act) prohibits the manufacture, production, acquisition, stationing and testing of nuclear explosive devices, and R&D relating to manufacture or production of nuclear explosive devices.

The SPNFZ Act establishes the framework for inspections in Australia by Treaty inspectors, and provides for appointment by the Minister for Foreign Affairs of authorised officers to accompany and observe international inspectors while they are in Australia. Inspectors appointed for the purposes of the Safeguards Act are also inspectors under the SPNFZ Act. These inspectors are to assist Treaty inspectors and authorised officers in carrying out Treaty inspections, and investigating possible breaches of the SPNFZ legislation in Australia.

Chemical Weapons (Prohibition) Act 1994

The *Chemical Weapons (Prohibition) Act 1994* was enacted on 25 February 1994. Division 1 of Part 7 of the Act (establishing the CWCO and the position of its Director), and sections 95, 96, 97, 99, 102, 103, and 104 were proclaimed on 15 February 1995. Other provisions of the Act which expressly relied on the CWC came into effect on 29 April 1997 when the CWC entered into force. The final parts of the Act, dealing with routine compliance inspections of Other Chemical Production Facilities, came into effect on 17 August 2000.

In conjunction with other legislation (see under the following heading), the Act gives effect to Australia's obligations, responsibilities and rights as a State Party to the CWC. In particular, the Act:

- prohibits activities connected to the development, production or use of chemical weapons, including assisting anyone engaged in these activities, whether intentionally or recklessly—such offences are punishable by life imprisonment;
- establishes permit and notification systems to provide a legal framework for the mandatory provision of data to CWCO (i.e. ASNO) by facilities which produce or use chemicals as specified by the Convention, so that ASNO can lodge declarations with the OPCW;

- provides for routine inspections of declared facilities and challenge inspections of any facility or other place in Australia by OPCW inspectors to verify compliance with the CWC, and for inspections by CWCO to verify compliance with the Act; and
- provides for procedures should another State Party seek clarification concerning compliance with the Convention by any facility or other person or place in Australia.

Regulations under the Act prescribe procedures and details of other arrangements provided for in the Act. In particular, the Regulations define conditions that are to be met by holders of permits issued under the Act, and for granting privileges and immunities to OPCW inspectors when in Australia to carry out an on-site inspection.

The text of the CWC is reproduced in the Schedule to the Act. The manner in which any powers are exercised under the Act must be consistent with the Convention, and have regard to Australia's obligations under it.

The *Chemical Weapons (Prohibition) Act 1994* was amended on 6 April 1998. The amendments refine administration of the Act by simplifying compliance obligations for facilities requiring permits, clarifying the legislative basis for Australia to implement some of its obligations under the Convention, correcting drafting errors and improving certain procedures, including those related to secrecy. For consistency, concomitant Regulations were amended on 17 December 1998.

Other CWC related legislation

Other aspects of the CWC which required legislation have been, or are being, dealt with under existing legislation, in particular the:

- *Customs (Prohibited Exports) Regulations* and *Customs (Prohibited Imports) Regulations* to enforce CWC obligations in relation to export and import controls on scheduled chemicals. The *Customs (Prohibited Imports) Regulations* were amended on 15 December 1999 to extend import licensing arrangements to cover all CWC Scheduled chemicals; and
- *International Organisations (Privileges and Immunities) Act 1963*, to recognise the OPCW as an international organisation, and to grant appropriate privileges and immunities to its officers when in Australia for official purposes.

Comprehensive Nuclear Test-Ban Treaty Act 1998

The Act gives effect to Australia's obligations as a Party to the Comprehensive Nuclear-Test-Ban Treaty (CTBT). It prohibits the causing of any nuclear explosion at any place within Australian jurisdiction or control and establishes a penalty of up to life imprisonment for an offence against the provision. The Act also prohibits Australian nationals from causing a nuclear explosion in any other place.

The Act requires the Commonwealth Government to facilitate verification of compliance with the Treaty provisions, including the obligation to arrange for the establishment and operation of Australian monitoring stations and the provision of data from these. It provides the Commonwealth with the authority to establish IMS stations and to make provision for access to them for CTBT monitoring purposes. The Act also makes provision for the Minister for Foreign Affairs to enter into arrangements with the CTBT Organisation to facilitate cooperation in relation to monitoring stations under Australian control.

Australia is under an obligation, pursuant to Article IV of the Treaty, to allow CTBT inspectors to inspect any place in Australia or the external Territories in an On-Site Inspection. The Act provides comprehensive powers for inspection arrangements, including the right for inspectors to gather information, to collect and remove samples, to undertake drilling. Access to facilities by inspectors for challenge inspections is by consent of the occupier or by warrant issued by a magistrate.

The Act establishes ACTBO (part of ASNO) as the Australian national authority for the CTBT. The Act grants ACTBO necessary legal capacity and provides for the power to make regulations with respect to privileges and immunities for the CTBT Organisation and its officials under Australian law in accordance with the Treaty.

The Act was assented to on 2 July 1998 but, as provided for in section 2 of the Act, will not come into effect until the CTBT enters into force.

Proposed legislative amendments

It is envisaged that amendments to relevant legislation will be introduced at a convenient time in order to formalise the amalgamation of ASO, CWCO and ACTBO into ASNO and to formally establish the position of Director General, ASNO.

THE YEAR IN REVIEW

KEY RESULTS FOR ASNO:

- **All treaty and statutory requirements met in respect of:**
  - **nuclear material and nuclear items in Australia**
  - **Australian uranium exports (Australian Obligated Nuclear Material)**
  - **chemicals covered by the CWC (Chemical Weapons Convention)**
  - **establishment of CTBT (Comprehensive Nuclear-Test-Ban Treaty) monitoring stations.**
- **Effective contribution to strengthening non-proliferation verification regimes and counter terrorism initiatives:**
  - **ongoing support for IAEA safeguards development**
  - **regional outreach on IAEA safeguards, CWC implementation and encouraging CTBT ratification**
  - **ANSTO security upgraded; security plan approved for construction of replacement research reactor**
  - **review, with other responsible authorities, of security of CWC-related chemicals, and radiation sources.**

ASNO's primary focus is international action against the proliferation of weapons of mass destruction (WMD—nuclear, chemical and biological)—particularly the development and operation of verification and other technical aspects of WMD treaties and regimes. ASNO's work therefore is directly related to national and international security. ASNO also has important regulatory functions—a key role in ensuring that Australia is in compliance with its WMD treaty commitments, and ensuring that the public is protected through appropriate security standards for WMD-related materials.

This year has been dominated by the terrorist attacks of 11 September 2001 on the United States, and ongoing consequences. These events, and the concern that terrorists would use WMD if they were able to acquire them, have served to emphasise the importance of effective counter-proliferation and counter-terrorism measures to complement the non-proliferation regimes. They have also focused attention on the need to deal with non-compliance with WMD treaty commitments—see the article on Iraq at page 64 of this Report.

ASNO has thoroughly reviewed security over nuclear materials and facilities at ANSTO's Lucas Heights Research Establishment, and has carefully scrutinised security aspects of the design and construction of ANSTO's replacement research reactor. The regulation of hazardous chemicals and biological agents in Australia is primarily the responsibility of State and Territory authorities, or in some cases other Commonwealth agencies, and traditionally the emphasis has been on safety. However, ASNO has also highlighted the

need for better security, by addressing security issues through ASNO permits for CWC-related chemicals, actively engaging in Commonwealth work on the security of hazardous chemicals and biological products, and contributing to the efforts of other authorities and agencies in this area. Attention is also being given to security of radiological materials—also primarily a State/Territory responsibility, but ASNO has been collaborating with ARPANSA in promoting appropriate standards.

For ASNO, a high point of the year was the appointment by Dr Mohamed ElBaradei, Director General of the IAEA, of John Carlson as Chair of SAGSI (the Standing Advisory Group on Safeguards Implementation), the international group of experts advising Dr ElBaradei on safeguards matters (see the media release at Annex I.2). This appointment reflects Australia's position as a key supporter of the IAEA, and provides further opportunity to contribute to development and strengthening of the IAEA safeguards system.

The year was a positive one for IAEA safeguards—at the end of the period covered by this Report, 26 countries had ratified Additional Protocols accepting the application of strengthened safeguards measures, and these measures were also being applied in Taiwan, China. A further 38 countries had signed Additional Protocols, and were proceeding with the legislation and administrative arrangements necessary for ratification. Thus, although the rate of ratifications is slower than Australia would prefer, nevertheless steady progress is being made in extending the coverage of strengthened safeguards, and strengthened safeguards are clearly becoming established as the NPT safeguards norm.

Figure 2—Mr Downer opening the Cape Leeuwin station in April 2002, with Executive Secretary of the CTBT Preparatory Commission, Dr. Hoffmann, looking on.

Regrettably, developments have been less positive in other areas. A major disappointment is the breakdown in negotiations on the protocol designed to establish compliance measures for the Biological Weapons Convention (BWC). While it is indisputable that control of biological materials must be strengthened, it remains unclear how this can be achieved effectively at the multilateral level. Although agreement on strengthening national controls would help to counter access to biological materials by terrorists, and procurement activities by proliferant states, measures such as a challenge inspection

mechanism would be lacking.

While the continuing failure to secure the signatures and ratifications needed for the Comprehensive Nuclear Test-Ban Treaty (CTBT) to enter into force was disappointing, there were some positive aspects—a further four countries signed the Treaty and there were 16 new ratifications. Further, the Conference on Facilitating Entry into Force of the CTBT, convened in November 2001, strongly endorsed the security benefits of the Treaty. Finally, mention needs be made of the continuing delay in the commencement of negotiations on a Fissile Material Cut-off Treaty (FMCT) in the Conference on Disarmament in Geneva.

International safeguards

This was a year of considerable achievement by the IAEA—with the assistance of a number of countries, including Australia—in developing the concepts, methods and skills required for implementing strengthened safeguards and integrated safeguards—the rationalisation of 'classical' and strengthened safeguards measures. Australia was the first country to qualify for the introduction of integrated safeguards, in January 2001, and at the time of writing this Report was still the only country with integrated safeguards in place.

ASNO continued to make a substantial contribution to the development of IAEA safeguards, through activities including participation in SAGSI, projects under Australia's Safeguards Support Program, consultancies undertaken at the Agency's request, and through working with the Agency in the field-testing of safeguards measures and procedures in Australia. ASNO has been working with the IAEA on strengthened safeguards measures for nearly a decade.

Outlines of current developments in the IAEA's safeguards system can be found in previous Annual Reports (see e.g. the 2000-2001 Annual Report, page 50), in ASNO papers (see Annex K—particularly papers 1 and 11), and on the IAEA's website, www.iaea.org.

Figure 3—Panel discussion at the regional safeguards training course, August 2001 (left to right—Dr Young-Myung Choi, Director TCNC, Republic of Korea, Mr John Carlson, DG ASNO, and Mr Takeshi Osabe, NMCC Japan).

During the year ASNO conducted a major regional outreach program: to Indonesia, to

share experiences in the implementation of the Additional Protocol, and to Malaysia, Thailand and the Philippines to assist in their preparations for the Additional Protocol. This work was greatly appreciated by the IAEA, and was conducted in conjunction with the Department of Defence, which provided an expert on export controls.

In August 2001, ASNO conducted a safeguards training course designed primarily to assist the DPRK (Democratic People's Republic of Korea) to develop its national safeguards system. The course also included participants from China, Indonesia, New Zealand and the Republic of Korea. As an adjunct to this work, Australia has offered additional training for safeguards personnel in the DPRK. ASNO supported the IAEA and Indonesia in May 2001, when ASNO's Assistant Secretary Mr Andrew Leask gave several presentations at a regional workshop on physical protection and the prevention of illicit trafficking of nuclear materials, organised in Jakarta. This work was well received and has led to requests for further assistance.

Notwithstanding substantial difficulties in the Conference on Disarmament, achieving an FMCT continues to be a high priority for Australia. The FMCT will complement the CTBT—together they would place a quantitative cap on the nuclear material available for weapons and a qualitative cap on nuclear weapon development. ASNO has established itself internationally as a leader in the development of proposals for verification under an FMCT regime and during the year contributed to a number of workshops on this subject.

Building on work in 2000-01, during the year ASNO participated in the Legal and Technical Expert's meeting to draft an amendment to strengthen the Convention on the Physical Protection of Nuclear Material (CPPNM). Since the events of September 2001, there has been much greater support for these changes, but as yet the Parties have been unable to agree on a revised text. This work will continue in 2002-03.

Figure 4—Mr Andrew Leask meeting Indonesian President Megawati Sukarnoputri at a regional workshop on the physical protection and the prevention of illicit trafficking of nuclear materials in Jakarta, May 2002.

Bilateral safeguards

During 2001-02 Australia exported 7,366 tonnes of uranium ore concentrates, earning over $360 million. Australia was the world's second largest uranium producer. This quantity of uranium was sufficient to fuel over 30 power reactors—thereby enabling the countries concerned to avoid carbon dioxide emissions equivalent to around 75% of Australia's net total carbon dioxide emissions from all sources (based on emission data for 2000). These exports represented an increase of about 7% in the total quantity of Australian Obligated Nuclear Material (AONM) covered by Australia's network of safeguards agreements.

ASNO is responsible for ensuring that all AONM is accounted for in accordance with Australia's safeguards agreements, and that it is used for exclusively peaceful purposes. In this work, ASNO supports DFAT in the negotiation and review of safeguards agreements and is responsible for the implementation of the agreements.

Following scrutiny by the Joint Standing Committee on Treaties (JSCOT), bilateral safeguards agreements with the Czech Republic, Hungary, and with the United States covering uranium supply to Taiwan came into force this year. The Agreement signed with Argentina will come into force when domestic legal steps have been completed in Buenos Aires.

As in previous years, ASNO established that all AONM under Australia's bilateral agreements was satisfactorily accounted for—in the case of the US this was based on preliminary information, see page 33.

Domestic safeguards

ASNO's largest inspection effort was at ANSTO's Lucas Height site—to be expected since this is Australia's only nuclear facility. All IAEA requirements were met, including a major update of ANSTO's nuclear material inventory. ANSTO, with assistance from ASNO, has commenced implementation of a new computerised nuclear material accountancy system.

ASNO continued to work closely with Silex Systems Limited with respect to that company's laser enrichment R&D project—to ensure effective protection of 'associated technology', and to facilitate transfer of information and equipment between Silex and its US partner USEC.

With guidance from ASNO, ANSTO reviewed and upgraded security arrangements at Lucas Heights. ASNO assesses that these arrangements are at least as good as at comparable sites overseas. ASNO also reviewed security arrangements for the construction stage of the replacement research reactor project, and approved these, contributing to the ARPANSA licensing process. ASNO continues to work closely with ANSTO in the development of safeguards and security aspects of the reactor design.

ASNO inspected the Beverley mine and the planned Honeymoon mine, and a number of other holders of permits under the Safeguards Act. ASNO concluded that all of these permittees were satisfactorily meeting their permit requirements.

Chemical Weapons Convention (including Biological Weapons Convention issues)

The OPCW (Organisation for the Prohibition of Chemical Weapons) has experienced considerable management and budgetary difficulties during the year. As a consequence, it conducted only one inspection in Australia during 2001-02. However, ASNO has maintained an excellent professional relationship with the OPCW and worked well with it, and other State Parties, to resolve outstanding implementation issues through the Industry

Verification Cluster series of meetings.

A key element of ASNO's work is to support adherence to the CWC by regional countries. To this end, ASNO and DFAT co-sponsored with the OPCW a regional seminar held in Nadi, Fiji, in June 2001 and provided a keynote speaker, Dr Josy Meyer.

Through a program of on-site visits, ASNO has continued to work closely with industry, especially facilities producing unscheduled 'discrete organic chemicals' (DOCs). The only OPCW inspection in Australia this year was at a DOC facility in Western Australia. ASNO has used this outreach to raise awareness of the CWC and concomitant legislative obligations, and to prepare these sites for routine compliance inspections by the OPCW. ASNO also visited a number of traders in CWC Scheduled chemicals to explain import and export licensing arrangements.

During the year, ASNO provided support to DFAT in negotiations for a protocol to strengthen the BWC, and participated in the BWC National Consultative Group (NCG) and inter-departmental committees coordinated by DFAT.

Comprehensive Nuclear-Test-Ban Treaty

At 30 June 2002, 165 countries have signed the CTBT, and 93 of these have ratified it. This indicates strong international support for the CTBT. Meeting the requirement that 44 named states must ratify the Treaty for it to enter into force is still some time off, however, with only 31 of those 44 ratifications in place. Although entry-into-force is not yet imminent, the CTBT requires that its verification system—the International Monitoring System (IMS)—is to be capable of meeting the requirements of the Treaty upon entry-into-force. ASNO has made a leading contribution to this preparatory work on behalf of Australia, co-ordinating work to develop the 21 IMS facilities Australia will host, as well as to the work of the political organs of the CTBT Organization's (CTBTO) Preparatory Commission.

As the provisional CTBT National Authority, ASNO has developed an effective working relationship with the CTBTO's Provisional Technical Secretariat (PTS) in Vienna, and with national stakeholders—including the institutions constructing and operating IMS stations, as well as government agencies in the States and the Northern Territory where work on stations is underway. During the year three further Australian monitoring stations were certified by the PTS as part of the IMS, including a radionuclide station at Townsville in Queensland, an infrasound station at Warramunga in the Northern Territory, and the hydroacoustic station at Cape Leeuwin in Western Australia. At the time of writing, Australia—with a total of six certified IMS stations—has the greatest number of any country.

ASNO contributes also to the CTBTO Preparatory Commission's Working Group B, which is developing the technical framework for the full range of CTBT verification. The future development and provisional operation of the IMS has been a topical issue during 2001-2002. ASNO has made a key contribution to the development of verification procedures for the CTBT's On-Site Inspection mechanism.

A vital element of the IMS is the international data centre (IDC) in Vienna. To support the IDC and its analytical work, a Global Communications Infrastructure (GCI) links IMS stations to the IDC. In 2001, the PTS commissioned an Optus facility in Sydney as part of the GCI, feeding information to Vienna from sensors in Australia and the Pacific region.

The hydroacoustic system at Cape Leeuwin in Western Australia became operational late

last year and was formally opened by Mr Downer in April 2002.

ASNO management

ASNO is a centre of technical excellence with professional skills and expertise hard to find and maintain in Australia. Over the last two years ASNO has experienced a substantial turnover of staff, due primarily to retirements but, nonetheless, has been able to recruit people holding excellent professional qualifications who, with further specialised training, will sustain the strong qualities of the Office.

Despite the disadvantages of a small skills base, and its distance from major international centres of political and industrial activity in relevant fields, ASNO has built a high reputation amongst counterparts worldwide, and is a major contributor to Australia's position as an effective and constructive participant in the non-proliferation regimes.

Figure 5—Mr John Carlson, DG ASNO (right), received a Distinguished Service Award from the Institute of Nuclear Materials Management (INMM) for his contribution to non-proliferation and safeguards—presented in Orlando, Florida, USA on 25 June 2002 by Mr JD Williams, INMM President.

OUTLOOK: THE YEAR AHEAD

While the events of September 2001 have focused particular attention on counter-proliferation and counter-terrorism—and it is generally considered that the prospects for further multilateral non-proliferation regimes are not encouraging at least in the near term—nonetheless, non-proliferation—especially the NPT and the IAEA's safeguards system—continues to be of fundamental importance.

In order to achieve universal acceptance of strengthened safeguards within a reasonable time frame, more effort is required to encourage the conclusion of Additional Protocols. ASNO's contribution to this effort will include outreach activities to assist countries in Australia's region to sign and ratify the Additional Protocol. ASNO will continue to work closely with the IAEA, and with our counterpart organisations in other countries, in the further development of strengthened and integrated safeguards, particularly through the Australian Safeguards Support Program and substantial involvement in SAGSI. ASNO will follow closely worldwide developments in nuclear fuel cycle technology, specifically with regard to non-proliferation and safeguards implications.

With AusAID funding, ASNO has offered further safeguards training to the DPRK which is expected to occur this year. This training will support the IAEA's work in the DPRK as that country moves towards full compliance with its safeguards agreement in accordance with the Agreed Framework (see also page 53). ASNO will also commence planning for another regional safeguards training course, provisionally scheduled to be held in late 2003 or early 2004.

Although the start of FMCT negotiations is still stalled, a number of countries are considering a series of workshops and other activities in an effort to progress development of technical verification aspects. It is hoped this will raise awareness of these issues among the members of the Conference on Disarmament, and demonstrate that a substantial degree of agreement is possible on major elements of the FMCT regime. ASNO will continue to be actively engaged in this work.

During 2001-02 progress was made in the drafting of a text for the strengthening of the Convention on the Physical Protection of Nuclear Material (CPPNM), and key parties remain optimistic that agreement to revise and strengthen this Convention will be achieved in the coming year. ASNO has represented Australia in this endeavour and been an active participant.

ASNO will continue to work closely with ANSTO on physical protection aspects of the replacement research reactor project and with ARPANSA in its licensing processes.

ASNO will continue its contribution to the strengthening of the CWC verification regime, inter alia, by helping to resolve outstanding technical implementation issues, particularly those affecting industry. ASNO has followed closely recent changes in the OPCW's inspection approach—which will probably place greater emphasis on Discrete Organic Compound (DOC) facilities. These changes are unlikely to have any significant impact on implementation of the CWC in Australia, nor give rise to an increase in inspections beyond the levels seen in the late 1990s.

Although early entry-into-force of the CTBT remains unlikely, Australia is firmly committed to the Treaty, and reinforcement of the norm against the testing of nuclear weapons remains a very high priority for Australia. ASNO will be supporting the efforts of DFAT in encouraging signature and ratification of the CTBT—especially by regional countries—and will work to ensure that Australia's CTBT commitments are met, primarily

by coordinating the establishment and operation of Australian stations in the Treaty's International Monitoring System. ASNO will continue its contribution the CTBTO Preparatory Commission where securing the future of preparatory work on the verification system will be a priority. Finally, ASNO will continue its significant contribution to development of procedures for the conduct of On-Site Inspections under the Treaty.

The Review Conference on the BWC will re-convene in November 2002, but the prospects for substantive and early negotiations to strengthen this Convention are not encouraging. That said, agreement could be achieved on domestic arrangements for the control of biological materials that would substantially improve protection against misuse of biological materials by states and non-state entities.

With regard to CBNR (chemical, biological, nuclear and radiological) counter-terrorism, ASNO will continue its work to strengthen domestic controls, in collaboration with other responsible agencies.

RESOURCES OVERVIEW: CORPORATE MANAGEMENT

ASNO is required, as part of a Commonwealth Department and in accordance with sub-section 50(1) of the *Audit Act 1901*, to submit to the Auditor-General an annual Financial Statement. Details relating to that Financial Statement are contained in the Department of Foreign Affairs and Trade (DFAT) Annual Report for 2001-02, with DFAT managing salaries centrally.

ASNO kept its administrative and accounting procedures under review during the reporting period. Revised and new instructions or guidelines issued by DFAT, the Department of Finance and Administration and other regulatory bodies were implemented where applicable.

Further details of ASNO activities relating to financial management and performance, occupational health and safety, industrial democracy and advertising are included in the DFAT Annual Report for 2001-02.

STAFFING

ASNO is staffed through DFAT on the basis that it is a division within the Department. The Director General, ASNO holds the statutory office of Director of Safeguards, established under the Safeguards Act while, with one part-time exception, all other staff were employed under the *Public Service Act 1999* on a full-time basis.

Table 1—Details of ASNO Budget and Expenditure 2001-02

	2000-01 Actual	*2001-02 Actual*
Salaries	$1,015,061	$1,188,782
Administrative Costs	$1,017,634	$954,636
Total	$2,032,695	$2,143,418

For this reporting period, ASNO had departmental responsibility for managing special funding to support Australia's nuclear test monitoring activities. This amounted to $537,207 and was paid to Geoscience Australia for the provision of services to maintain and operate certain seismic stations in Australia and a related analysis capability. This amount is included in the Administrative Costs shown above.

A summary of ASNO staffing as of 30 June 2002 is given in Table 2. Although fully staffed, ASNO had a staff turnover of three (23%) of its specialist staff, and is rebuilding its expertise following the separation of senior staff foreshadowed in earlier reports.

Dr Annette Berriman was recruited to the Safeguards Adviser position to replace Dr Victor Bragin who has taken a position with the IAEA in Vienna. Mr John Howell was appointed Head of the Chemical Weapons Convention Implementation Section and brings a wealth of experience to this busy position. Mr Howell replaced Dr Geoffrey Shaw who was appointed Counsellor with Australia's Mission to the United Nations in Geneva.

In view of the highly specialised nature of ASNO's work, it remains an ongoing challenge to recruit and retain suitably skilled staff. This is particularly the case for nuclear

safeguards. Given the limited extent of nuclear activities in Australia, and the international orientation of safeguards, practical experience in international safeguards primarily has to be obtained overseas. Staff who retire or resign cannot be easily replaced.

In 2001-02 ASNO's level of professional staff engaged on nuclear issues was about 6¾ person-years, a slight increase on last year's effort. This rise was the result of staff employment continuity and is the minimum required to ensure effective maintenance of ASNO's nuclear work. Given the steady increase in regulatory work, this level of effort will be kept under review.

Table 2—Categories of Staff at 30 June 2002—approved and actual

	Male	*Female*	*Total*
	[Actual]	*[Actual]*	*[Approved in brackets]*
SES B2	1		1 (1)
SES B1	1		1 (1)
Executive level 2	4	1	5 (5)
Executive level 1	2		2 (2)
APS level 6	2		2 (3.8)
APS level 5	1	1.6	2.6 (1)
APS level 4	0	1	1 (1)
Total	11	3.6	14.6 (14.8)

Training

At the beginning of the year (foreshadowed in the last Annual Report), ASNO set training objectives to nurture and maintain its expertise through, primarily, in-house activities. A key focus of this work was improved multi-skilling throughout the whole office. Due to pressure of work and the need to concentrate its efforts on integrating new staff, ASNO has not achieved these broader training objectives as fully as had been hoped. Nonetheless, this remains a priority for the coming year.

ORGANISATION OF ASNO AT 30 JUNE 2002

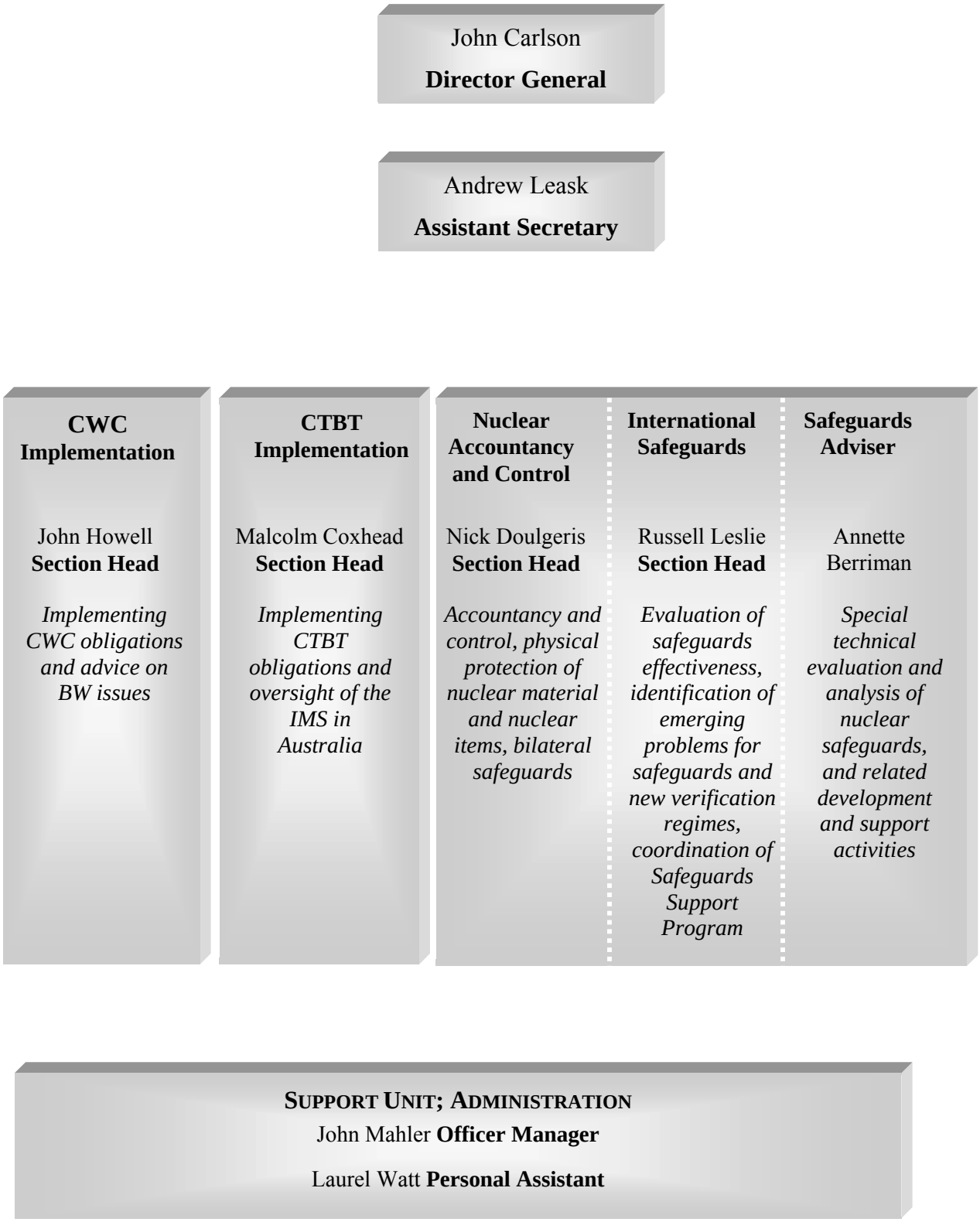

Figure 6—ASNO Organisational Chart

PERFORMANCE INDICATORS FOR ASNO

ASNO has tracked its performance against specific indicators relating to key aims and organisational tasks. This information is presented below from two differing perspectives. The first relates to the number of events of each type in which ASNO was involved; the second to the number of person-days of effort expended in each type of activity.

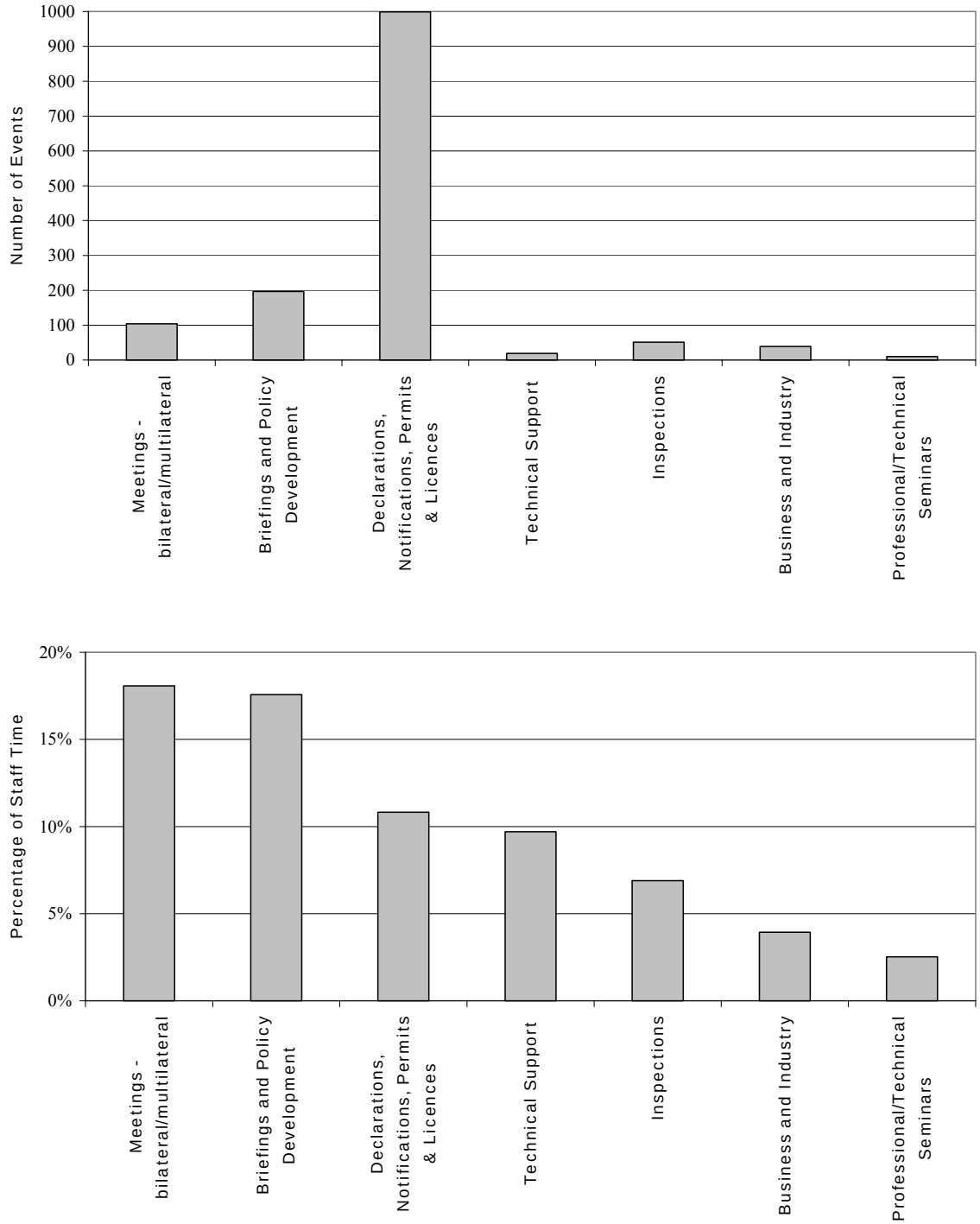

Figure 7—ASNO's performance against specific aims and organisational groupings. Note that figures for percentage of staff time include all preparation, planning, attendance and follow-up action where relevant.

URANIUM PRODUCERS CHARGE

As a number of ASNO's activities are of benefit to Australia's uranium exporters, the Government recoups about 40% of ASNO's annual costs for safeguards activities through the Uranium Producers Charge.

The current arrangements were introduced through the *Nuclear Safeguards (Producers of Uranium Ore Concentrates) Act 1993*. The Act provides for each producer to pay an annual charge, prescribed by regulation, up to a maximum of $500,000.

Following a review as part of the Government's overhaul of business regulation in June 1997, the charge on uranium producers was retained. However, this charge changed to a 'safeguards fee' per kilogram of production. This was seen as a fairer mechanism than the previous flat fee. The new fee includes a component for future costs, that is, the ongoing costs in respect of AONM which could remain in the fuel cycle for a considerable period after a mine had ceased production.

In October 2001 the fee was set at 5.7433 cents per kilogram of contained uranium produced during 2000–2001, which yielded $468,906 for Consolidated Revenue.

PROGRAM ACTIVITIES

ASNO's activities in 2001-02 are described and evaluated in the following sections.

Activities are described in relation to particular tasks, and grouped according to the output to which they relate (for summary of outcomes and outputs see page 3).

OUTPUT A—OPERATION OF NATIONAL SAFEGUARDS SYSTEM

Operation of Australia's national system of accounting for, and control of, nuclear material and items subject to IAEA safeguards, including promotion and regulation, within Australia, of effective measures for the physical protection of nuclear facilities and material.

MILESTONE A1

A1.1 The provisions of the *Nuclear Non-Proliferation (Safeguards) Act 1987* administered effectively.

A1.2 The continued appropriateness of the Act's provisions reviewed and evaluated.

A1.3 Under the Permit System pursuant to the Act, nuclear items in Australia—including those subject to bilateral safeguards agreements—controlled and accounted for effectively.

A1.4 Locations holding nuclear material and associated items inspected to check compliance with permit conditions.

Activities

Permits and authorities

During the year three new permits or authorities under the Safeguards Act were issued, 14 were varied, two expired and none were revoked.

Table 3—Status of Safeguards Permits and Authorities in Australia

Permit or Authority to:	Granted	Varied	Expired	Number at End of Period
Possess nuclear material	3	8	1	36
Possess associated items	0	4	0	22
Transport nuclear material	0	2	1	22
Transport associated items	0	0	0	0
Communicate information contained in associated technology	0	0	0	18
Total	3	14	2	98

Replacement Research Reactor

The Australian Nuclear Science and Technology Organisation (ANSTO) is progressing with its project to replace its aging reactor, HIFAR. ASNO was involved in the approval process for the construction stage of the project. As the construction stage does not

involve nuclear material, ASNO's involvement related primarily to security issues, as well as ensuring provision of information required by the IAEA for safeguards purposes. ASNO is also involved in work with the design team regarding safeguards and security arrangements for the operational stage of the project.

Laser enrichment R&D

Silex Systems Limited, an Australian company, is developing an innovative method of separating uranium isotopes using laser techniques. In 1996 the company entered into an agreement with the United States Enrichment Corporation (USEC) to explore the commercial potential of this technology. Experimental work is proceeding to establish if the process is in fact practicable for the separation of uranium isotopes and, if so, whether it could be commercially viable. Tests to produce small (gram quantity) samples marginally enriched or depleted were planned for the second half of 2002. However, equipment problems delayed these tests to early 2003. If successful, the technology may be commercialised in the United States—this aspect is discussed further under Milestone B2 (see page 32).

Silex Systems Ltd holds a permit to possess 'associated technology'. ASNO monitors the progress of this research closely. The objective is to ensure that nuclear technology remains in exclusively peaceful use and does not contribute to any proliferation activity. As SILEX technology constitutes associated technology, access to the technology is restricted to authorised persons. Under its permit, Silex Systems Ltd has been required to put in place appropriate security measures to protect the technology against unauthorised access. ASNO is also ensuring that all IAEA requirements are met with respect to the reporting category of nuclear-related R&D.

Data reported pursuant to the Safeguards Act

As required by sub-section 51(2) of the Safeguards Act, details of nuclear material and associated items of Australian origin, and nuclear material and associated items within Australia, regardless of origin, are set out in Annexes to this Report as follows:

Annex A: Nuclear Material within Australia at 30 June 2002.

Annex B: Associated Items within Australia at 30 June 2002.

Annex C: Australian Obligated Nuclear Material Overseas:

(i) Locations and Quantities of AONM at 31 December 2001.

(ii) Transfers of AONM during 2001.

(iii) Transfers of associated items during 2001.

ASNO also provides the Australian National Audit Office with an annual statement listing nuclear items held by ANSTO.

Compliance with permit requirements

In 2001-02 ASNO carried out 28 domestic inspections, involving seven permit holders, to review that statutory and permit requirements were being met.

ASNO's largest inspection effort was at ANSTO's Lucas Heights site—to be expected since this is Australia's only nuclear facility. Since the inspection activity at Lucas Heights is closely linked to the meeting of IAEA requirements, more details are given under Milestone A2 below, on the implementation of IAEA safeguards.

During inspections this year ASNO has overseen three major changes to arrangements at ANSTO's Lucas Heights site:

- There has been a major upgrade to security on the site;
- Large quantities of stored nuclear material have been thoroughly inventoried and brought under (in many cases returned to) IAEA safeguards;
- ANSTO has commenced implementation of a new computerised nuclear material accountancy system.

ANSTO is still working to fully implement the accountancy procedures introduced in 2000-01, making steady progress through the year. Through inspections and cooperative effort (including the provision of training), ASNO continues its work with ANSTO to further improve the nuclear accountancy system at Lucas Heights.

ASNO continued to work closely with Silex Systems Limited to ensure the accountancy and control system for the Silex laboratory effectively protects both nuclear material and, more significantly, technology. During 2001-02 the classification and control systems for associated technology at the laboratory were brought into full operation and Silex appointed a Regulatory Manager to ensure safeguards and other regulatory requirements such as safety are met.

ASNO inspected the Beverley mine and the planned Honeymoon mine, following on inspections of the Ranger and Olympic Dam mines in June 2001. During ASNO's inspections of these projects, the operators were very cooperative. They met all ASNO requirements, and demonstrated a willingness to act upon ASNO advice.

Inspections of small holders of nuclear material and associated technology during the year resulted in improvements to their accountancy and control systems. All were very cooperative. The small holders of nuclear material were also prepared for the possibility of IAEA visits to their sites under the strengthened safeguards system.

Performance Assessment

ASNO found no indication of unauthorised access to or use of nuclear materials or nuclear items in Australia. Inspections of Silex Systems Limited, the uranium mines and small holders of nuclear material and associated items have confirmed they are satisfactorily complying with permit conditions. ASNO assistance continues to make an important contribution to ANSTO's upgrading of the safeguards system at Lucas Heights. Administration of the Permit System was carried out in a timely manner, with all Permit changes published in the Commonwealth Gazette as required by the Safeguards Act.

MILESTONE A2

IAEA safeguards implemented satisfactorily in Australia.

Activities

Australia's State System of Accounting for and Control of Nuclear Material (SSAC) is operated by ASNO in accordance with Australia's safeguards agreement with the IAEA. ASNO reports to the IAEA on the disposition of nuclear material in Australia and facilitates inspections carried out by the IAEA at Australian facilities.

Reports on the disposition of nuclear material

As part of ASNO's inspection effort, each month an ASNO officer audits the inventory record of nuclear material at the ANSTO site at Lucas Heights (near Sydney), which is the principal location of safeguardable nuclear material in Australia. Inventory changes at Lucas Heights—on a monthly basis—as well as any changes elsewhere in Australia, are reported by ASNO to the IAEA. Accounting reports are also given to the IAEA by ASNO following Agency inspections described below.

Details of Australian Accounting Reports to the IAEA during the year are at Annex D.

IAEA inspections in Australia

The IAEA carries out routine inspections of Australian nuclear facilities. The aim of these inspections is to verify that nuclear material inventories are as declared by the operator and the SSAC. Each inspection deals with what is described as a 'Material Balance Area' (MBA), of which Australia currently has five (see Table 4). It is expected that additional MBAs will be added in the future both to account for new facilities and to enable more efficient IAEA inspection of existing facilities.

IAEA inspectors carried out one scheduled inspection at Lucas Heights during 2001-02, one short notice inspection at Lucas Heights that also involved complementary access and three other complementary accesses (see Annex D for details).

Table 4—Material Balance Areas in Australia

Location	*MBA*	*Facility*
ANSTO	AS-A	HIFAR reactor
ANSTO	AS-B	Moata reactor[1]
ANSTO	AS-C	Research and Development Laboratories
ANSTO	AS-D	Vault Storage
Elsewhere	AS-E	Other locations in Australia

As Australia's national safeguards authority, ASNO acts as the intermediary between the IAEA and the facility operator on all safeguards matters. An ASNO officer accompanies IAEA inspectors during inspections in Australia. This officer ensures the inspectors are able to carry out their duties so that Australia meets its obligations, and if necessary mediates on any issues arising between the IAEA and the facility operator. In particular, ASNO assists in the resolution of any inconsistencies discovered during inspections, thus simplifying the IAEA inspectors' task.

A major focus of IAEA inspection activity is the identification and evaluation of 'material unaccounted for' (MUF), that is, the difference between the records maintained by the operator (the 'ending book inventory') and the physical inventory verified by the IAEA. Since MUF is the difference between two measured quantities, it may be equal to zero, or it may be either a positive or negative value. If MUF is positive it does not necessarily indicate that material has been lost, nor does a negative figure mean that material has somehow been created. In many cases MUF can be attributed to unavoidable

1. In February 1995 the ANSTO Board decided to cease operation of Moata, and the reactor was defuelled in May 1995.

measurement differences, but where the size of the MUF is outside the range expected from measurement difference further investigation is required.

In 2001-02 there was MUF in four material categories in MBA AS-C (R&D Laboratories). For enriched uranium, the Physical Inventory was less than the Book Inventory by 9,799.89 grams of uranium element and 310.33 grams of U-235 isotope—this was mostly due to a large quantity (over 500 kilograms) of retained waste being transferred back onto the safeguards inventory at the IAEA's request. The material had been sent to waste progressively over the entire period safeguards have been in force in Australia (since 1974), and removed from the safeguards inventory. However, the IAEA has now determined that the material concerned should be brought on to the safeguards inventory until it is conditioned for final disposal. When this was done, the aggregated total was found to differ from currently available data. The material is active waste from radioisotope production stored in sealed tanks and so is difficult to measure accurately. Most of the difference is due to one batch of waste that is thought to have been disposed of in an active waste pit. However, it was not possible to confirm this from the old records and so the material has been listed as MUF.

There were also large quantities of natural uranium, depleted uranium and thorium added to the IAEA inventory. Again, this material had been transferred to waste or exempted from safeguards over a long period and because it was not possible to precisely match old records with the material present, this resulted in MUF. For natural uranium, the Physical Inventory was greater than the Book Inventory by 14.96 kilograms; for depleted uranium, the Physical Inventory was less than the Book Inventory by 4.41 kilograms; while for thorium, the Physical Inventory was less than the Book Inventory by 61.26 kilograms. These MUFs in AS-C mostly arose from a one-off exercise to transfer all nuclear material holdings on site onto the IAEA inventory (except in a few specific cases where the IAEA has granted exemptions).

ASNO is satisfied with ANSTO's explanations for these MUFs. The IAEA has confirmed that its requirements are satisfied in respect of the nuclear material balance for the reporting period.

The IAEA reports all conclusions drawn from its routine safeguards inspections in Australia, including comments on any MUF, in the statements provided pursuant to Article 91(b) of Australia's NPT safeguards agreement. The conclusions from complementary accesses are provided in statements made pursuant to Article 10.c. of the Additional Protocol to Australia's safeguards agreement (see Annex E for details of 91(b) and 10.c. statements).

Declaration of Safeguards Inspectors

Under section 57 of the Safeguards Act, the Minister may declare a person to be an inspector for the purposes of the Act. In practice, only ASNO officers have been so declared. The role of an inspector is to ensure compliance with provisions of the Safeguards Act and to assist IAEA inspectors in the conduct of Agency inspections in Australia. One new national inspector was declared in 2001-02.

The Minister may declare a person designated by the IAEA as an 'Agency Inspector' for the purpose of the Safeguards Act. In practice, all IAEA staff designated to Australia are declared under the Safeguards Act—there were 12 new designations during 2001-02 and a further 17 that had been nominated by the IAEA but were still awaiting designation under the Act. At 30 June 2002 there were 325 IAEA staff declared as Agency Inspectors

pursuant to the Act. Some of those declared (about 33) have now left the Agency and so their designations will be revoked.

Since 1990, the Director of Safeguards has had the right to appoint inspectors and has held powers of declaration under delegation from the Minister.

Performance Assessment

All routine IAEA inspections were concluded satisfactorily.

IAEA statements during 2001-02 confirm that all of Australia's IAEA safeguards obligations were discharged satisfactorily, and that relevant records had been maintained in accordance with prescribed practice. ASNO's reporting has satisfied IAEA requirements in full.

The IAEA has never found cause to comment adversely on Australia's accounting for and control of nuclear material—a fact reflected in Article 91(b) and Article 10.c. statements over the years.

MILESTONE A3

A3.1 Appropriate physical protection measures for nuclear material and associated items in Australia prescribed and reviewed.

A3.2 Sites holding nuclear material and associated items inspected to check that prescribed physical protection measures have been implemented effectively.

Activities

Physical Protection within Australia

ASNO is responsible for prescribing the levels of physical protection—in lay terms, security—to be applied to nuclear items subject to the Safeguards Act. During the year, ASNO carried out inspections of the physical protection measures applied by ANSTO at its Lucas Heights site. ASNO also carried out inspections of the physical protection measures applied at, and in connection with, uranium mining operations. In addition, regular inspections were made of the arrangements put in place for the protection of sensitive information such as that relating to the SILEX laser enrichment R&D project.

ASNO liaised with ANSTO in regard to security requirements for the construction phase of the research reactor project. ASNO then assessed ANSTO's proposed construction security plan, which was found to be acceptable subject to a few conditions being met. One of these conditions related to additional security measures which had to be installed before bulk excavation could commence. ASNO inspected the site to confirm these measures were in place prior to the start of the bulk excavation phase.

During the reconciliation visit program in May-June 2002 Mr Doulgeris and Dr Bayer, from ASNO's NAC Section, and ANSTO's Agency Security Advisor held additional discussions and site visits to examine physical protection arrangements in the US, Canada and UK. This was done to provide a current measure against which ANSTO's performance in this area could be assessed. At this time, ASNO considers that the physical protection arrangements at Lucas Heights are at least as good as at comparable sites overseas.

Performance Assessment

Physical protection requirements prescribed by ASNO are consistent with the most up-to-date international standards.

Through inspections, ASNO determined that all physical protection arrangements at ANSTO, the Australian uranium mines and associated operations, and Silex Systems Ltd were satisfactory and effective.

OUTPUT B—BILATERAL SAFEGUARDS

Development and implementation of bilateral safeguards measures that ensure nuclear material and items exported from Australia remain in exclusively peaceful use.

MILESTONE B1

Internationally agreed standards for physical protection of nuclear material are applied to all AONM.

Activities

ASNO continued past practice, requiring exporters to adopt and report on specific procedures to ensure appropriate levels of physical protection for shipments of uranium ore concentrates (UOC) from Australia to the port of unloading overseas. These procedures included checking on the physical condition of the containers and verifying the container and seal numbers at each port of unloading or transhipment.

At the time of export ASNO contacts its counterparts in countries through which the material will transit alerting them to the need to protect appropriately AONM within its jurisdiction.

The Administrative Security Arrangements (ASA) pursuant to the Australia/United States Silex Agreement specifies the procedures to be applied when classified SILEX technology is transferred and the level of protection to be applied in the receiving country. A joint classification guide, finalised in May 2001, to ensure that SILEX technology is protected to an equivalent standard in both Australia and the USA, was updated in May 2002.

Performance Assessment

Reporting by conversion facilities, safeguards authorities and shipping agencies confirms that all AONM shipments from Australia safely reached their destinations. The specified physical protection measures effectively contributed to this good outcome.

MILESTONE B2

AONM in countries with which Australia has concluded nuclear safeguards agreements is accounted for in accordance with procedures and standards prescribed under relevant agreements.

Activities

Exports of Uranium Ore Concentrates (UOC)

Between 1 July 2001 and 30 June 2002 there were 60 shipments of UOC from Australia. These were from the Ranger mine, Northern Territory, and the Olympic Dam and Beverley mines, South Australia. Exports totalled 7,366 tonnes of U_3O_8, or U_3O_8 equivalent, as UOC; export earnings were over $360 million. Further information on Australia's uranium exports may be found on page 74.

Exporters shipped UOC to conversion facilities in the UK, the US, France and Canada. ASNO notified each export to the safeguards authorities in relevant countries. In every case, those safeguards authorities confirmed to ASNO receipt of each shipment. ASNO also notified the IAEA of each export: to non-nuclear-weapon States pursuant to Article 35(a) of Australia's NPT safeguards agreement with the IAEA; and to nuclear-weapon States under the IAEA's Voluntary Reporting Scheme. Receiving countries similarly reported receipts to the IAEA.

The shipper's weight for each consignment was entered on ASNO's record of the relevant country's inventory of AONM. These weights, subject to amendment by measured Shipper/Receiver Differences, are the basic source data for ASNO's system of accounting for AONM throughout the international nuclear fuel cycle.

Operation of bilateral agreements

Reports from ASNO's counterpart organisations were provided in a timely fashion and in the agreed format (excepting the US, explained further as follows), which enabled analysis and reconciliation with ASNO's records. In the case of the US accounts, to date the US Department of Energy (DOE) has been able to provide only preliminary figures. In part the delay in finalising these accounts is an indirect consequence of the terrorist attacks in September 2001. Responding to those attacks drew resources away from other areas, including bilateral nuclear accountancy, and the resulting backlog of work has not yet been cleared. ASNO is working closely with DOE on this matter, and does not expect any significant difficulty in completing the reconciliation process.

Mexico provided an annual report for the first time, following receipt of AONM in March 2001.

Messrs Carlson and Leask visited the Euratom Safeguards Office (ESO) in November 2001 and February 2002 respectively. These visits have proven invaluable to ASNO's appreciation of ESO's practices and procedures for accounting for nuclear material in the European Community and in developing a closer cooperative relationship.

During this reporting period, ASNO participated in nuclear policy consultations, pursuant to the respective Agreements, with Japan, Canada and the US.

During May and June 2002 Mr Doulgeris and Dr Bayer held technical discussions with ASNO's counterpart organisations in the US, Canada, Sweden, Finland, France, the UK and Euratom. These discussions covered the reconciliation of accounting figures under the respective Agreements and a range of technical issues germane to their operation. The annual discussions with Japan were deferred until July 2002 for logistical reasons.

In addition to the consultations referred to above, during the year Mr Carlson had discussions with senior officials in the US and Japan—and also took the opportunity to discuss bilateral matters with a number of counterparts on the margins of SAGSI meetings.

Laser enrichment technology

The arrangements established by ASNO with the US covering the transfer of SILEX laser enrichment technology govern both the way in which the technology is to be protected and exactly what the technology can be used for. ASNO and NRC met in May 2002 and compared records of classified transfers. All transfers, of both documentation and equipment, during the year proceeded smoothly. If SILEX technology is adopted by the US company USEC, uranium enriched by this technology will become subject to the same reporting requirements as uranium exported to the US from Australia.

Performance Assessment

On the basis of reporting, other information and analysis, ASNO concludes that, apart from AONM in the US for which reconciliation is ongoing, all AONM has been accounted for satisfactorily.

ASNO's counterparts have confirmed receipt of all relevant exports in accordance with the requirements of the bilateral safeguards agreements, either formally or informally pending completion of formal processes. In addition, the IAEA provides ASNO with regular acknowledgments of ASNO's notifications of international transfers of nuclear material to and from Australia. The IAEA has confirmed that, as at 25 July 2002 there were no outstanding unconfirmed shipments to Australia (i.e. imports). Similarly, receipt of all of Australia's exports up to 18 March 2002 has been confirmed through the IAEA's transit matching system.

As at 30 June 2002 ASNO had satisfactorily accounted for AONM located overseas through, *inter alia*, the annual reports (made pursuant to bilateral agreements) and other information provided by relevant bilateral treaty partners, namely Canada, Euratom, Finland, France, Japan, Mexico, New Zealand, ROK, Sweden, Switzerland, the UK and the US (in the latter case a combination of the preliminary data provided by the US and ASNO's own records was used). Australia's other bilateral partners—Egypt, the Philippines and the Russian Federation—did not hold any AONM in 2001.

Given that AONM located overseas has been accounted for satisfactorily (or in the case of the US is expected to be once reports are finalised), is under IAEA safeguards, and drawing on the IAEA's Safeguards Statement for 2001 (see page 73), ASNO concludes that no AONM has been used for non-peaceful purposes.

OUTPUT C—INTERNATIONAL SAFEGUARDS

Contribution to the development and effective implementation of international safeguards and non-proliferation regimes, including participation in international expert groups and conferences, and provision to the IAEA of consultancies, assessments, support in R&D and training; and evaluation of the effectiveness of IAEA safeguards and related regimes.

MILESTONE C1

C1.1 A pro-active and useful contribution made to the development and effective implementation of IAEA safeguards, with national and international safeguards methods evaluated in an expert and thorough manner.

C1.2 Assessment of developments in nuclear technology.

C1.3 Contribution to IAEA technical training courses concerning nuclear material accountancy and control and other safeguards-related topics.

Activities

ASNO took an active part in the development of safeguards, through the following elements of work:

- participation in SAGSI (the Standing Advisory Group on Safeguards Implementation) and other international expert bodies (see below);
- the Australian Safeguards Support Program (ASSP), comprising R&D and consultancy work in support of IAEA safeguards (see Milestone C3 on page 38);
- participation in relevant DFAT policy development activities, and support for Australia's Mission to the IAEA in Vienna and to Australian Missions in other capitals; and
- promotion of safeguards and non-proliferation concepts through experts meetings, publications and conferences, and discussions with counterparts in other countries.

SAGSI

SAGSI is a group of international experts, appointed by the IAEA Director General, to advise him on the effectiveness and cost-efficiency of implementing IAEA safeguards, and other international safeguards matters. Mr Carlson has been a member of SAGSI since 1998 and was appointed Chairman in July 2001.

SAGSI has provided much of the energy and vision for the current program to strengthen IAEA safeguards and continues to review developments. A key topic for SAGSI is the development of integrated safeguards, that is, the optimal combination of 'classical' safeguards and strengthened safeguards measures. This is a matter of the highest priority for the IAEA. SAGSI is examining specific subjects related to integrated safeguards, including development of safeguards concepts and approaches, safeguards parameters, evaluation methodologies, and quality management systems.

With the advent of strengthened and integrated safeguards, SAGSI has been active in the reconsideration of a range of issues affecting safeguards performance and effectiveness. Topics examined by SAGSI included:

- safeguards implementation and performance issues, including reporting aspects, and information review and evaluation;
- the role of containment and surveillance measures, and the categorisation of nuclear material for safeguards purposes;
- further developments in safeguards, including wide area environmental sampling, safeguards approaches for spent fuel repositories, and the application of satellite imagery; and
- possible new verification roles for the IAEA, including with respect to nuclear materials released from weapons programs and the proposed FMCT (Fissile Material Cut-off Treaty).

Evaluation of safeguards

In evaluating the IAEA's safeguards performance, ASNO drew on a wide range of activities and sources, such as:

- the IAEA's 'Safeguards Implementation Report' (SIR) and other detailed information made available to Australia as a member of the IAEA Board of Governors;
- appreciation of practical issues derived from participation in SAGSI and the operation of Australia's Safeguards Support Program in support of IAEA safeguards; and
- exchanges of views and information with IAEA staff, ASNO's counterparts in other countries, and relevant Australian agencies.

ASNO's assessment of IAEA data for 2001 and related information is that the safeguards system has fulfilled effectively its task of verifying the non-diversion of significant quantities of nuclear material subject to IAEA safeguards (see IAEA Safeguards Statement for 2001, page 73).

Other work

At several international conferences—including the Annual Meeting of the INMM (Institute of Nuclear Materials Management) and the European Safeguards Research and Development Association (ESARDA) Symposium—ASNO took the opportunity to present and promote Australian ideas on safeguards and non-proliferation developments. ASNO has a well-established reputation for presenting innovative, constructive and thought-provoking papers.

ASNO has also been developing outreach activities to assist countries in the region prepare for the introduction of strengthened safeguards, and in December 2001 contributed to an IAEA Regional Safeguards Symposium aimed at promoting the conclusion of further Additional Protocols in the Latin American and Caribbean region.

Performance Assessment

Australia's participation in international work is making a significant, effective and highly regarded contribution to strengthening the IAEA safeguards system.

ASNO was involved closely with the IAEA through participation in SAGSI and other expert meetings. Under the Australian Safeguards Support Program ASNO provided cost free consultancy services to the IAEA for the further development of international safeguards (see Milestone C3 on page 38). The IAEA has expressed appreciation for and satisfaction with these services. This work has contributed to more effective international safeguards with improved use of new technologies and methods.

ASNO has been an influential advocate for strengthened and integrated safeguards through participation in international fora such as the INMM and ESARDA.

Developments in Nuclear Technology

Activities

For a number of reasons—including concern about climate change, uncertainty about long-term cost and security of supply for hydrocarbons, and the development of lower cost reactor designs—there are indications of increased interest in nuclear energy, including in Australia's region. Australia has a strong interest in ensuring that non-proliferation aspects are factored into developing technologies at an early stage—ASNO is working to this end.

Amongst other activities in this area during the year, ASNO maintained an active interest in the IAEA's INPRO (International Project on Innovative Reactors and Fuel Cycle) steering committee. ASNO is taking a particular interest in the South African 'pebble bed' reactor, which may be the first of the current innovative designs to be commercialised, and will be assisting the IAEA in a safeguards analysis of this reactor type.

Performance Assessment

Although Australia is not directly involved in substantial nuclear technology developments, ASNO has maintained a sound understanding of important developments and issues and is making a constructive contribution to ensuring non-proliferation and safeguards aspects are fully taken into account.

IAEA safeguards training courses

Activities

In August 2001 a safeguards training course was held that aimed at assisting the DPRK to develop its national safeguards system. Mr Downer offered this course in discussions with his DPRK counterpart in November 2000. The DPRK nominated six safeguards officials for the course. The course was developed in consultation with the IAEA, and funding was provided by AusAID. Participation was broadened to include China, Indonesia, New Zealand and the ROK, as well as Australian participants. The course was highly successful.

In addition ASNO was invited to assist in a regional safeguards training course held in Japan by the Japan Atomic Energy Research Institute in February-March 2002. Mr Nick Doulgeris presented two lectures to this course.

Performance Assessment

Through involvement in regional training activities on nuclear safeguards, ASNO has made an effective contribution to the IAEA's training programs designed to: improve the technical performance of safeguards authorities in the region; promote a fuller understanding of the IAEA Additional Protocol; and enable a better appreciation of the work of the IAEA. An important additional benefit has been strengthened relationships with counterparts in the region.

MILESTONE C2

Highly effective liaison maintained with the IAEA and with counterparts in other countries.

Activities

ASNO is pro-active in maintaining and strengthening contacts with the IAEA, other safeguards agencies and international safeguards practitioners. Relevant activities during the year include:

- With his counterparts in Indonesia, Japan and the ROK and Japan, Mr Carlson is exploring ways of strengthening regional cooperation on safeguards matters. One concept under consideration is an informal association of safeguards agencies to facilitate cooperation and promote a 'safeguards culture'.

- An outreach program to regional countries concerning the Additional Protocol—with Indonesia, to share experiences in implementation (Indonesia was one of the first countries to conclude an Additional Protocol, in 1999), and with Malaysia, Thailand, and the Philippines to assist with issues related to signature and ratification. The Department of Defence assisted with this effort by providing an expert on export control issues and AusAID provided funding for travel related to the program.
- Participation in Annual Meetings of the Institute of Nuclear Materials Management (INMM) in the USA in July 2001 and June 2002, the IAEA Safeguards Symposium in Vienna in November 2001, a Technical Coordination Meeting on the application of State-Level concepts to integrated safeguards in Vienna in May 2002, and chairing a meeting on cooperation between the IAEA and SSACs (national safeguards authorities) in Vienna, also in May.
- Extensive discussions with senior IAEA officials (including the Director General, Dr ElBaradei and the Deputy Director General for Safeguards, Dr Goldschmidt) and with counterparts in Euratom and ABACC (Argentine-Brazilian Safeguards Agency), as well as with senior officials of several governments and industry representatives, including from Canada, Indonesia, Japan, ROK, Sweden, the UK, and the US. In particular, detailed and productive discussions were held with US and Canadian experts during a 'trilateral' meeting in Canberra in February 2002.
- Mr Carlson briefed the Chairman and Commissioners of the Nuclear Regulatory Commission on international safeguards developments in Washington in June 2002.

Performance Assessment

ASNO has achieved highly effective links with the IAEA and a wide range of safeguards organisations and regional counterparts. Through such links ASNO is abreast of developments and emerging problems in safeguards. ASNO has been effective in promoting Australian thinking on a range of safeguards and associated issues, contributing to resolving issues of safeguards concern, and ensuring that its work program is relevant to the international non-proliferation agenda.

ASNO has been able to give the Government sound advice on nuclear safeguards, both internationally and from a domestic perspective.

MILESTONE C3

Efficient performance and management of a technical R&D program, supporting the development and enhancement of IAEA safeguards.

Activities

The resources available to the IAEA are not sufficient to allow all necessary safeguards R&D programs to be conducted 'in-house'. Safeguards are an evolving discipline and ASSP—the Australian Safeguards Support Program—is intended to assist the IAEA develop the equipment and procedures needed to meet new challenges in a cost-effective way.

ASSP incorporates consultancy work, analysis, and the development of equipment and procedures. The program embraces safeguards projects formally agreed directly with the IAEA. It also covers collaborative work with ASNO's counterparts and expert groups.

This program is not only an important tangible expression of Australia's support for IAEA safeguards, but plays a major role in maintaining ASNO's technical expertise and appreciation of the practical issues confronting the safeguards system. Fifteen formal Member State Support Programs are currently in operation, with an aggregate annual budget of over US$20 million. In dollar terms, ASSP is very modest—this year about $143,000. This includes $65,000 for direct expenditure relating to consultancy services and participation in SAGSI, but excludes monies spent by ANSTO and other Commonwealth agencies on ASSP projects, and also excludes indirect costs such as time spent by ASNO officers.

ASNO has a long-standing safeguards R&D Arrangement with the US Department of Energy (DOE). Three further 'Action Sheets' under this Arrangement were agreed during the reporting period. The first program relates to an effort to improve the transparency of nuclear activities in the Asia-Pacific region—the work under this program will be conducted on ASNO's behalf by ANSTO. The second program relates to the continuation of the Additional Protocol Outreach program to countries in the Asia Pacific region. The third relates to coordinating efforts to support the IAEA in developing the concept of 'information-driven safeguards approaches'. ASNO and DOE are examining what other collaborative projects might be carried out under this Arrangement.

During the reporting period ASNO worked cooperatively with the Canadian Safeguards Support Program (CSSP) on the analysis of satellite images of uranium mines. A preliminary report covering some aspects of the first stage of this work was presented at the INMM Annual Meeting in Orlando, Florida, in June 2002. The work will be ongoing for the next three years.

ASNO is continuing to explore options for collaborative projects with the Institute for Transuranium Elements in Germany, and ideas are being examined for collaboration with Indonesia's Nuclear Energy Control Board (BAPETEN) under the ASNO-BAPETEN MOU.

One major ASSP project—analysis of environmental samples—is carried out by ANSTO. ASNO is continuing to discuss with ANSTO other safeguards R&D projects which would strengthen ANSTO's non-proliferation program.

Details of ASSP projects are summarised at Annex H.

Performance Assessment

The results of several projects progressed and completed under the Australian Safeguards Assistance Program have been incorporated in the practices of the IAEA in 2001-02. The IAEA has expressed appreciation for the valuable and vital contribution provided to the Agency's safeguards efforts under the Australian Safeguards Support Program.

MILESTONE C4

Completion of work undertaken by the Informal Open-Ended Experts Meeting convened to discuss whether there is a need to revise the Convention on the Physical Protection of Nuclear Material (CPPNM).

Activities

Mr Leask attended three meetings in Vienna of Legal and Technical Experts, convened by the Director General of the IAEA to draft amendments to the CPPNM. Since the events of

September last year, there has been much greater support for this change—indeed, the number of states ratifying the CPPNM continues to grow steadily—but at the time of writing some complex issues in the revised text remain to be resolved. This work will continue in 2002-03.

Performance Assessment

The amendment process is still in progress and its outcome is difficult to predict at this stage. ASNO's contribution has been well received and work is ongoing.

OUTPUT D—CWC IMPLEMENTATION

Operation of the national authority for implementation of the CWC, including contribution to effective international implementation of the CWC, particularly in Australia's immediate region.

MILESTONE D1

Effective performance as the national focal point for liaison with the OPCW and other States Parties in relation to the fulfilment of Australia's obligations under the CWC.

Activities

Dealings with the OPCW

In accordance with Australia's obligations under the CWC, ASNO prepared and submitted annual routine declarations and notifications to the Technical Secretariat of the OPCW. In September and October 2001, ASNO submitted the routine CWC Article VI declarations on activities anticipated for 2002 for a total of 11 Australian facilities working with Scheduled chemicals. In March 2002, ASNO submitted declarations for 2001 on international transfers of Scheduled chemicals and for work in 41 facilities with CWC-relevant activities. These declarations were compiled using information gathered through the operation of the *Chemical Weapons (Prohibition) Act 1994*, and information on imports and exports of Scheduled chemicals obtained from Customs data, import and export-licensing records and through industry surveys.

Figure 8—Mr John Howell, ASNO (right), visiting a textile plant handling Schedule 2 chemicals, April 2002.

In accordance with obligations under Article X of the CWC, and for the purposes of promoting transparency between States Parties, ASNO submitted to the OPCW an annual declaration of Australia's national chemical defence program. ASNO worked closely with the Department of Defence in compiling this declaration.

Other contacts with the OPCW during 2001-02 included: notifications in relation to approval of inspectors designated to Australia; streamlining the visa system for OPCW inspector entry to Australia; providing potential Australian contacts for furthering the OPCW Ethics Project; and clearance arrangements for non-scheduled OPCW flights.

There was one routine OPCW inspection of Australia during the year, being at a 'discrete organic chemical' (DOC) facility in Western Australia in July 2001. This was the first DOC inspection in Australia since such facilities became subject to OPCW inspections on 29 April 2000. The inspection proceeded smoothly and the OPCW findings were in accordance with ASNO's assessment and declaration of the facility. Such facilities are declarable and inspectable based on the capability of their equipment to be used for proscribed purposes, rather than for the nature of the chemicals handled on-site.

Dr Josy Meyer attended an OPCW advanced training course for national authorities personnel in November 2001 held in The Hague, and also participated in an Industry Cluster meeting immediately after. The OPCW convenes Industry Cluster meetings to resolve outstanding technical issues faced by States Parties in implementing the CWC. Issues included, *inter alia*: definitions on the boundaries of production; international transfer of Schedule 3 chemicals; captive use; a formula for reporting national aggregate chemical data; and methodology for inspections of discrete organic chemical production facilities. Mr John Howell, Head CWC Implementation Section, participated in a similar meeting in February 2002.

As a follow-on to their Melbourne CWC Regional Workshop in May 2001, ASNO and DFAT helped sponsor and organise a CWC Workshop in Nadi, Fiji. This was aimed at increasing CWC participation in the South West Pacific and was attended by eight of these

island countries. A detailed item on the Workshop in Fiji appears on page 59 of this Report.

Dealings with other States Parties

Following an invitation, Mr Andrew Leask, Assistant Secretary, ASNO, participated as an international observer in a mock challenge inspection at Indian Head, a Defence Research and Development facility in the United States. The exercise was held from 23 to 27 July 2001, and the OPCW supplied an inspection team.

The Section has also had extensive dealings with other State Parties, especially in the region. This included work to reconcile trade in CWC Scheduled chemicals and in facilitating greater Pacific island involvement with the CWC.

Performance Assessment

By providing accurate and timely declarations and notifications to the OPCW, ASNO has ensured that Australia has maintained a strong record of performance in meeting its CWC commitments. In fact, Australia is amongst a small group of countries that consistently meet the declaration deadlines.

The CWC Regional Workshop was highly rated by participants, with requests for similar workshops to be held in the region in the future. The OPCW especially thanked ASNO and Australia for the strong support that was provided.

Participation in the challenge inspection exercise has provided invaluable insight into managing a CWC challenge inspection at an Australian defence site—although the likelihood of this is remote. To this end, ASNO continues to work with the Department of Defence in developing appropriate operating procedures.

MILESTONE D2

Activities and facilities in Australia relevant to CWC declarations are identified and the systems of permits and notifications established by the *Chemical Weapons (Prohibition) Act 1994*, and Regulation 5J of the *Customs (Prohibited Imports) Regulations* are operated effectively and/or amended as necessary.

Activities

Permits and Notifications

During the year ASNO identified one additional facility which required a permit under the Act to consume Schedule 2 chemicals, while the operators of two facilities notified ASNO that work with Schedule 2 chemicals had ceased, and that their permits were no longer required. Also, one research facility ceased research work on Schedule 1 chemicals.

Forty-seven companies submitted valid notifications under subsection 29(1) of the Act in relation to production of discrete organic chemicals during 2001. Also three additional notifiable companies were identified, largely due to ASNO's investigative efforts.

As part of its industry outreach, ASNO provided reminders of legislative requirements to each company or organisation concerned.

As part of its contribution to Government efforts to address the threat of chemical terrorism, ASNO implemented new provisions in its permit conditions. The main changes related to requiring reporting of chemical thefts or unexplained losses, and also for permit

holders to advise of the precautions they were taking to prevent unauthorised access to chemicals.

In addition, ASNO updated and considerably upgraded its CWC webpage. This is designed not only to inform industry and the public in regard to CWC obligations and contact details, but also to provide all necessary downloadable forms required in applying for permits and making notifications.

Table 5—Permits for CWC Scheduled Chemical Facilities held at 30 June 2002

Subsection	*19(4)*	*19(5)*	*19(6)*	*18(1)*	*18(1)*	*18(1)*
FACILITY	Schedule 1	Schedule 1	Schedule 1	Schedule 2	Schedule 2	Schedule 3
Type	Protective facility	Research facility	Consumption facility	Consumption facility	Processing facility	Production facility
Number	1	6	1	1	9	4

Industry Consultations

Throughout the year ASNO continued to operate an on-site industry consultation and outreach program focussed primarily on facilities producing discrete organic chemicals. The aim of such visits included: providing facilities with updated CWC and associated legislative information; collecting information necessary for declarations; and preparing sites for possible routine compliance inspections by the OPCW.

In June, ASNO officers attended the National Conference of the Plastics and Chemicals Industries Association (PACIA). This was an ideal opportunity for networking, to determine the chemical industry's direction and understand the challenges it faced. A number of discussions were arranged on the margins of the conference which helped address industry concerns, such as streamlining the import clearing process.

ASNO also held discussions with PACIA, Science Industries Australia and enforcement agencies on how dual-use chemicals could be better tracked and controlled within Australia. This work is preliminary and likely to require considerable time and effort to be fully effective.

Customs (Prohibited Imports) Regulations

During the year, ASNO issued 35 import permits covering Schedule 2 and 3 chemicals. It also liaised extensively with the Australian Customs Service on improvements to the processing and monitoring chemical imports and exports.

Monitoring Chemical Trade

ASNO, together with the Australian Bureau of Statistics, Australian Customs Service and the Department of Defence, developed and implemented unique identifiers for CWC Scheduled chemicals during the year. These are based World Customs Organisation codes and allow specific tracking of relevant chemical imports and exports.

Importer Survey

ASNO undertook a survey of all import permit holders to determine the level of import trade in 22 potential chemical warfare agent precursors not covered by CWC Schedules. This was part of a risk analysis in regard to potential terrorist access to such chemicals.

There appears to be substantial trade activity but the level of threat is considered to be very low.

The survey also gathered data about the customer base for Schedule 3 chemical imports. These data may be used to raise awareness in this sector about taking adequate precautions against unauthorised chemical access.

Performance Assessment

The system of permits and notifications operated well during the year and were subject to some refinements. This came during a period of staff turnover and additional tasking associated with the aftermath of September 11.

The main new achievements were associated with introducing new systems to address the threat of chemical terrorism and also several measures designed to assist the effectiveness of CWC implementation in Australia. Industry and other agencies have expressed their appreciation for the work ASNO has done on core regulatory work, enhancements to the permits system and counter-terrorism.

OUTPUT E—CTBT IMPLEMENTATION

Operation of the national authority for implementation of the CTBT, including development of CTBT verification systems and development of arrangements in support of Australia's CTBT commitments.

MILESTONE E1

E1.1 Operate effectively as the national point of liaison with the CTBTO and other States in relation to the fulfillment of Australia's obligations under the CTBT.

E1.2 Facilitation and enhancement of Australia's technical contributions to the work of the CTBT Preparatory Commission and its Working Groups.

Activities

IMS establishment

Preparation of the CTBT's verification arrangements ahead of entry into force began in 1997 and, based on current projections, should be largely complete by around 2007. The largest single element is the establishment of an International Monitoring System (IMS), comprising 321 stations and 16 laboratories around the globe. ASNO co-ordinates work on the 20 IMS stations and one laboratory that Australia will host (see Annex J)—the third largest number of any country. ASNO also contributes actively to the work of the CTBTO's Preparatory Commission on other aspects of CTBT verification. As the CTBT and Australia's implementing legislation are not yet in force, ASNO does not currently carry out the full range of anticipated legal functions.

Establishing a new IMS station, or upgrading a pre-existing facility for IMS service, normally requires planning and work over two to three years. ASNO co-ordinates these activities in liaison with the CTBTO's Provisional Technical Secretariat (PTS), with institutions constructing and operating the stations, and with relevant Commonwealth and State and Territory agencies. The interaction of Commonwealth and State legislation on land acquisition posed some difficulties at the beginning of the year. ASNO, working with

the Department of Finance and Administration, and with relevant State officials, has been successful in finding and implementing a resolution for certain stations in Western Australia.

The single largest IMS project in Australia to date has been the installation of the hydroacoustic monitoring station at Cape Leeuwin. The station will play a significant role in the IMS, monitoring large areas of the southern oceans for evidence of any nuclear test carried out at the ocean surface, or underwater. Its completion was marked by a ceremony in April 2002, at which the station was officially opened by the Minister for Foreign Affairs, the Hon Alexander Downer MP. Dr Wolfgang Hoffmann, the Executive Secretary of the CTBTO Preparatory Commission, and senior PTS staff visited Australia to participate also, along with the Government of Western Australia, and local representatives. Mr Downer took the opportunity offered by the opening ceremony to reiterate Australia's strong support for the CTBT. ASNO co-ordinated the ceremony, and contributed to development of Mr Downer's statement and associated media information.

CTBTO Preparatory Commission

ASNO participates in the technical working group sessions of the CTBTO Preparatory Commission in Vienna, in conjunction with Australia's mission in Vienna and with technical specialists from Geoscience Australia and ARPANSA. ASNO's particular contributions during 2001-02 dealt with procedures for the conduct of an On-Site Inspection (OSI) to establish whether a nuclear explosion has been carried out in violation of the CTBT, and with discussion on the modes of operation of the IMS before the Treaty enters into force.

The development of procedures for conduct on an OSI must address differing views amongst CTBT signatories about the balance between protecting the legitimate security interests of an inspected state during an inspection (which may take place in strategically or militarily sensitive areas), and ensuring an inspection team is able to carry out its task effectively. ASNO contributed to a draft text for a procedures manual that is under negotiation by states, and participates actively in the negotiation process. ASNO representatives also participated in OSI related training and exercise activities during the year.

Some differences have emerged in the Preparatory Commission during 2001-2002 about the manner in which the IMS should be operated in the period before entry into force of the CTBT. As a number of key states are unlikely to ratify the Treaty in the near future, this period may now extend over some years. Australia, as a strong supporter of the CTBT, is concerned to secure the future of the Treaty, and to make best use of the considerable investment in the IMS. ASNO contributed to, and participated in, the Preparatory Commission debate, along with representatives of Australia's Mission in Vienna.

Regional Outreach

At the invitation of the Government of Vietnam, ASNO, together with Geoscience Australia and the PTS, conducted a seminar in Hanoi in August 2001, to assist with planning for ratification of the CTBT. The seminar provided information on the benefits and obligations in the Treaty to a number of Ministries and agencies considering Vietnam's ratification.

Performance Assessment

ASNO has met, and successfully addressed, a number of challenges during 2001-02 as the co-ordinator of work on IMS projects in Australia. During 2001-2002 three Australian stations were brought to completion and certified as meeting IMS requirements:

- an infrasound station at Warramunga in the Northern Territory;
- a radionuclide station at Townsville in Queensland; and
- a hydroacoustic station at Cape Leeuwin in Western Australia.

Significant co-ordination work was also undertaken in relation to further stations:

- construction of infrasound stations at Buckland in Tasmania, and Shannon National Park in Western Australia, with completion expected in 2002-2003;
- planning for new radionuclide and infrasound stations on the Cocos Islands, at Macquarie Island, and in Antarctica.

At the CTBTO Preparatory Commission in Vienna, Australia is recognised as an important contributor on key aspects of the work of the Commission. ASNO has made a significant contribution to this in recent years through its work on IMS establishment, and on modalities for On-Site Inspection under the CTBT.

The Executive Secretary of the CTBT Preparatory Commission has welcomed Australia's provision of practical assistance to regional countries yet to ratify the Treaty. These efforts included the seminar conducted by ASNO and other agencies in Hanoi in August 2001.

MILESTONE E2

Timely establishment and maintenance of legal and administrative mechanisms which will give effect to CTBT obligations in Australia.

Activities

Although the *Comprehensive Nuclear Test-Ban Treaty Act 1998* received Royal Assent on 2 July 1998, under section 2 of the Act it will not come into force before the day the CTBT enters into force.

Geoscience Australia (GA) carries out nuclear test monitoring, using its network of seismic stations, under contract to DFAT. Since 1 July 2000 ASNO has administered that contract on behalf of the Department, and together with GA, concluded a review of its provisions (agreed in 1993) to reflect the new operating environment created by IMS development.

Early in 2000 Australia concluded an arrangement with the Preparatory Commission to facilitate establishment and operation of IMS stations in Australia. The implementation of that arrangement has required a review of the tax environment in which the Preparatory Commission and its contractors operate in Australia. In early 2002, ASNO co-ordinated the development and promulgation of regulations under the *International Organisations (Privileges and Immunities) Act 1963* to afford the Preparatory Commission access to Australia's Indirect Tax Concession Scheme (ITCS).

Consistent with principles set out in the CTBT, activities associated with the development of its verification are funded primarily from the contributions of signatories. This includes training of people involved with the work of the Treaty. ASNO coordinates the

involvement of Australians in this training. During the year 13 national data centre technical staff took part in training for future responsibilities as station operators, or as inspectors to be deployed should the Treaty's On-Site Inspection provisions be invoked.

Performance Assessment

The review of the Nuclear Monitoring contract with Geoscience Australia (GA) has succeeded in placing the relationship between the parties on a solid basis.

The promulgation of regulations affording ITCS access to the Preparatory Commission enables Australia to offer taxation treatment broadly equivalent to that given by other CTBT signatories.

Australia is widely regarded as an active participant in and contributor to the practical work of preparing for entry-into-force of the CTBT. Participation in training activities has presented useful opportunities to strengthen this involvement and promote Australia's interests.

OUTPUT F—NEW NON-PROLIFERATION REGIMES

Contribution to development of new and strengthened WMD non-proliferation regimes such as the BWC and FMCT.

MILESTONE F1

Provision of effective technical support and advice to Australia's negotiations to strengthen the BWC.

Activities

ASNO continued to provide technical support to DFAT in efforts to negotiate means to strengthen the BWC. This support was more varied than previously as the international community explored new alternatives to the Verification Protocol, on which agreement was not possible. ASNO participated in the National Consultative Group on the BWC chaired by DFAT. ASNO also undertook a review on biological control legislation in Australia and circulated the findings through the inter-agency Non-Proliferation Coordination Group.

ASNO was also provided advice on a number of issues that arose after the *Bacillus anthracis* attacks in the United States, including to officials in the UN, Japan and the United States.

Performance Assessment

DFAT continues to value ASNO's input towards strengthening the BWC and in helping to address bioterrorism concerns. This contribution was also evident in the number of papers prepared and services provided to a broad group of agencies.

MILESTONE F2

Effective contribution to national and international discussions on a possible Fissile Material Cut-off Treaty (FMCT).

Activities

Effective and cost-efficient verification will be fundamental to the FMCT regime. An important part of preparation for FMCT negotiations, therefore, is the development of verification concepts to help guide the negotiations to a successful outcome. This is a task of high priority for ASNO.

Since 1995 ASNO has been developing a 'focused' approach, under which verification would be concentrated on enrichment and reprocessing plants, and on separated plutonium and HEU (high enriched uranium) (see pages 73-75 of ASNO's 1999-2000 Annual Report). Messrs Carlson and Leslie presented papers on the place of FMCT in the overall non-proliferation regime in a variety of fora including the 2002 ESARDA symposium, the 2002 INMM Annual Meeting and meetings organised by Japan's Nuclear Materials Control Center.

ASNO has provided assistance to DFAT's International Security Division (ISD) in the formulation of advice on FMCT for the Australian Delegation in the CD and Australian posts in key capitals, also taking the opportunity during bilateral consultations to promote Australian concepts for an FMCT. Other activities have included publications, presentation of conference papers, and participation in international seminars.

Performance Assessment

ASNO's ideas on a 'focused' FMCT verification regime were presented at several international seminars and conferences where they were well received. ASNO is generally regarded by those engaged in FMCT matters to be at the forefront in the development of practical and effective verification concepts.

ISD values ASNO input towards the development of verification arrangements for the FMCT.

OUTPUT G—ADVICE TO GOVERNMENT

Provision of high quality, timely and relevant professional advice to Government.

MILESTONE G1

Ministers and other key stakeholders satisfied with policy advice, analysis and briefings.

Activities

ASNO provided advice to the Minister for Foreign Affairs on a range of issues, as well as contributing extensively to the development of advice provided by other Divisions in DFAT, different agencies including the Department of Industry, Tourism and Resources, the Department of Education, Science and Training, the Department of Defence, and the Office of National Assessments.

Significant issues affecting nuclear safeguards, the CWC, the BWC and the CTBT were kept under review, and close liaison was maintained with DFAT on these and other matters of common interest.

ASNO also provided evidence to the Joint Standing Committee on Treaties.

Performance Assessment

During the reporting period ASNO submitted a total of 43 Ministerial briefs, Ministerial correspondence, Parliamentary Question briefs and press releases. It contributed to DFAT items policy advice, analysis and other briefings on nuclear, CWC, BWC, CTBT and other relevant issues. Ministers, Departments and agencies have indicated appreciation of the high quality, timely and relevant advice provided by ASNO.

OUTPUT H—PROVISION OF PUBLIC INFORMATION

Provision of public information on the development, management and regulation of WMD non-proliferation treaties, and Australia's role in these activities.

MILESTONE H1

Management of an effective program to inform and educate the public on nuclear safeguards and CWC issues, and promotion of an understanding of the CTBT and its verification arrangements.

Activities

As in the past, this year's ASNO Annual Report contains a considerable number of background articles and information on nuclear, CWC and CTBT issues. ASNO has also presented a number of papers at conferences and in international publications—see Annex K of this Report. ASNO's Annual Report and papers have been read and used by many parts of the community and formed the basis of public briefings.

Messrs Carlson and Leask have provided the media with background briefings on a number of topics.

Messrs Leask and Doulgeris participated in the ARPANSA public forum concerning the Replacement Research Reactor.

Basic details of permits issued, revoked and varied under the Safeguards Act were published in the Commonwealth Government Gazette.

ASNO's web site was modified to bring it in line with the Departmental standard and material was updated. All ASNO publications were listed and a start made at linking them to the web site.

CWC Related Activities

ASNO ensured that facility operators which might be affected by the CWC were informed of the impact on them, including statutory requirements. This involved the publication and distribution of updated industry brochures, together with an active program of on-site consultations.

Forms for licence applications and annual declarations were made available on the web site.

Arising from this outreach, ASNO has had several invitations to make presentations to university courses, primarily those involving chemistry, law and international studies.

General Activities

Aimed at both multi-skilling its staff and offering an educational service to Government agencies, ASNO has presented a number of technical seminars on industry and WMD-related issues.

Performance Assessment

ASNO has used a wide range of material to inform the public and officials about current nuclear issues.

Industry has expressed appreciation for efforts to keep them informed about changes under the CWC and domestic legislation. An evaluation of ASNO's relationship with industry shows that dissemination of information has fostered an acceptance and broader understanding of the CWC and its verification mechanisms.

CURRENT TOPICS

ADDITIONAL PROTOCOL OUTREACH FOR THE ASIA-PACIFIC REGION

Australia is actively engaged in international efforts to encourage other countries to sign and ratify an 'Additional Protocol' (AP)—a legal instrument through which each country gives the IAEA more extensive information about its nuclear activities, and greater rights of access within the country. To further these efforts, ASNO obtained funding from AusAID to undertake an Outreach Program in support of the AP in the South-East Asia region. The first phase of this program involved a series of country visits, by Mr Russell Leslie, Director of ASNO's International Safeguards Section, and Mr Geoff Wainwright, Assistant Director, from the Department of Defence's Defence Trade Compliance and Control Branch. Messrs Leslie and Wainwright visited four regional countries, Malaysia, Thailand, Indonesia and the Philippines. The visits took place from 26 February to 13 March 2002. ASNO also proposed a visit to Vietnam, but it was not possible to reach agreement on a suitable program in time to include Vietnam in the first round of visits.

Malaysia and Thailand have not yet signed Additional Protocols, and the outreach effort was focussed on informing them about the AP and its safeguards benefits, and providing detailed guidance on the new responsibilities the AP will entail.

The Malaysian Atomic Energy Licensing Board (AELB) organised a interdepartmental seminar to coincide with the visit by Messrs Leslie and Wainwright—with 40 attendees from 10 different government departments. The AELB was an enthusiastic and efficient host, and provided an excellent forum for the fruitful exchange of ideas on how best to prepare for the advent of the Additional Protocol in Malaysia.

Figure 9—Additional Protocol Outreach Seminar, Kuala Lumpur, March 2002

The Thai Office of Atomic Energy for Peace (OAEP) organised a small internal seminar attended by the people who will be directly involved in preparing for the Additional Protocol in Thailand (the Government of Thailand has not yet made a decision to sign an AP, but the OAEP is working to be ready in case such a decision is made).

The Philippines have signed an Additional Protocol and are working through their ratification process. The outreach effort concentrated on providing assistance with outstanding AP implementation issues. The Philippine Nuclear Research Institute (PNRI) hosted intensive discussions of the types of activities it will need to perform in order to be ready when the AP is ratified.

Indonesia was one of the first countries to ratify an Additional Protocol, in 1999. In Indonesia's case the outreach effort focused on sharing Australia's implementation experiences and providing assistance with the resolution of any outstanding operational issues. ASNO and Indonesia's Nuclear Energy Control Board (BAPETEN) have a close and cordial working relationship, and the visit to Indonesia provided a good opportunity for both organisations to work together on this important issue.

The Outreach Program benefited from enthusiastic assistance from the relevant Australian posts that provided invaluable logistical and other support. The program was very well received by the host governments and was a valuable step on the road to widespread regional adherence to the Additional Protocol.

TRAINING COURSE ON NUCLEAR SAFEGUARDS FOR DPRK AND OTHER ASIAN PERSONNEL

ASNO conducted a nuclear safeguards training course, primarily for safeguards personnel from the Democratic People's Republic of Korea (DPRK), in Sydney and Canberra over the period 13 to 24 August 2001. The course was conducted in association with the IAEA, with funding provided by AusAID, and with the assistance of ANSTO and lecturers from the Republic of Korea (ROK) and Japan.

Australia was well placed to host such a course because of our long experience with courses of this nature, the successful participation of two DPRK safeguards staff in the regional course conducted by Australia in 2000, and because of our leading position in the development of the IAEA safeguards system. With these considerations in mind, during his visit to the DPRK in November 2000, Mr Downer expressed Australia's willingness to provide safeguards training for DPRK personnel. DPRK officials indicated that they were happy to take up that offer, and subsequently the DPRK nominated six safeguards staff for the course. Australia's preparedness to undertake a special training course at this time, additional to ASNO's regular series of regional safeguards training courses (the last of which was in 2000), reflected the importance of developing safeguards expertise and infrastructure in the DPRK, and Australia's engagement with the DPRK following the resumption of diplomatic relations in May 2000.

While the course was intended mainly for DPRK personnel, it was thought useful, and conducive to a good atmosphere for the course, to also include participants from China, Indonesia, New Zealand and the ROK, as well as from Australia. In all there were 15 participants.

Figure 10—International Safeguards Training Course, Sydney, August 2001

ASNO was in overall charge of the technical content of the training program, and the day-to-day administrative operation of the course. ASNO worked in close cooperation with DFAT's Nuclear Policy Branch and Korea Section. The project was supported by Australian posts in Vienna, Beijing and Seoul, as well as Jakarta and Wellington.

The course turned out to be a great success. The DPRK participants (and the other participants) were clearly appreciative of the substance of the course and the way it had been conducted. The course was notable for its friendly and positive atmosphere, excellent relations were built between the various participants which ASNO very much hopes will form a foundation for ongoing professional associations, and for its part ASNO gained a better understanding of the DPRK's perceptions and concerns in the safeguards area.

Overall, the course has furthered the DPRK's understanding of safeguards generally and of the verification activities necessary under the Agreed Framework and the DPRK's safeguards agreement with the IAEA. It was an important practical step in Australia's engagement with the DPRK and a demonstration of the constructive role Australia is able to play in this area. ASNO expects to continue its work with the DPRK in this area and follow-up activities are under consideration by both sides.

CTBT INTERNATIONAL MONITORING SYSTEM – CIVIL AND SCIENTIFIC BENEFITS

Although the prime function of the CTBT verification system is to ensure the verifiability of the nuclear test ban, the technologies and infrastructure involved have the potential to serve human welfare more generally, and to contribute to scientific research, sustainable development and civil safety against natural disasters. This was a finding of experts who met in London on 9-10 May 2002 to assess the civil and scientific benefits of CTBT verification technologies.

The major element of these verification technologies is the CTBT's International Monitoring System (IMS). While the IMS brings together a group of technologies that aren't especially new, it has of course made its own contribution to their development. However, a particular benefit of the IMS—aside from verifying the test ban, is that it offers a global capacity for monitoring certain phenomena in the terrestrial environment—often in near real-time.

Seismic monitoring is the foundation of the IMS, and when completed will draw together data from 170 monitoring stations around the world. The experts meeting in London found that if IMS seismic data were made available in real-time to national and international earthquake monitoring agencies, they would greatly improve the accuracy and timeliness of reports on earthquake location and magnitude, and in the case of large earthquakes could help direct emergency response and relief efforts, and assist predictions on the size and frequency of aftershocks. IMS data can also contribute to seismic research more generally, improving knowledge of the earth's structure and earthquake hazard.

Although experience with infrasound (low frequency atmospheric sound waves) monitoring dates back over 30 years, the development of new equipment and designs for the IMS has rekindled the possibilities for civil and scientific applications. Two direct examples of these identified at the London meeting are the timely detection of volcanic explosions, which assists aviation safety, and the detection of disastrous chemical explosions at the earth's surface.

The oceans are a very efficient medium for transmitting sounds, and the London meeting identified a wide range of possible applications for IMS hydroacoustic monitoring. Access to real-time data could have humanitarian benefits, by enhancing tsunami warning systems, and by identifying and locating active underwater volcanoes which may present a risk to shipping. The potential contribution of IMS hydroacoustic data to scientific research is also very wide. One example is the use of hydroacoustic stations as part of an acoustic thermometry system to measure ocean temperature and currents, leading to benefits to weather prediction and climate change studies. Other examples include monitoring of whale populations, and of iceberg calving.

The fourth IMS technology is radionuclide monitoring. The network of 80 radionuclide stations builds significantly upon existing radionuclide monitoring activity, and has advantages as a well calibrated and trustworthy system. Experts at the London meeting considered the system would be very valuable in the short-term period after an accidental nuclear release, for early mapping of the dispersion of radioactive material—which is important for emergency response and mitigation of consequences. In a more routine context, meteorological measurements made at IMS radionuclide stations already contribute to international weather forecasting. Experts noted also the significant value of

archived samples from routine monitoring for historical studies of atmospheric pollutants or other material trapped on filters during sample collection.

The London meeting also considered the civil and scientific benefits of other aspects of CTBT verification such as the work of the International Data Centre, and development of an On-Site Inspection capability (to investigate possible breaches of Treaty compliance).

Participants in the London meeting acknowledged the need for progress, within the CTBTO Preparatory Commission, on the issue of developing guidelines for access to data for civil and scientific purposes. They noted that it is in the interest of all CTBT States Signatories to make best use of the verification technologies for such purposes given the large investment being made in them.

AUSTRALIA'S REPLACEMENT RESEARCH REACTOR - ASNO'S ROLE IN THE APPROVAL PROCESS

A quick reading of the Safeguards Act might suggest that ASNO does not have a significant role in the approval process for the replacement reactor until quite late in the construction process. This is because, while the Act requires a permit to possess a reactor, the initial stages of the project relate to construction of the reactor building rather than the reactor itself. However, ASNO is closely involved in the early stages of the project through three mechanisms.

Firstly, the reactor is being built on an existing nuclear site covered by Safeguards Act permits that require early provision of design information for changes to the site. This enables ASNO to meet the IAEA's requirements for provision of design information and access by IAEA inspectors as necessary to verify aspects of the design during construction.

Secondly, when a permit under the Safeguards Act is issued for the replacement reactor, the Act explicitly provides for restrictions or conditions on the granting of such permits in respect of measures to be taken to ensure the physical security of nuclear material or associated items. The Director General, ASNO has determined that the appropriate standard for physical protection of nuclear material and nuclear facilities in Australia is IAEA document INFCIRC/225/Rev.4. In addition Australia's bilateral nuclear cooperation agreements require that Australia adopts this standard. Although in a formal sense ANSTO does not need to apply for a permit for the replacement reactor as yet, obviously ANSTO wishes to ensure that the physical protection measures being incorporated into the design and construction will meet ASNO's requirements in due course. Accordingly, ANSTO is working closely with ASNO in developing the Security Plan for the reactor.

The third mechanism relates more generally to ASNO's role as the regulator for physical protection measures in respect of nuclear material and facilities in Australia. This leads to ASNO input to the assessment process followed by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) in issuing the construction licence for the reactor. Part 1 of Schedule 3 of the *Australian Radiation Protection and Nuclear Safety Regulations 1999* lists the information that may be requested by the CEO of ARPANSA in relation to an application for a Facility Licence. Item 4(e) of this Schedule refers to the Security Plan for the controlled facility, in particular the plans and arrangements for security to ensure the health and safety of people and protection of the environment from the harmful effects of radiation. In relation to the research reactor licence application, the CEO of ARPANSA has requested that a Security Plan be provided by ANSTO, and that this plan be subject to review by ARPANSA and ASNO.

As the operator, ANSTO is responsible for preparing a security plan, and for implementing the security system defined by this plan for the protection of nuclear material and nuclear facilities against sabotage, damage, theft, loss or unauthorised use. The security system is to include administrative and physical controls and barriers, to ensure that control of the nuclear facility and nuclear material is properly maintained at all times.

To ensure appropriate physical protection measures are put in place during both construction and operation of the replacement reactor, ASNO and ARPANSA have established a framework for cooperation in this area. The framework follows the guidelines established by document INFCIRC/225/Rev.4. That is, ARPANSA assesses the possible sabotage targets on the site and the consequences of a successful attack on those

targets, and advises ASNO of these. ASNO then assesses the physical protection measures proposed to prevent such attacks being successful, and advises ARPANSA whether the proposed measures are acceptable. To assist in smooth operation of this framework, ASNO and ARPANSA agreed to use a set of joint acceptance criteria in the assessment of ANSTO's proposed security plan.

The joint acceptance criteria specify the objectives ANSTO's Security Plan is to achieve, and requires the Plan to detail the measures, making up the system, that ANSTO will establish to achieve these objectives. The objectives fall into the following ten broad headings:

1. Security Management;
2. Site Security and Threat Assessments;
3. System of Physical Protection and Security;
4. Access Control;
5. Personnel Security;
6. Security of Information Management (IM) Systems;
7. Performance assessment;
8. Record Keeping;
9. Reporting;
10. Review.

The approval process using the above approach has now largely been completed for the construction phase of the project. On 14 March 2002 ARPANSA advised ASNO that ANSTO had completed a satisfactory site security assessment for the construction project. ANSTO then submitted a Construction Security Plan on 19 March 2002 which ASNO assessed (in fact ASNO had been informally assessing drafts of this plan over several months) and gave provisional approval on 21 March 2002. This provisional approval was for the bulk excavation phase, with additional information required prior to commencement of main construction phase. This additional information was provided on 3 June and ASNO gave approval for the main construction phase on 12 June.

It should be noted that ASNO approval relates only to the meeting of security requirements. ARPANSA must take into account many other factors before allowing progress from one stage to the next.

ASNO's role does not end with this approval. There are many measures outlined in the Construction Security Plan which ASNO will audit. There is still a substantial amount of work to be done on the detailed design of security measures—these will be assessed in considering the issue of a Safeguards permit covering the reactor.

PROMOTING UNIVERSALITY OF THE CHEMICAL WEAPONS CONVENTION IN THE SOUTH PACIFIC

ASNO gives a high priority to the encouragement of adherence to the CWC by regional countries. To this end, ASNO and DFAT (International Security Division) co-sponsored, with the Organisation for the Prohibition of Chemical Weapons (OPCW), a regional seminar held in Nadi, Fiji, on 10-11 June 2002, and provided a keynote speaker, Dr Josy Meyer.

The workshop was organised by the OPCW and the Pacific Islands Forum to encourage Pacific island countries to join the CWC. The workshop was appropriately timed as a lead-in to the 2002 Forum Regional Security Committee (FRSC) meeting. There were 12 participants, from government ministries, industry and academia, representing the Federated States of Micronesia, Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

Participants commented on the usefulness of presentations and documentation provided by expert representatives of the OPCW, the Pacific Islands Forum Secretariat, the Oceania Customs Organisation and the Australian Government (Dr Josy Meyer, ASNO, and Mr Robert Mathews, Defence Science and Technology Organisation). For some participants, it was the first time that they had been given the opportunity to learn about the Convention and the benefits of becoming a State Party, including the impact on trade in CWC-Scheduled chemicals. In addition, the OPCW emphasised the relevance of universal adherence to the Convention in contributing tangibly to the struggle against terrorism and to global and regional security, by enlarging the area of the world in which chemical weapons are banned.

Figure 11—CWC Regional Workshop in Nadi, Fiji, June 2002. Dr Josy Meyer of ASNO is in the front row, second from right.

Practical legislative drafting expertise was identified as a critical area of need for non-signatory regional states deciding to join the CWC, and the OPCW and other States

Parties, including Australia, have offered to assist in this area. CWC implementation experiences in Kiribati and Fiji highlighted that in their respective countries, accession to the Convention was possible prior to the introduction of specific legislation. For example, Fiji ratified the Convention in 1997 but intends to include CWC provisions in its pending Bill on Sustainable Development. Of particular relevance is the CWC legislation developed by the Cook Islands, which is highly suitable as model legislation for other Pacific island countries with similar operating environments.

Despite the challenges of accession to the CWC, such as the lack of specialist expertise, legislative requirements and perceived lack of relevance in relation to regional economic and environmental issues, non-signatory representatives expressed their strong interest in joining the CWC. They were encouraged that Australia's implementation experiences indicated extensive resources would not be necessary for Pacific island countries to meet State Party obligations under the Convention.

As a result of this workshop, the OPCW is paying greater attention to the region, and is giving four Pacific island representatives an opportunity to gain experience and training at the OPCW in The Hague. It has been suggested that a similar workshop be held prior to the FRSC meeting in 2003.

MOX FUEL – A BRIEF DISCUSSION

What is MOX?

The term 'MOX' stands for **M**ixed **Ox**ide and is used to describe any mixture of uranium and plutonium oxides. MOX potentially covers a wide range of material types and compositions, but the form of MOX that is in general use today is MOX in light water reactor (LWR) fuel assemblies. MOX is also used in fast breeder reactor (FBR) driver fuel. The MOX used for LWRs and FBRs is a mixture of plutonium oxide (PuO_2) and uranium oxide (UO_2), sintered to form a hard, dense, durable, refractory ceramic that remains stable at temperatures of up to 2,815°C.

The MOX used in LWR fuel typically contains between 5% and 7% plutonium (depending on the proportion of the isotope Pu-239); by far the greatest constituent of this MOX (93-95%) is uranium, either natural or depleted. The overall fissile content of this MOX fuel is similar to that of LEU (low enriched uranium) fuel.

How is MOX used?

For LWR fuel MOX is formed into fuel assemblies that are very similar to standard LEU fuel assemblies. As with LEU, the MOX is formed into cylindrical pellets, enclosed in zirconium tubes, or fuel rods. The fuel rods are arranged into a rectangular or hexagonal array that makes up a fuel assembly. A typical MOX fuel assembly will weigh one tonne or more, of which around 500-600 kg will be MOX pellets.

Is MOX dangerous to transport?

Finished MOX fuel assemblies are commercially valuable items that are subject to both international nuclear safeguards and the protection requirements of the Convention on the Physical Protection of Nuclear Material (CPPNM). Those involved in the transport of MOX take great care to ensure it is transported in ways commensurate with its commercial value (each assembly costs around a million dollars) and complies with international obligations to ensure it is appropriately protected. During transport the MOX assemblies are placed in containers designed to protect against impact, fire and theft.

As noted above, MOX fuel pellets take the form of a hard, dense, durable, refractory ceramic. MOX fuel assemblies are designed to contain their contents in the intense pressures and high temperatures experienced in a reactor core. MOX is difficult to destroy or disperse even in the event of extreme accidents.

Is MOX dangerous to use in reactors?

During the operation of any reactor using uranium fuel, plutonium is formed in the fuel—through neutron capture by the uranium isotope U-238—and that plutonium contributes to the reactor's energy output. As fissile uranium (U-235) in the fuel is consumed, increasing amounts of plutonium are formed in the fuel, and by the end of an operating cycle the energy produced from the fissioning of plutonium will be almost as great as the energy from the fissioning of uranium. Where it is decided to use MOX fuel, in most cases around a third of the reactor core can be loaded with MOX fuel without the need for any engineering or operational modifications to the reactor.

Where does the plutonium for MOX come from?

Plutonium is produced through the irradiation of uranium. Spent fuel discharged from a light water reactor contains about 1% plutonium. This plutonium can be recovered from the spent fuel through reprocessing, and fabricated into fresh MOX fuel.

There are also proposals to make MOX fuel from ex-military plutonium retired from the nuclear arsenals of the USA and Russia as part of their nuclear threat reduction initiatives. The idea behind such proposals is that the plutonium from weapons can be fabricated into an economically useful form, and the use of the plutonium in a reactor will degrade its isotopic composition so it will no longer be weapons-grade.

Why is MOX used?

MOX is used as a means of recycling plutonium. This provides a means of increasing the efficiency of usage of existing uranium resources. The term 'thermal recycle' refers to the use of MOX in 'moderated' (usually light water, but possibly also heavy water or graphite) reactors. Thermal recycle of plutonium increases the efficiency of uranium usage by about 25%. Plutonium recycle reduces stockpiles of separated plutonium, and reduces spent fuel storage requirements.

It is envisaged that eventually the plutonium generated in light water reactors will be used to fuel fast breeder or other fast neutron reactors. The use of plutonium in fast neutron reactors could increase the efficiency of uranium usage by a factor of fifty or more. Technical and economic difficulties have delayed the introduction of fast neutron reactors—the use of thermal recycle is a way of getting value from reserves of plutonium in the interim.

Can MOX be used in nuclear weapons?

MOX does not contain enough fissile material to be usable in a nuclear weapon. MOX fuel for light water reactors typically comprises only 5% to 7% plutonium. The total fissile content—fissile plutonium isotopes and fissile uranium (U-235)—in such fuel will only be around 6%. This compares with nuclear materials used in nuclear weapons, which have fissile contents of at least 80% (in the case of uranium—*weapons-grade* is 93% U-235) or well over 90% (in the case of plutonium—*weapons-grade* is around 93% fissile isotopes (Pu-239 and Pu-241)).

MOX fuel is not an attractive source of plutonium for nuclear weapons. Separating the plutonium from the MOX is a complex task requiring specialised equipment and handling. The plutonium in MOX fuel is of a quality referred to as *reactor grade*—comprising around 70% fissile isotopes. The presence of a high proportion of non-fissile plutonium isotopes greatly complicates the design of any nuclear explosive, because these isotopes generate a lot of heat and spontaneous fission neutrons.

Does MOX usage increase the world's plutonium inventories?

Use of MOX fuel is expected to significantly reduce plutonium inventories. As an example, the Euratom Supply Agency estimates that the use of a single typical MOX fuel element results in a net consumption of 9 kg of plutonium, and avoids the production of a further 5 kg (compared with the use of low enriched uranium fuel). Thus in this example each typical MOX fuel element used results in a net reduction of 14 kg of plutonium.

Currently plutonium is being recycled as MOX in 32 light water reactors in Europe, and the use of MOX is expected to commence in Japan within the next few years. Use of

MOX fuels in LWRs will increase over the next decade. While this will involve mainly reprocessed civil plutonium, the use of MOX fuel to degrade weapons-grade plutonium transferred from military programs as part of the disarmament process, will assume increasing importance. By 2010 it is expected that MOX fuels will be used with 45 reactors in Europe, together with up to 16–18 in Japan, and possibly five in Russia and six in the US, that is, some 15–20% of the world's power reactors.

IRAQ - WEAPONS OF MASS DESTRUCTION ACTIVITIES

> 'The proliferation of all weapons of mass destruction constitutes a threat to international peace and security'—*statement of the President of the Security Council, 31 January 1992*[1].

The NPT and other non-proliferation regimes have been established to provide assurance of a country's commitment to undertakings against acquiring weapons of mass destruction. Effective non-proliferation regimes are fundamental to the maintenance of international peace and security—providing assurance that benefits both the international community and the individual country. *Effectiveness* requires compliance mechanisms—verification and other measures—and cooperation with those mechanisms.

Iraq has violated non-proliferation commitments in the past, and remains in non-compliance with relevant Security Council Resolutions. Accordingly, Iraq continues to present a serious challenge to the objective of non-proliferation.

History

As early as the 1980s Iraq had produced chemical weapons and used them against Iranian troops and its own Kurdish population. Following the Gulf War in 1991, it was found that Iraq had much more extensive programs to develop weapons of mass destruction (WMD) than was previously believed. As well as chemical weapons (CW), Iraq had an extensive nuclear weapons development program—in violation of the NPT—and was undertaking research, development and production of biological weapons (BW). In addition, Iraq had both acquired and developed ballistic missiles, and had produced CW and BW warheads.

Following UN Security Council resolutions the UN Special Commission (UNSCOM) was established and—in conjunction with the IAEA—was mandated to uncover, dismantle and prevent reconstitution of Iraq's WMD programs. This work began in 1991.

After a large number of inspections—often obstructed by Iraq—UNSCOM and the IAEA gradually gained a much clearer picture of Iraq's WMD programs, but major gaps still remain.

- In the nuclear area, Iraq was found to have explored a number of uranium enrichment technologies. It had successfully developed electromagnetic enrichment, and was developing more efficient centrifuge technology. Work had also been carried out on design of a nuclear warhead.
- UNSCOM inspectors found about 4,000 tons in total of sulphur mustard and the nerve agents tabun, sarin, GF (sarin analogue) and VX. Inspectors also discovered 75 CW ballistic missile warheads filled with sarin/GF mixtures or binary nerve agent. Iraq's declarations on its past program remain inadequate, especially for VX and the CW munitions/precursors material balances.

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1. UNSC document S/23500.

- In 1995 Iraq finally admitted to possessing an offensive BW program at the time of the Gulf War. About 30,000 litres of concentrated *Bacillus anthracis* (anthrax), botulinum toxin, *Clostridium perfringens*, aflatoxin and ricin were declared. Iraq claimed to have unilaterally destroyed all of its BW stocks when it acceded to the Biological Weapons Convention in 1991, but there is only limited evidence of this. UNSCOM estimated actual amounts of biological agents to be significantly higher than those declared (by a factor of four in the case of anthrax), but was never able to quantify Iraq's post-Gulf War BW program with any accuracy.

There was a deliberate effort on the part of the Iraqis to conceal the details of these programs, with some major elements only being discovered several years after the inspections began. The IAEA and UNSCOM removed, dismantled or destroyed large amounts of equipment, materials and facilities. The lack of cooperation by Iraq however meant that new-found elements of these programs were still being investigated in late 1998, when the level of non-cooperation was such that inspections could no longer proceed and consequently inspectors were withdrawn.

Since then Baghdad has only allowed annual inspections by the IAEA of specific areas of the Tuwaitha nuclear research centre, as required under Iraq's NPT safeguards agreement. All UN inspectors—other than IAEA inspectors carrying out the annual inspections at Tuwaitha—have been refused entry into Iraq, and automated monitoring systems installed by UNSCOM, and by the IAEA at locations other than Tuwaitha, are no longer operational.

In December 1999 the Security Council established a follow-on organisation to UNSCOM, known as the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC). UNMOVIC has a number of unresolved issues to address, but despite several rounds of discussions with Iraq it has not been able to undertake inspections to do so.

Figure 12— UNSCOM inspection of Iraqi pharmaceutical plant, April, 1998. Mr John Howell (with backpack), now with ASNO, was Chief Inspector for this inspection.

ASNO's role

ASNO, as part of Australian efforts in this area, continues to support this UN work and has made staff available with expertise in nuclear, chemical and biological areas. The Deputy Director of ASO (ASNO's predecessor), Mr John Bardsley, participated in the early IAEA inspections in Iraq, and Mr John Howell of ASNO has been an UNSCOM inspector, and is on call to participate in UNMOVIC inspections if Iraq permits these. ASNO also provides technical input to Australian policy development.

Current situation

Iraq has avoided international scrutiny of its WMD-related activities since 1998, when the last Security Council-mandated inspections took place:

- Iraq retains most of the expertise, and some of the dual-use equipment and facilities, that supported its previous WMD programs—there are grave concerns about what Iraq may have been able to achieve in the four years since inspections were halted;
- Iraq's biological resources, including vaccine and pharmaceutical plants, are more than sufficient to rapidly support undetected BW agent production and weaponisation in the absence of inspections;
- Iraq's chemical and manufacturing industries could fairly quickly produce and weaponise substantial quantities of some CW agents, with such activity not readily identifiable without inspections; and
- while Iraq's known nuclear facilities were disabled, in the absence of intrusive inspections it is not known what Iraq might have developed since.

It is important to the international community—and in Iraq's own interest—for Iraq to change its present course: not only to permit the resumption of UN inspections, but to cooperate fully with those inspections, and to demonstrate convincingly that it has destroyed its weapons of mass destruction and permanently abandoned the intention of developing such weapons.

PROLIFERATION AND INTANGIBLE TECHNOLOGY TRANSFER

The production of nuclear, chemical and biological weapons and their means of delivery requires, in addition to the necessary material and equipment, personnel with suitable technical and scientific skills and knowledge. A specific aspect of counter-proliferation—and one that is being given increasing attention around the world—relates to the need to take steps against proliferation programs deriving benefit through the training of personnel in other countries—what is known as intangible technology transfer. Clearly this raises some dilemmas. While we have to remain conscious of the interests of the individual, respect academic freedom, and recognise the value of international student and research exchange, it is also essential to be mindful of the interest of the international community in curtailing the development of weapons of mass destruction (WMD).

Tertiary education and post-graduate study

Clearly there is the potential for students from countries of proliferation concern to gain access to advanced technology applicable to WMD by undertaking tertiary studies and research in foreign countries, including Australia. A number of countries with WMD programs have pursued this as a deliberate strategy.

In some cases it may be relatively straightforward to identify areas where the matters being studied may be directly useful to a proliferation program (e.g. chemical and physical properties of uranium and plutonium, hydrodynamic studies of plasmas etc. for nuclear weapons; organophosphate fertilisers for chemical weapons; toxin studies for biological weapons; and engineering studies for missile development). In a greater number of cases, however, the potential connection with WMD programs may be less obvious. It may therefore be necessary to evaluate proliferation risk on an individual, case-by-case basis. Post-graduate studies and research are the areas of greatest concern.

Training

In addition to formal tertiary studies, it is also necessary to take into account the potential for WMD-related skills and knowledge to be acquired through employment. Examples of proliferation by training encompasses the expansion of the skill sets of engineers, scientists, technicians, tradespeople and machine operators when they are employed in industries either with direct WMD-related technology exposure or which employ dual use equipment (or even in other areas not normally considered to be dual use). Areas of interest could include handling or manufacturing of dual-use materials, electronic equipment, explosives, vaccines, medicines and fertilisers.

Student visa control

In order to limit the risk of proliferation through tertiary studies in sensitive areas, a number of countries, including Australia, have instituted visa controls to limit access to their educational institutions in appropriate cases. Such visa controls typically take note of the level and field of study of the applicant and his or her country of origin, in order to determine whether the person could reasonably be considered a potential contributor to a proliferation program.

Educational and research institutions also have explicit legal obligations not to provide services which could reasonably be expected to contribute to WMD proliferation under Australia's non-proliferation 'catch all' legislation, in particular section 11 of the *Weapons of Mass Destruction Act 1995*. To ensure that non-proliferation objectives are not

inadvertently compromised, it is important to have the understanding and cooperation of educational institutions in this regard.

Conclusion

As a responsible member of the international community Australia must carefully balance competing priorities, including the desire to promote knowledge that will allow developing countries to improve their technical base and scientific infrastructure—and the need to ensure we do not materially contribute to the spread of weapons of mass destruction.

Further information on this issue can be obtained by contacting the International Security Division of DFAT, or ASNO.

BACKGROUND

BRIEF OUTLINE OF THE NUCLEAR FUEL CYCLE

Currently there are almost 440 nuclear power reactors in operation in over 30 countries worldwide. In many cases they supply a substantial proportion of national electricity requirements (see Table 7 on page 72).

Reactor types

The majority of the world's power reactors are of the light water type (LWRs—light water reactors), where ordinary water acts as both moderator, slowing down neutrons to efficient speeds for nuclear fission to occur, and coolant, transferring heat from the nuclear reaction to steam generators for producing electricity.

Because ordinary water is an inefficient moderator, LWRs must be operated on enriched uranium, that is, uranium in which the proportion of the fissile isotope U-235 has been increased from the level in natural uranium, 0.71%, usually to between 3 and 5%. Some reactor types can be operated on natural uranium, by using more efficient moderators, such as heavy water, which has a proportion of the heavier hydrogen isotope deuterium, and graphite. Typical examples of this type of reactor are the Canadian CANDU, which is moderated and cooled by heavy water, and gas-cooled graphite-moderated reactors such as the UK Magnox.

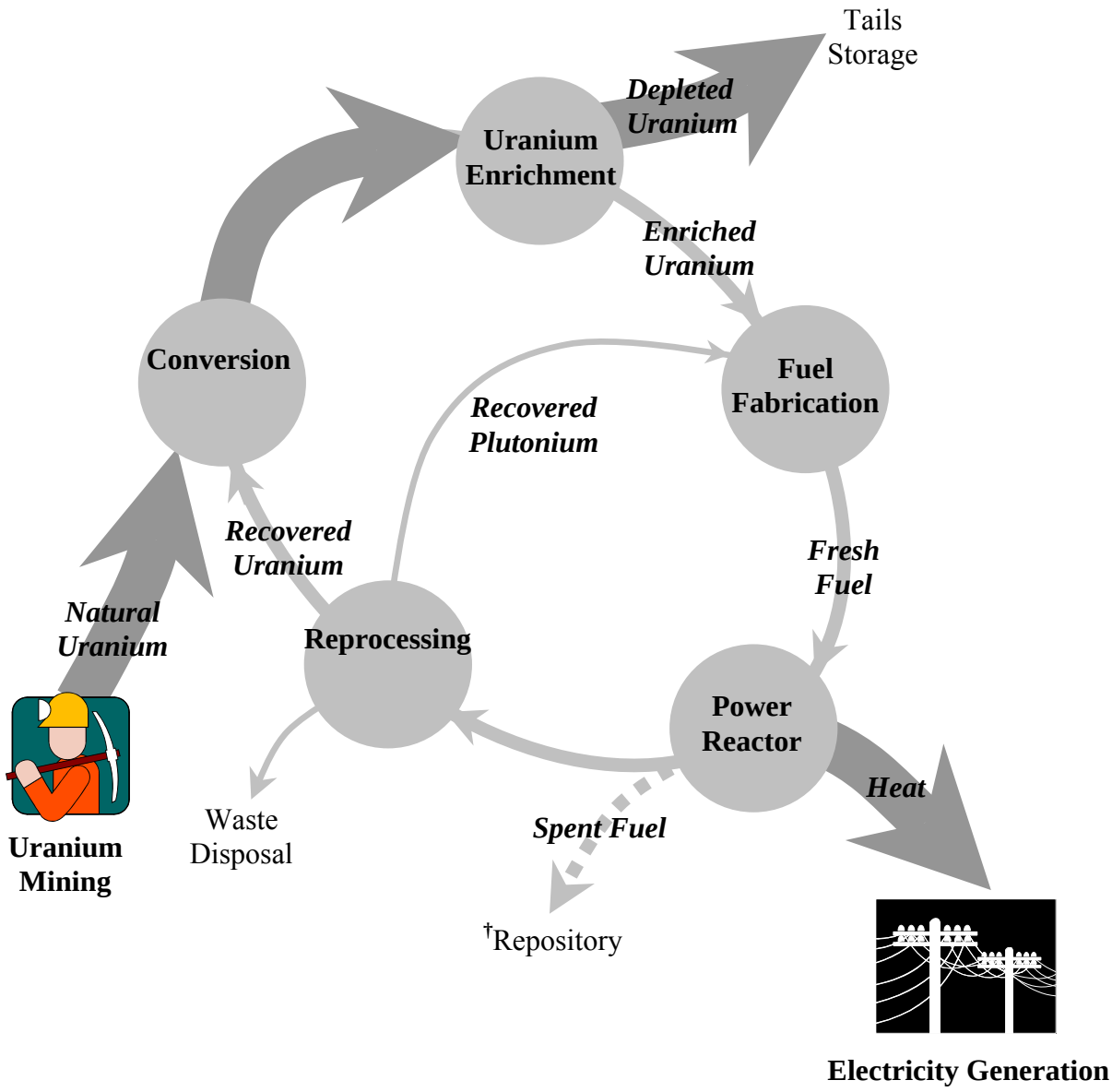
Fuel cycle stages

Following mining and milling of uranium and production of uranium ore concentrates (yellowcake), the stages of the light water fuel cycle are as follows (see Figure 13 on page 70):

- Conversion: natural uranium is formed into a gaseous compound, uranium hexafluoride (UF6), prior to enrichment;
- Enrichment: a process by which the proportion of the U-235 content is increased. The main technologies in use are gaseous diffusion and centrifuge. The product is described as low enriched uranium (LEU), typically containing between 3% and 5% U-235;
- Fabrication: manufacture of LEU into uranium oxide fuel pellets, which are assembled into fuel rods and then fuel elements for use in a reactor;
- Reactors: a power reactor uses the heat from a controlled nuclear chain reaction to drive a turbine to generate electricity. Typically the turbine(s) is driven by steam. In the case of pressurised water reactors as well as liquid metal-cooled reactors and some gas-cooled reactors, steam for the turbines is produced in a secondary circuit. There are some high-temperature gas-cooled reactors where the generating turbine is gas-driven.
- In a typical LWR fuel elements are used over 3–4 operating cycles each of 12–18 months (i.e. the reactor might be unloaded every 12 months, with a third of the core being replaced each time);
- Reprocessing: spent fuel is dissolved for the separation of highly radioactive fission products, and for the recovery of plutonium and uranium. Uranium can be re-enriched

for further reactor use. Plutonium is mixed with uranium to produce MOX (mixed oxide) fuel and used both in LWRs and potentially in fast neutron reactors.

Partly because depressed uranium prices are impacting on the economics of reprocessing, a number of countries have committed to, or are considering, the once-through cycle, where spent fuel will be disposed of without reprocessing.



†Some countries choose to dispose of their spent fuel in repositories instead of recycling it.

Figure 13—Civil Nuclear Fuel Cycle-Outline

Military fuel cycle

There are five acknowledged nuclear-weapon states (the US, Russia, the UK, France and China) and three 'threshold' states, two of which have conducted nuclear explosive tests (India and Pakistan) and one which is suspected of having a nuclear weapon capability (Israel). In all cases the military nuclear programs developed ahead of civil power programs. Military programs involve the production of special grades of nuclear material, substantially different to the material used in civil programs.

Nuclear weapons are based on the following nuclear materials:

Plutonium

Plutonium is formed through the irradiation of uranium in a reactor. The uranium-238 isotope absorbs a neutron, leading to the formation of plutonium-239. Longer irradiation times lead to the formation of higher plutonium isotopes, Pu-240, Pu-241 and Pu-242.

Weapons-grade plutonium predominantly comprises the isotope Pu-239 and contains no more than 7% of the isotope Pu-240. Pu-240 (and the higher isotope Pu-242) are undesirable for weapons purposes because their rate of spontaneous fission causes pre-initiation (a premature chain reaction). By contrast, 'reactor-grade' plutonium from the normal operation of a LWR contains high levels of Pu-240, typically around 25%.

Because of the need to minimise the Pu-240 content, weapons-grade plutonium is produced in dedicated plutonium production reactors, usually natural uranium-fuelled, graphite-moderated, where irradiated fuel can be removed after short irradiation times (i.e. at low burn-up levels).

Uranium

Weapons-grade uranium is very highly enriched, to 90% or more U-235. This compares with normal civil enrichment levels of around 3–5% U-235. High enrichment levels are produced in enrichment plants specially designed and operated for this purpose.

Table 6—Comparison of Quality (Isotopic Composition) of Materials in Civil and Military Nuclear Fuel Cycles (figures are approximate)

Material	*Civil*	*Military*
Plutonium	60% ^{239}Pu	93% ^{239}Pu
Uranium	4% ^{235}U	90% ^{235}U

The US, Russia, the UK and France have announced that they have ceased production of fissile material for nuclear weapons purposes, and China is believed to have done so. Australia is a strong supporter of a Fissile Material Cut-off Treaty (FMCT) under which this situation will be formalised, and extended to India, Israel and Pakistan. The FMCT will prohibit production of fissile material for weapons purposes, and will provide for verification on relevant facilities and material.

Table 7—World Nuclear Electricity Generation at 31 December 2001

Country	*Operating Reactors*	*Capacity (GWe)*	*% of Total Electricity in 2001*	*Reactors under Construction*	
				Number	*(GWe)*
*USA	104	97.8	20.4		
*France	59	63.1	77.1		
*Japan	54	44.3	34.3	3	3.7
*Germany	19	21.3	30.5		
Russia	30	20.8	15.4	2	1.9
*ROK	16	13.0	39.3	4	3.8
*UK	33	12.5	22.6		
Ukraine	13	11.2	46.0	4	3.8
*Canada	14	10.0	12.9		
*Sweden	11	9.4	43.9		
*Spain	9	7.5	28.8		
*Belgium	7	5.7	58.0		
*Taiwan, China	6	4.9	21.6	2	2.7
Bulgaria	6	3.5	41.6		
*Switzerland	5	3.2	36.0		
*Finland	4	2.7	30.6		
*Czech Republic	5	2.6	19.8	1	0.9
India	14	2.5	3.7	2	1.0
Lithuania	2	2.4	77.6		
Slovak Republic	6	2.4	53.4	2	0.8
China	3	2.2	1.1	8	6.4
Brazil	2	1.9	4.3		
South Africa	2	1.8	6.7		
*Hungary	4	1.8	39.1		
*Mexico	2	1.4	3.7		
Argentina	2	0.9	8.2	1	0.7
Romania	1	0.7	10.5	1	0.7
Slovenia	1	0.7	39.0		
*Netherlands	1	0.4	4.2		
Armenia	1	0.4	34.8		
Pakistan	2	0.4	2.9		
Iran	-	-	-	2	2.1
World total	438	353.4	(est) 16.0	32	28.5

* Eligible to use Australian uranium. Countries eligible to use Australian uranium operate 353 power reactors, accounting for over 85% of world nuclear generating capacity.

Source: IAEA Worldatom Staff Report, *Nuclear Electricity Production Edging Up – The IAEA Reports on Nuclear Power Status and Trends*, 11 July 2002.

(http://www.iaea.org/worldatom/Press/News/11072002_news.shtml)

IAEA SAFEGUARDS STATEMENT FOR 2001

The safeguards statement is published annually by the IAEA—the following text is taken from the IAEA Annual Report 2001 (page 95).

'In fulfilling the safeguards obligations of the Agency in 2001, the Secretariat — having evaluated all the information acquired in implementing safeguards agreements and all other information available to the Agency — found no indication of diversion of nuclear material placed under safeguards nor of misuse of facilities, equipment or non-nuclear material placed under safeguards. On this basis, the Secretariat concluded that, in 2001, the nuclear material and other items placed under safeguards remained in peaceful nuclear activities or were otherwise adequately accounted for.

'Notwithstanding the conclusion above, the Agency is still unable to verify the correctness and completeness of the initial report of nuclear material made by the Democratic People's Republic of Korea (DPRK) and is, therefore, unable to conclude that all nuclear material subject to safeguards has been declared. The DPRK remains in non-compliance with its safeguards agreement, which is in force and binding. In 2001, the Agency maintained a continuous inspector presence in Nyongbyon to monitor the freeze of the DPRK's graphite moderated reactors and related facilities.

'From 1991 to 1998, the Agency's safeguards activities in Iraq under the comprehensive safeguards agreement concluded pursuant to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) were implemented as part of the activities carried out by the Agency in that State pursuant to United Nations Security Council Resolution 687 and related resolutions. Since December 1998, the Agency has not been in a position to implement its Security Council mandated activities in Iraq. Pursuant to its safeguards agreement with Iraq, for the year 2001 the Agency conducted a physical inventory verification of the nuclear material placed under safeguards in Iraq and verified the presence of the nuclear material in question.

'In 2001, with regard to nine States, the Secretariat — having evaluated all the information obtained through activities pursuant to these States' comprehensive safeguards agreements and additional protocols, and all other information available to the Agency — found no indication of undeclared nuclear material or activities in those States. On this basis, and taking into account the conclusion referred to in the first paragraph of this statement, the Secretariat concluded that all nuclear material in those States had been placed under safeguards and remained in peaceful nuclear activities or was otherwise adequately accounted for. In the case of the other 16 States with comprehensive safeguards agreements and additional protocols in force, the Agency's evaluations for drawing such a conclusion are in progress.'

AUSTRALIAN URANIUM EXPORTS

In 2001-02 Australia exported 7,366 tonnes of uranium ore concentrates (U_3O_8 or U_3O_8 equivalent, amounting to 6,246 tonnes contained uranium). This quantity of uranium is sufficient for the annual fuel requirements of some 31 reactors (each of 1000 MWe), producing around 250 billion kilowatt hours (i.e. 250 terawatt hours—TWh) of electricity—well in excess of Australia's own electricity production, which in 2001 totalled about 200 TWh.

Australia holds about 40% of the world's uranium resources recoverable at less than US$40/kg. In 2001-02, the Ranger and Olympic Dam mines were respectively the world's second and third largest uranium producers, and overall Australia was the world's second largest uranium exporter.

While Australia recognises the importance of this substantial uranium holding as a source of energy for other countries not as well endowed with natural resources, strong support for the nuclear non-proliferation regime has always been a paramount consideration.

Australia exports uranium only to countries within its network of bilateral safeguards agreements—details of these agreements and the conditions under which Australia exports uranium are given in the following pages.

Australia has 18 bilateral agreements covering 27 countries and Taiwan, China. These agreements are listed in Table 9 on page 77. Those bilateral partners which imported Australian uranium in 2001 are listed in Table 8 below.

Table 8—Countries to which Australian Uranium was supplied in 2001

Country	*Tonnes UOC (U_3O_8)*	*% of total (rounded)*
Belgium	88.45	1.07
Canada	158.83	1.93
Germany	158.76	1.93
Finland	58.97	0.72
France	497.16	6.03
UK	407.45	4.94
Japan	2,158.21	26.18
ROK	848.16	10.29
Sweden	200.47	2.43
US	3,666.61	44.48
Total	8,243.06	100.00

These figures are for calendar year 2001 and do not correspond exactly to exports for the 2001-02 financial year. The destinations are based on the contracted end user at the time of export and do not take account of possible on-selling to other countries within Australia's bilateral network

As at the end of 2001 there were 438 power reactors in operation in over 30 countries, with a total electrical generating capacity of over 350 GWe, and an electrical output of around 2,544 TWh. These reactors produced 16% of the world's electricity (see Table 7 on page 72). Of these, 353 reactors were operated by countries eligible to use Australian uranium. The reactors in these countries produced 13.6% of total world electricity: nuclear energy's

contribution to electricity production in countries using Australian uranium ranged from 3.7% in Mexico to 77% in France.

In 2001-02, exports of Australian uranium represented around 10% of the total carbon dioxide emissions avoided world-wide through generating electricity by nuclear energy rather than fossil fuels. Countries using Australian uranium thereby avoided carbon dioxide emissions of around 283 million tonnes—equivalent to about 75% of Australia's net total carbon dioxide emissions (from all sources), based on data for 2000.

SAFEGUARDS ON AUSTRALIAN URANIUM EXPORTS

A fundamental tenet of the Government's uranium policy is that exports are permitted only under stringent safeguards. Uranium exports are made only to selected countries and are covered by a bilateral safeguards agreement. Bilateral safeguards are concluded between the supplier and the recipient of nuclear items and serve as a mechanism for applying conditions additional to IAEA safeguards: for example, restrictions on retransfers, high enrichment, and reprocessing. The safeguards requirements Australia applies to uranium exports are bilateral; they are elaborated in a series of treaty-level agreements with each country involved. These requirements are outlined below.

The key point is that Australia's safeguards requirements are superimposed on IAEA safeguards. IAEA safeguards provide the basic assurance that nuclear material is not being diverted from peaceful to non-peaceful purposes.

It should be noted that IAEA safeguards are generally not concerned with origin attribution, that is, the 'flag' and conditions attached by suppliers (for the IAEA there are limited exceptions, e.g. under certain non-NPT safeguards agreements). This is the purpose of bilateral safeguards agreements.

Australia's safeguards requirements are intended to ensure that:

- AONM (Australian Obligated Nuclear Material—discussed below) is properly accounted for as it moves through the nuclear fuel cycle;
- AONM is used only for peaceful purposes in accordance with the applicable agreements;
- AONM in no way enhances or contributes to any military process.

Australia's Safeguards Conditions

The application of Australia's requirements starts with a careful selection of those countries eligible to receive AONM:

- it is a minimum requirement that, in the case of non-nuclear-weapon States, countries must meet the NPT full scope safeguards standard, that is, IAEA safeguards must apply to all existing and future nuclear activities; and
- in the case of nuclear-weapon States, there must be a treaty level assurance that AONM will only be used for peaceful purposes, and arrangements must be in place under which AONM is covered by IAEA safeguards.

A basic requirement is the conclusion of a safeguards agreement between Australia and the country concerned, setting out the various conditions which apply to AONM. The

principal conditions for the use of AONM set out in Australia's bilateral safeguards agreements are summarised as follows:

- an undertaking that AONM will be used only for peaceful purposes and will not be diverted to military or explosive purposes, and that IAEA safeguards will apply;
- none of the following actions can take place without Australia's prior consent:
  - transfers to third parties
  - enrichment to 20% or more in the isotope uranium-235
  - reprocessing[1];
- provision for fallback safeguards or contingency arrangements in case NPT or IAEA safeguards cease to apply in the country concerned;
- an assurance that internationally agreed standards of physical security will be applied to nuclear material in the country concerned;
- detailed 'administrative arrangements' between ASNO and its counterpart organisation, setting out the procedures to apply in accounting for AONM;
- regular consultations on the operation of the agreement; and
- provision for the removal of AONM in the event of a breach of the agreement.

Australian Obligated Nuclear Material

A characteristic of the civil nuclear fuel cycle is the international interdependence of facility operators and power utilities. Apart from the nuclear-weapon states, it is unusual for a country to be entirely self-contained in the processing of uranium for civil use—and even in the case of the nuclear-weapon states, power utilities will seek the most favourable financial terms, often going to processors in other countries. Thus it is not unusual, for example, for a Japanese utility buying Australian uranium to have the uranium converted to uranium hexafluoride in Canada, enriched in France, fabricated into fuel in Japan, and reprocessed in the United Kingdom. The international flow of nuclear material enhances safeguards accountability, through 'transit matching' of transfers at the different stages of the fuel cycle.

The international nature of nuclear material flows means that uranium from many sources is routinely mixed during processes such as conversion and enrichment. Uranium is termed a 'fungible' commodity, that is, at these processing stages uranium from any source is identical to uranium from any other—it is not possible physically to differentiate the origin of the uranium. This is not unique to uranium, but is also the case with a number of other commodities. The fungibility of uranium has led to the establishment of conventions used universally in the industry and in the application of safeguards, namely equivalence and proportionality. These are discussed below.

Because of the impossibility of physically identifying 'Australian atoms', and also because Australian obligations apply not just to uranium as it moves through the different stages of the nuclear fuel cycle, but also to material generated through the use of that uranium, e.g. plutonium produced through the irradiation of uranium fuel in a reactor, the obligations under Australia's various bilateral safeguards agreements are applied to Australian

1. Consent has been given in advance to reprocessing on a programmatic basis in the case of five Agreements: Euratom, France, Japan, Sweden and Switzerland.

Obligated Nuclear Material (AONM). 'AONM' is a shorthand way of describing the nuclear material which is subject to the provisions of the particular bilateral agreement.

This approach is also used by those other countries applying bilateral safeguards comparable to Australia's, principally the US and Canada. These countries attach a safeguards 'obligation' to nuclear material which they upgrade, hence giving rise to the situation of 'multi-labelling', for example, AONM enriched in the US will also become US obligated nuclear material (USONM), and its subsequent use will have to meet the requirements of both Australian and US agreements. This is a common situation, that is, a significant proportion of AONM is also characterised as USONM and is accounted for both to ASNO and its US counterpart (the DOE).

Table 9—Australia's Bilateral Safeguards Agreements and their Dates of Entry into Force.

Country[1]	*Date of EIF*
Republic of Korea (ROK)	2 May 1979
UK	24 July 1979
Finland	9 February 1980
USA	16 January 1981
Canada	9 March 1981
Sweden	22 May 1981
France	12 September 1981
Euratom[2]	15 January 1982
Philippines[3]	11 May 1982
Japan	17 August 1982
Switzerland	27 July 1988
Egypt[3]	2 June 1989
Russian Federation[4]	24 December 1990
Mexico	17 July 1992
New Zealand[5]	1 May 2000
Czech Republic[3]	17 May 2002
USA covering supply to Taiwan, China[3]	17 May 2002
Hungary[3]	15 June 2002

The equivalence principle provides that where AONM loses its separate identity because of process characteristics (e.g. mixing), an equivalent quantity is designated AONM, based on the fact that atoms or molecules of the same substance are indistinguishable, any one atom or molecule being identical to any other of the same substance. In such circumstances, equivalent quantities of the products of such nuclear material may be derived by calculation or from operating plant parameters. It should be noted that the

1. This list does not include Australia's NPT safeguards agreement with the IAEA, concluded on 10 July 1974 (reproduced as Schedule 3 to the *Nuclear Non-Proliferation (Safeguards) Act 1987*).
   In addition to these Agreements, Australia also has an Exchange of Notes constituting an Agreement with Singapore Concerning Cooperation on the Physical Protection of Nuclear Materials, which entered into force on 15 December 1989.
   The texts of these Agreements are published in the Australian Treaty Series.
2. Euratom is the atomic energy agency of the European Union. For further details see Glossary.
3. In the case of the Czech Republic, Egypt, Hungary, the Philippines and the USA (covering supply to Taiwan), Administrative Arrangements pursuant to the Agreements have not been concluded, so in practice the Agreements have not yet entered into operation.
4. The Australia/Russia Agreement covers the processing (conversion, enrichment or fuel fabrication) of AONM in Russia on behalf of other partner countries, but does not permit the use of AONM by Russia.
5. The Australia/New Zealand agreement covers the supply of uranium for non-nuclear use.

principle of equivalence does not permit substitution by a lower quality material, e.g. enriched uranium cannot be replaced by natural or depleted uranium.

The proportionality principle provides that where AONM is mixed with other nuclear material, and is processed or irradiated, a proportion of the resulting material will be regarded as AONM corresponding to the same proportion as was AONM initially.

Some people are concerned that the operation of the equivalence principle means there cannot be assurance that 'Australian atoms' do not enter military programs. This overlooks the realities of the situation, that uranium atoms are indistinguishable from one another and there is no practical way of attaching 'flags' to atoms. The objective of Australia's bilateral agreements is to ensure that AONM in no way materially contributes to or enhances any military purpose. Even if AONM were to be in a processing stream with nuclear material subsequently withdrawn for military use, the presence of the AONM would add nothing to the quantity or quality of the military material (NB as noted elsewhere in this Report, those nuclear-weapon states eligible for the supply of Australian uranium have ceased production of fissile material for nuclear weapons).

Accounting for AONM

Australia's bilateral partners holding AONM are required to maintain detailed records of transactions involving AONM, and ASNO's counterpart organisations are required to submit regular reports, consent requests, transfer and receipt documentation to ASNO. ASNO accounts for AONM on the basis of information and knowledge including:

- reports from each bilateral partner;
- shipping and transfer documentation;
- calculations of process losses and nuclear consumption, and nuclear production;
- knowledge of the fuel cycle in each country;
- regular liaison with counterpart organisations and with industry; and
- reconciliation of any discrepancies with counterparts.

NUCLEAR REGULATION IN AUSTRALIA

Australia has two nuclear regulatory agencies: ASNO and ARPANSA—the Australian Radiation Protection and Nuclear Safety Agency.

ASNO is responsible for nuclear safeguards and physical protection: ensuring that nuclear materials and nuclear items—facilities, equipment, technology and nuclear-related materials—are appropriately regulated and accounted for. An important part of this responsibility is ensuring that Australia's treaty commitments are met, particularly that nuclear activities are conducted for exclusively peaceful purposes.

ASNO's responsibilities cover nuclear materials—uranium, thorium and plutonium—not radioactive materials as such. ASNO's legislation applies to all persons or organisations in Australian jurisdiction having relevant materials, items or technology. Principally this applies to ANSTO, as Australia's only nuclear operator, but also covers a diverse range of other entities including the uranium mines and associated transport and storage operations, private sector laboratories, educational institutions, and patent attorneys. ASNO's activities are based on a number of constitutional heads of power, especially external affairs (meeting treaty requirements).

ARPANSA is charged with responsibility for protecting the health and safety of people, and the environment, from the harmful effects of radiation (ionizing and non-ionizing). ARPANSA's responsibilities include:

- Promoting uniformity of radiation protection and nuclear safety policy and practices across jurisdictions of the Commonwealth, the States and the Territories;
- Providing advice to Government and the community on radiation protection;
- Providing advice to Government and the community on nuclear safety—reactors and visits by nuclear powered warships;
- Undertaking research and providing services in relation to radiation protection, nuclear safety and medical exposures to radiation;
- Regulating radiation protection and nuclear safety aspects of all Commonwealth entities involved in radiation or nuclear activities or dealings; and
- Approval of imports of radioactive material.

An area receiving increasing attention is that of radioactive sources. Historically, regulation of radioactive sources in Australia has focused on health and safety issues. Since September 2001, the possibility has been examined of terrorists attempting to use radiological dispersal devices (so-called 'dirty bombs'—conventional explosives used to disperse radioactive contaminants—though the possibility of non-explosive dispersal is also being taken into account), and attention has turned to the security of radiation sources. ASNO has been working closely with ARPANSA, and through ARPANSA State and Territory authorities, to reach agreement on the need for a national security standard and the drafting of such a standard. This will form the basis of significant work in the coming year.

REPORTING REQUIREMENTS

Table 10—Checklist of Reporting Requirements

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Information not included in this Report

Financial statements in respect of ASNO appear in the Annual Report of the Department of Foreign Affairs and Trade. The Auditor General does not audit ASNO/CWCO/ACTBO finances separately (some financial information is given at page 21 of this report).

Information on the operations of ASNO also appears in the 2001-02 Annual Report of the Department Foreign Affairs and Trade. In particular, any involvement in:

- industrial democracy;
- occupational health and safety;
- advertising and market research;
- ecologically sustainable development and environmental performance; and
- the Commonwealth Disability Strategy

appears in that report.

FREEDOM OF INFORMATION ACT 1982
SECTION 8 STATEMENT

This statement is published in order to meet the requirements of section 8 of the *Freedom of Information Act 1982* which commenced operation on 1 December 1982.

Section 8 requires departments and prescribed agencies to publish statements about their organisation, functions, decision-making powers, consultative arrangements, categories of documents maintained and facilities and procedures to enable members of the public to obtain access to documents under the Act. Departments and agencies must publish updated statements annually.

Information about the organisation and functions, decision-making powers and consultative arrangements of ASNO is found in earlier parts of this Annual Report. This statement provides additional details (where appropriate) of consultative arrangements and categories and availability of documents maintained by ASNO. The Report describes the Office as it existed in 2001-02 within the Foreign Affairs and Trade portfolio.

Documents are listed under three main headings: agreements; legislation and related documents; and other. All agreements/treaties are available from the Australian Treaty Series from Australian Government Bookshops. Treaty documents are also available from the ASNO website http://www.asno.dfat.gov.au.

All Acts and Regulations are available from the Australian Government Bookshops and some legislation is available from the Internet sites:

http://www.austlii.edu.au/au/legis/cth/consol_act

or

http://scaleplus.law.gov.au

Except where indicated, none of the documents under 'other' is available for a fee or for purchase by the public nor are they customarily made available free of charge.

Applications for release of documents under the *Freedom of Information Act 1982* should be addressed to the Director General, Australian Safeguards and Non-Proliferation Office.

Arrangements for outside participation

ASNO liaises with Federal, State and Territory government departments and authorities, authorities in countries with which Australia has bilateral nuclear safeguards agreements, the IAEA, the OPCW, the Provisional Technical Secretariat of the CTBTO, the private sector, and non-government organisations.

Views, suggestions, and comments in relation to policy formation and administration of enactments and regulations may be addressed to the Director General, Australian Safeguards and Non-Proliferation Office or to the Minister for Foreign Affairs.

General and media enquires relating to ASNO activities and responsibilities should be directed to the Director General, Australian Safeguards and Non-Proliferation Office—telephone number: (02) 6261 1920.

CATEGORIES OF DOCUMENTS HELD BY ASNO

Agreements

- Treaty on the Non-Proliferation of Nuclear Weapons. (This Treaty is reproduced as Schedule 2 to the *Nuclear Non-Proliferation (Safeguards) Act 1987*).
- Convention on the Physical Protection of Nuclear Material. (This Convention is reproduced as Schedule 4 to the *Nuclear Non-Proliferation (Safeguards) Act 1987*).
- Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction. (The Convention is reproduced as the Schedule to the *Chemical Weapons (Prohibition) Act 1994*.)
- Comprehensive Nuclear-Test-Ban Treaty. (The Treaty is reproduced as the Schedule to the *Comprehensive Nuclear Test-Ban Treaty Act 1998*.)
- Agreement between Australia and the IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons, covering nuclear material within Australia under NPT safeguards. (This Agreement is reproduced as Schedule 3 to the *Nuclear Non-Proliferation (Safeguards) Act 1987*.)
- Protocol additional to the Agreement between Australia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons.
- Agreements and Exchanges of Notes constituting an Agreement between the Government of Australia and other governments, and Agreements between the Government of Australia and the European Atomic Energy Community, concerning the peaceful uses of nuclear energy, covering transfers of nuclear material, material, equipment, components, information, technology and sensitive technology, and cooperation on the physical protection of nuclear materials. (For a complete list and texts of agreements, see the *Australian Treaties Library* available at www.austlii.edu.au/au/other/dfat or the *Australian Treaties Database* available at www.info.dfat.gov.au/treaties)

Legislation and Related Documents

- *Chemical Weapons (Prohibition) Act 1994.*
- Regulations under the *Chemical Weapons (Prohibition) Act 1994.*
- *Chemical Weapons (Prohibition) Amendment Act 1998.*
- *Comprehensive Nuclear Test-Ban Treaty Act 1998.*
- *Nuclear Non-Proliferation (Safeguards) Act 1987.*
- *Nuclear Non-Proliferation (Safeguards) (Consequential Amendments) Act 1988.*
- Declaration under the *Nuclear Non-Proliferation (Safeguards) Act 1987* regarding 'associated equipment' and 'associated material', dated 31 March 1987 (available from ASNO).
- Regulations under the *Nuclear Non-Proliferation (Safeguards) Act 1987.*
- *Nuclear Safeguards (Producers of Uranium Ore Concentrates) Charge Act 1993.*
- *South Pacific Nuclear Free Zone Treaty Act 1986.*

Other

- The Annual Reports of the Director of Safeguards, Director, CWCO and Director, ACTBO are included in the ASNO Annual Report (available from ASNO).
- Papers prepared in whole or in part by ASNO officers for presentation at conferences and meetings. Papers which are in the public domain are listed in Annex K to this Report.
- Technical and other reports, extracts from published literature and publications (including newspaper, newsletter and journal clippings), representations and other general correspondence, discussion papers, position papers, briefings to the Minister and senior officers, extracts from Parliamentary debates, questions and answers associated with nuclear safeguards issues. Working papers and files related to ASNO's safeguards, CWC and CTBT responsibilities.
- Minutes and working documents of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO).
- Industry information booklets and leaflets on the CWC (available from ASNO).
- Survey forms completed and returned by Australian companies and organisations relating to the applicability of the *Chemical Weapons (Prohibition) Act 1994*. Information in forms has been provided on a 'Commercial-in-Confidence' basis.
- A copy of Executive Council papers related to proclamation of Division 1 of Part 7; and sections 95, 96, 97, 99, 102, 103, and 104 of *the Chemical Weapons (Prohibition) Act 1994*.
- Documents related to the designation of the office of Director of Safeguards as the office whose occupant is the Director of the Chemical Weapons Convention Office, and to the designation of the Controller of Permits and Notifications under the Act.
- Minutes and working documents of the Organisation for the Prohibition of Chemical Weapons and of its Preparatory Commission.
- A register of the permits and notifications issued pursuant to the *Chemical Weapons (Prohibition) Act 1994*.
- Copies of forms approved by the Director for use pursuant to provisions of the *Chemical Weapons (Prohibition) Act 1994* (available from ASNO).
- Administrative Arrangements pursuant to bilateral nuclear agreements. The Administrative Arrangements are not available for public viewing as they have been agreed as being confidential between the Parties to the Agreements.
- Administrative Security Arrangements pursuant to the Silex Agreement.
- Joint Australian-United States Classification Guide for Enrichment of Uranium by the SILEX Process
- Arrangement between the Australian Safeguards and Non-Proliferation Office and the US Department of Energy Concerning Research and Development in Nuclear Material Control, Accountancy, Verification, Physical Protection, and Advanced Containment and Surveillance technologies for International Safeguards.
- Arrangement between the Government of Australia and the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organization on the conduct of activities

including post-certification activities, relating to international monitoring facilities for the Comprehensive Nuclear-Test-Ban-Treaty.

- Arrangement between the Australian Safeguards and Non-Proliferation Office and the Indonesian Nuclear Energy Control Board Concerning Cooperation on Nuclear Safeguards and Related Matters.
- Memorandum of Understanding for Cooperation and Exchange of Information in Nuclear Regulatory Affairs between the Australian Safeguards and Non-Proliferation Office and the Australian Radiation Protection and Nuclear Safety Agency.
- Permits and authorities (and registers thereof) issued by the Minister for Foreign Affairs or the Minister's delegate pursuant to sections 13, 16 or 18 of the *Nuclear Non-Proliferation (Safeguards) Act 1987*.
- A Nuclear Materials Accountancy and Control Procedures Manual.
- Delegations to the Director of Safeguards to exercise powers under the *Nuclear Non-Proliferation (Safeguards) Act 1987*.
- Documents relating to the declaration under section 57 of *the Nuclear Non-Proliferation (Safeguards) Act 19*87 of persons as inspectors for the purposes of that Act. List of persons so declared.
- Agendas, minutes and working documents of the IAEA, mostly concerned with the activities of its Department of Safeguards.

ANNEXES

ANNEX A—NUCLEAR MATERIAL WITHIN AUSTRALIA

Table 11—Nuclear Material within Australia at 30 June 2002

Category	*Quantity*[1]	*Intended End-use*
Source Material:		
Uranium ore concentrates (UOC) at mines	1,261 tonnes U_3O_8	Exports for energy use pursuant to bilateral agreements
Other UOC	4 tonnes U_3O_8	Research
Natural Uranium (other than UOC)	10,825 kg	Research and shielding
Depleted Uranium	10,499 kg	Research and shielding
Thorium (Th) in ore residues	59 tonnes Th	Storage
Thorium (other than ore residues)	1,902 kg	Research, industry
Special Fissionable Material:		
Uranium-235	171,607 g[2]	Research, radioisotope production
Uranium-233	5 g	Research
Plutonium (except Pu-238)[3]	2,046 g[4]	Research, neutron sources

ANNEX B—ASSOCIATED ITEMS WITHIN AUSTRALIA

Table 12—Associated Items within Australia at 30 June 2002

Category[5]	*Quantity*	*Intended End-use*
Associated Material:		
Deuterium and Heavy Water	18.1 tonnes	Research, including reactor operation
Nuclear grade graphite	115 tonnes	Incorporated in HIFAR and Moata reactors, and in storage
Associated Equipment:		
HIFAR research reactor		
Moata research reactor[6]		
Fuel charging and discharging machines	2	
HIFAR coarse control arms	11	
HIFAR safety rods (not in reactors)	2	
Gas centrifuge components	-	Dismantled
SILEX equipment	-	Enrichment R&D

1. These figures are based on reports received pursuant to Permit requirements and were correct at the time of preparing this Annual Report.
2. Most of this U-235 is contained in irradiated fuel elements which have been used in ANSTO's HIFAR reactor. The figure given here is based on the weight of U-235 in each fuel element before irradiation, in accordance with the accounting convention used in the application of IAEA safeguards to HIFAR and Moata fuel prior to shipment from ANSTO.
3. Plutonium with an isotopic concentration of plutonium-238 exceeding 80% is exempt from safeguards.
4. Because of the IAEA accounting convention mentioned above, this figure does not include any plutonium in irradiated reactor fuel. However this quantity is very small and in the event of reprocessing of the fuel, the contained plutonium is considered practicably irrecoverable.
5. In addition to the associated items listed, associated technology is held by ANSTO, Silex Systems Ltd., patent attorneys, and IP Australia.
6. The reactor fuel has been discharged and the control room dismantled pending final decommissioning.

ANNEX C—AONM OVERSEAS

Australian Obligated Nuclear Material Overseas[1]

Table 13—Locations and Quantities of AONM as at 31 December 2001

Category	*Location*	*Quantity (tonnes)*
Natural Uranium	Canada, Euratom, Japan, ROK, USA	20,800
Uranium in Enrichment Plants	Euratom, Japan, USA	21,409
Depleted Uranium	Euratom, Japan, USA	52,083
Low Enriched Uranium	Canada, Euratom, Japan, ROK, Switzerland, USA	7,480
Irradiated Plutonium	Canada, Euratom, Japan, ROK, Switzerland, USA	63.4
Separated Plutonium	Euratom, Japan	0.6
Thorium	USA	86
Total (tonnes)		101,922

1. The end-use for all AONM is for the production of electric power in civil nuclear reactors and for related R&D. AONM cannot be used for any military purpose.

   In accordance with the relevant agreements, Australia's bilateral safeguards agreement partners report on a calendar year basis.

   The actual quantities of AONM held in each country, and accounted for by that country pursuant to the relevant agreement with Australia, are considered by ASNO's counterparts to be confidential information. Totals above are based on annual reports under Australia's bilateral agreements (in the case of the US, preliminary data were used, see page 33) and other information held by ASNO.

   All quantities are given as tonnes weight of the element uranium, plutonium or thorium. In the case of uranium, the isotope weight of uranium-235 is, for natural uranium 0.711% of the element weight, for depleted uranium 0.20%, and for low enriched uranium in the range 1-5%.

   Irradiated plutonium comprises plutonium contained in irradiated power reactor fuel, or plutonium reloaded in a power reactor following reprocessing. Plutonium recovered from reprocessing is categorised as separated plutonium until it has been fabricated with uranium as MOX (mixed oxide) fuel and returned to a reactor for further power generation.

   There may be minor discrepancies in the above figures due to rounding.

Table 14—Transfers of AONM during 2001

Process[1]	*Quantity Uranium (tonnes)*	*Transfer Destination*
Conversion	1,349	Canada
	3,398	Euratom
	3,389	USA
Total transfers between jurisdictions to conversion plants	**8,136**	
Enrichment	432	USA
	1043	Euratom
Total transfers between jurisdictions to enrichment plants	**1475**	
Fuel Fabrication		
	124	Japan
	155	USA
	34	ROK
Total transfers between jurisdictions to fuel fabrication plants	**313**	
Reactor Irradiation	10	USA
	1	Mexico
Total transfers between jurisdictions to reactors	**11**	

1. The above figures are for transfers made during 2001 and do not include transfers made in earlier years. The figures do not include transfers of AONM made within the fuel cycle of a State (or of Euratom), only between jurisdictions. In addition to the above, there was one transfer of 56 kg of AONM to Euratom reprocessing plants in 2001 (quantity too small to show on Table).

ANNEX D—ACCOUNTING REPORTS TO THE IAEA

Australian Accounting Reports generated for the IAEA for the period 2001-02 under Australia's NPT Safeguards Agreement with the IAEA.

Table 15—Numbers of Accounting Reports generated for the IAEA

Number of Reports Sent	*MBA*	*ICR*	*PIL*	*MBR*	*Total*
HIFAR, ANSTO	AS-A	3	1	1	5
Moata, ANSTO	AS-B	0	0	0	0
R&D Laboratories, ANSTO	AS-C	12	5	4	21
Vault Storage, ANSTO	AS-D	0	1	2	3
Miscellaneous Locations	AS-E	3	0	0	3
Total		18	7	7	32

Table 16—Numbers of Entries covered by Accounting Reports generated for the IAEA

Number of Entries Covered by These Reports	*MBA*	*ICR*	*PIL*	*MBR*	*Total*
HIFAR, ANSTO	AS-A	5	25	8	38
Moata, ANSTO	AS-B	0	0	0	0
R&D Laboratories, ANSTO	AS-C	180	217	74	471
Vault Storage, ANSTO	AS-D	0	11	6	17
Miscellaneous Locations	AS-E	4	0	0	4
Total		189	253	88	530

Table 17—Routine Safeguards Inspections and Complementary Access performed by the IAEA during 2001-02

2001	*Type*	*2002*	*Type*
5-6 November	MBA AS-A, SN & CA	22 January	MBAs AS-A, AS-C, CA
8 November	Uranium mine CA	23 January	MBA AS-E, CA
		15-24 April	MBA AS-A, AS-C & AS-D, RI

RI	Routine Inventory Verification Inspection
CA	Complementary Access
SN	Short Notice Inventory Verification Inspection
MBA	Material Balance Area
ICR	Inventory Change Report
PIL	Physical Inventory Listing
MBR	Material Balance Report
LHSTC	Lucas Heights Science and Technology Centre

ANNEX E—IAEA STATEMENTS OF CONCLUSIONS FOR AUSTRALIA

IAEA Statements of Conclusions of Inspections in Australia.

During 2001-02 the IAEA carried out inspections in three of Australia's five Material Balance Areas (MBAs): AS-A, AS-C and AS-D. However, this is not the only monitoring of Australia carried out by the IAEA, as the Agency carries out a range of other activities, such as short notice inspections, complementary accesses and increased data collection and analysis.

The IAEA provides statements of conclusions of inspections under Article 91(b) of Australia's NPT Safeguards Agreement. At the time of writing this Report, the 91(b) statements for the annual inventory verifications of AS-A and AS-C, conducted in April 2002, had not been received from the IAEA. However, previous Article 91(b) statements have stated the conclusions set out in Table 18 (note that Activity (3) applies only to MBAs AS-A and AS-D), and ASNO anticipates this year's statement will be similar.

The statement for the March 2001 inspection of AS-A was received during this financial year. This showed a non-attainment of an IAEA quantity goal. This was due to material being inaccessible at the time of the inspection. However, there was no suggestion the material was missing, as the IAEA was able to verify it at a later inspection.

Table 18—IAEA Conclusions of Inspections in Australia

	Verification Activity	*Conclusion*
(1)	Examination of records	'The records satisfied the Agency requirements.'
(2)	Examination of Reports to the Agency	'The reports satisfied the Agency requirements.'
(3)	Application of Containment and Surveillance Measures	'The application of containment and surveillance measures adequately complemented the nuclear material accountancy measures.'
(4)	Verification of Physical Inventory	'The physical inventory declared by the operator was verified and the results satisfied the Agency requirements.'

Explanatory note on MBA AS-E

MBA AS-E covers all locations in Australia where safeguardable nuclear material is present, other than at Lucas Heights.

No IAEA statement under Article 91(b) of Australia's NPT Safeguards Agreement has been provided for this MBA since the IAEA has not inspected the nuclear material located there. This is because the quantities are too small to be of proliferation significance and in most cases have been exempted from active safeguards or have had safeguards terminated in accordance with the Agreement (Articles 36, 37, 38 and 39 of the Agreement refer).

Conclusions of Complementary Accesses

The IAEA provides statements of conclusions for each State in which Strengthened Safeguards is in force. These are provided under Article 10.c. of the additional protocol to

Australia's NPT Safeguards Agreement. The Statement for calendar year 2001 concluded as follows.

'Access pursuant to Article 4.a.(i) did not indicate the presence of undeclared nuclear material or activities at:

Lucas Heights Science and Technology Center, Building 42
Lucas Heights Science and Technology Center, Building 21
Lucas Heights Science and Technology Center, Building 3
Lucas Heights Science and Technology Center, Building 64
Lucas Heights Science and Technology Center, Building 22
Beverley Uranium Mine.

These conclusions are pending the results of environmental samples.'

ANNEX F—IAEA SAFEGUARDS STATISTICS[1]

Table 19—IAEA Safeguards Expenditure (US$ million)

	1999	*2000*	*2001*
Regular Budget expenditure	78.985	70.617[2]	69.971[2]
Extra budgetary funds expenditure	13.826	10.311	15.172

Table 20—IAEA Verification Activities

	1999	*2000*	*2001*
Number of inspectors	224	217	231
Inspections performed	2,495	2,467	2,487
Person-days of inspection	10,190	10,264	10,314
Number of seals applied to nuclear material or safeguards equipment, detached and subsequently verified	28,044	25,484	26,195
Films, video tapes and digital storage media items reviewed	6,304	6,099	5,402

Table 21—Approximate Quantities of Material Subject to IAEA Safeguards on 31 December 1999, 2000 and 2001

Tonnes	*1999*	*2000*	*2001*
Plutonium contained in irradiated fuel	628	644	678.9
Separated plutonium outside reactor cores	73.1	72.2	77.5
Recycled plutonium in reactor cores	8.0	10.7	11.5
Highly enriched uranium	21.2	21.8	20.9
Low enriched uranium	51,191	49,722	50,079
Source material (natural uranium or thorium)	92,150	91,699	94,940

Table 22—Number of Installations under IAEA Safeguards or Containing Safeguarded Material on 31 December 1999, 2000 and 2001

	Number of Installations		
Facility Type	*1999*	*2000*	*2001*
Power reactors	236	236	238
Research reactors and critical assemblies	168	168	160
Conversion plants	13	13	14
Fuel fabrication plants	45	43	41
Reprocessing plants	6	6	6
Enrichment plants	14	13	12
Separate storage facilities	71	75	79
Other facilities	97	95	94
Subtotals	650	649	645
Other locations and non-nuclear installations	443	454	454
Totals	1,093	1,094	1,099

1. Source of information: IAEA Annual Reports and Safeguards Implementation Reports for 1999-2001. All figures given are for calendar years.
2. The decrease in Regular Budget expenditure in 2000 and 2001, in US$, reflected currency movements—the IAEA's accounts are paid in Austrian Schillings.

ANNEX G—EXPENDITURE BY OPCW AND CTBTO PREPCOM

Table 23—Expenditure by the OPCW (Organisation for the Prohibition of Chemical Weapons) and CTBTO (Comprehensive Nuclear-Test-Ban Treaty Organisation) Preparatory Commission (US$ million)

	1999	2000	2001
OPCW[1]	55.2	56.2	49.8
CTBTO[2]	69.9	79.9	93.3

1. OPCW budget is in Netherlands Guilders—the above figures are unofficial conversions to US$ based on exchange rates as at 31 December in each year. Sources—'Report of the Organisation on the Implementation of the Convention' for 1999, 2000 and 2001.
2. Sources—CTBTO PrepCom Annual Reports, Programme and Budget documents.

ANNEX H—AUSTRALIAN SAFEGUARDS SUPPORT PROGRAM

CURRENT PROJECTS

Analytical Services for Environmental Sampling Environmental sampling is an important safeguards strengthening measure that will enhance the IAEA's capability to detect undeclared nuclear activities. ANSTO has demonstrated that mass spectrometry using a tandem accelerator can be used to analyse environmental samples with very high sensitivity.

ANSTO has demonstrated unequivocally that AMS (Accelerator Mass Spectroscopy) is the only technique capable of measuring U-236 at the low levels expected in environmental materials. Consequently, the IAEA asked ANSTO to measure U-236 in soil samples from Kosovo, as part of the UN Environment Program's study of the environmental and health consequences of the use of depleted uranium (DU) munitions.

The AMS facility at ANSTO is now a certified member of the IAEA's Network of Analytical Laboratories.

Re-Examination of Basic Safeguards Implementation Parameters During the 1990s the IAEA acknowledged the need, in parallel with the development of strengthened and integrated safeguards concepts, to re-examine basic safeguards implementation parameters, such as timeliness goals, significant quantities, and the categorisation of nuclear material for safeguards purposes.

Under this task ASNO has prepared papers for the IAEA—on timeliness verification goals, the categorisation of nuclear material, unannounced inspections and continuity of knowledge—which have been extensively used by the IAEA for the conceptual development of integrated safeguards. Work is currently underway on a further paper on the starting point of safeguards, but this paper had not been finalised by the end of the reporting period.

ASNO has also prepared several papers related to the development of integrated safeguards approaches to specific facility types (research reactors and light water reactors with and without MOX fuel) for SAGSI during the reporting period.

Expansion of the 'Physical Model' The Physical Model was developed for the IAEA by a panel of international experts (including ASNO staff) in support of enhanced information analysis in the context of strengthened and integrated safeguards. The Model identifies, describes and characterises all known fuel cycle technologies and processes, especially those required for the acquisition of weapons-usable fissile material, as a guide for IAEA analysts and inspectors.

As developed, the Physical Model is a living document subject to periodic review and update. During the reporting period ASNO, with support from ANSTO, contributed to the revision of the Physical Model to encompass hot cell operations.

The expansion of the Physical Model is still under way—the last part, 'Intermediate and High Active Waste Management', was reviewed by both ASNO and ANSTO and the completed version is pending. In addition, a general revision process has been set in train, initially looking particularly at the volumes on reprocessing and enrichment, and

consideration is being given to the further development of an electronic version of the Model.

Support for Information Review and Evaluation Since 1997, ASNO has undertaken for the IAEA a number of consultancy subtasks in this area which support the implementation of strengthened safeguards. Activities during the reporting period were as follows.

To evaluate information on mining and milling of uranium for safeguards purposes This task seeks to determine: the circumstances under which the IAEA might undertake complementary access to a uranium mining/milling site; what verification activities might be undertaken; and how declared information about mining/milling activities would be taken into account in an assessment on possible undeclared activities.

An interim report was submitted by ASNO in June 1998. The IAEA found the report very useful in helping it to develop new verification procedures under the Additional Protocol. Using an approach proposed by ASNO, the IAEA achieved highly conclusive results on the dating of uranium samples taken during the Agency's (first ever) complementary access to a uranium mine, the Ranger mine, in June 1999.

Currently ASNO, in collaboration with the IAEA, is working on further validation of the proposed method. This involved additional sampling and measurements at a series of uranium mines—the relevant visits took place in October 2001 and the samples are still being analysed. A paper presenting some preliminary results was presented at the 2002 INMM meeting.

In addition, ASNO and the IAEA are examining the use of remote sensing (satellite imagery) to confirm the operational status of uranium mines. ASSP and the Canadian Safeguards Support Program (CSSP) are cooperating on the analysis of these and related images. A paper presenting some preliminary results was presented at the 2002 INMM meeting. The completion date for this very successful project is set as December 2003.

To evaluate the ways in which technology transfers (both within and outside the internationally established export control regimes) contribute to clandestine weapon programs Under this subtask, the routes for transfer of technology needed to establish an undeclared capability for nuclear weapon production are being studied. ASNO has submitted a draft report to the IAEA.

TASKS COMPLETED DURING 2001-02

Application of the State-level Integration Concept on Fuel Cycles Under Safeguards Eleven Member States (Argentina, Australia, Belgium, Canada, Finland, France, Germany, Japan, Sweden, United Kingdom and United States) contribute to this joint task by developing integrated safeguards approaches for their nuclear fuel cycles and/or by helping the IAEA to derive generic guidance for the design of integrated safeguards approaches on the level of the state-as-a-whole.

ASNO is an active participant in this joint task. In early 2001, ASNO finalised its proposal for an integrated safeguards approach for Australia, thus contributing to Australia becoming the first country in which integrated safeguards were introduced. The IAEA commended ASNO's contribution to the joint task by the following conclusion:

> 'Under this task the Australian Support Program demonstrated a strong sense of leadership in the implementation of strengthened safeguards by providing a state-level safeguards approach for the Australian fuel cycle. This approach was part of

the background information for the Agency during the development of the in-house state-level safeguards approach for Australia. The task also contained some elements that were used by other support programs; specifically the Integrated Safeguards Evaluation Methodology developed by the U.S. Support Programme.'

In May 2002 the final Technical Coordination Meeting for this project was held in Vienna. The outstanding reports from the 11 Member States were presented and papers summarising further progress were given by Australia, Finland and Sweden.

Installation and Demonstration of Reactor Power Monitors at the HIFAR Reactor This task required the installation and demonstration of two categories of power monitor at ANSTO's HIFAR research reactor. The purpose was to test the suitability of these monitors for general application to large research reactors, for detection of reactor operation at higher than declared power levels, and undeclared shutdowns.

ANNEX I.1—MEDIA RELEASES 2001-2002

ASNO contributed to the following media releases during 2001-2002. Those marked with an asterisk are reproduced in this Annex.

11 July 2001/ D12: Australian Communications Hub to Support Nuclear Test Ban.

28 July 2001/ FA113: Australia and the Czech Republic Sign Safeguards Agreement.

2 August 2001/ FA116: Australian to Head International Safeguards Expert Group.*

9 August 2001/ FA120: Nuclear Safeguards Agreement between Australia and Hungary.

13 August 2001/ FA124: Safeguards Arrangements for Uranium Exports to Taiwan.*

5 October 2001/FA 154: The Australia Group: Tackling the Threat of Chemical and Biological Weapons.

15 November 2001/ FA168: Australia and the International Community Maintain Strong Support for Nuclear-Test-Ban Treaty.*

15 April 2002/ FA54: New $10m Station to Monitor Nuclear Explosions.*

13 June 2002/ FA89: New Measures to Fight the Spread of Chemical and Biological Weapons.*

ANNEX I.2—MEDIA RELEASE

MINISTER FOR FOREIGN AFFAIRS

Australian Minister for Foreign Affairs, Alexander Downer

2 AUGUST 2001

Australian to Head International Safeguards Expert Group

I am pleased to announce that Mr John Carlson, head of the Australian Safeguards and Non-Proliferation Office (ASNO) has been appointed by the Director General of the International Atomic Energy Agency (IAEA), Dr ElBaradei, as Chairman of the Standing Advisory Group on Safeguards Implementation (SAGSI). SAGSI is a group of international experts, which advises Dr ElBaradei on international safeguards matters.

Safeguards are a key element in international action against the spread of nuclear weapons. They comprise inspections and various technical measures aimed at verifying that States are meeting their commitment under the Nuclear Non-Proliferation Treaty and other treaties to use nuclear materials and facilities exclusively for peaceful purposes.

Mr Carlson's appointment reflects his expertise and international standing in this area and recognises Australia's leading role in strengthening the IAEA's safeguards system. In December 1997 Australia was the first country to bring into effect an Additional Protocol for strengthened safeguards, giving IAEA inspectors access to a wider range of locations and increased information about nuclear-related activities. In January 2001 Australia became the first country to qualify for the application of "integrated safeguards", the new IAEA safeguards system combining conventional and strengthened safeguards. Australia is encouraging and assisting others to conclude Additional Protocols, particularly in our region.

FA116/2001

ANNEX I.3—MEDIA RELEASE

MINISTER FOR FOREIGN AFFAIRS

Australian Minister for Foreign Affairs, Alexander Downer

13 August 2001/FA124 Safeguards Arrangements for Uranium Exports to Taiwan

The Minister for Foreign Affairs, Mr Downer, announced today that an Agreement was concluded in Washington on 31 July 2001 with the United States, which will facilitate the sale of Australian uranium to Taiwan.

The Agreement is consistent with the terms of Australia's recognition of the People's Republic of China in 1972, and Australia's role as a major supplier of energy and minerals commodities to Taiwan. The Australian Government has kept the Chinese Government fully informed of the proposed Agreement.

All of Australia's uranium is exported for exclusively peaceful purposes under bilateral safeguards agreements. Australia currently has 15 such agreements in place, covering 25 countries (one is with the European Atomic Energy Community, Euratom). Australia's network of nuclear bilateral safeguards agreements complements and builds upon the International Atomic Energy Agency's (IAEA's) safeguards regime.

Australia does not recognise Taiwan as a state and it is therefore not possible to negotiate a bilateral safeguards agreement with Taiwan. Australia, however, recognises that Taiwan has legitimate energy needs and that it has chosen nuclear power as part of its energy mix. Accordingly, an Agreement has been concluded with the United States providing for Australian uranium to be enriched in the United States, after which it would be transferred to Taiwan. Australian uranium destined for the Taiwan market will thereby be covered by the nuclear safeguards agreement between Australia and the United States, and agreements between the United States, Taiwan, and the IAEA. This arrangement is similar to one made by Canada in 1993.

Taiwan has made clear its strong commitment to nuclear non-proliferation, including through welcoming the indefinite extension of the Nuclear Non-Proliferation Treaty in 1995. Furthermore, it has accepted international safeguards on all its nuclear activities, including being amongst the first to implement the terms and conditions of the Additional Protocol for strengthened IAEA safeguards. Taiwan has also publicly stated in its '2000 National Defense Report" that its armed forces will not own, manufacture, or use nuclear weapons.

The Agreement is consistent with Australia's strong stance on preventing the proliferation of nuclear weapons while allowing the export of uranium for peaceful uses. It ensures that any transfer of Australian uranium to Taiwan is subject to IAEA safeguards and complies with Australia's longstanding policies for the control of nuclear materials.

It is anticipated that the Agreement will be tabled in Parliament this year. It will enter into force once Australia completes its domestic requirements.

ANNEX I.4—MEDIA RELEASE

MINISTER FOR FOREIGN AFFAIRS

Australian Minister for Foreign Affairs, Alexander Downer

FA168 / 15 November 2001 Australia and the International Community Maintain Strong Support for Nuclear-Test-Ban Treaty

The terrible events of 11 September, and their aftermath, have underlined the importance of renewed international commitment to the cause of the non-proliferation of weapons of mass destruction. The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is a central plank of the global nuclear non-proliferation regime.

I therefore welcome this week's affirmation in New York by the Conference on Facilitating the Entry into Force of the CTBT of the international community's strong commitment to the Treaty. The Conference Declaration also supported the moratorium on nuclear testing, pending entry into force of the CTBT, and called on countries yet to sign and ratify the Treaty to do so as soon as possible.

Australia played a significant role in the negotiation and acceptance of the CTBT. In 1996, I led international action to bring the Treaty to the United Nations General Assembly where it was adopted by an overwhelming majority. I had planned to lead Australia's delegation to the Conference and attend the parallel verification seminar, but was unable to do so due to the Australian election. Australia's Permanent Representative in New York, Mr John Dauth, led the delegation in my absence.

The Conference, held on 11 to 13 November, welcomed good progress in establishing the International Monitoring System (IMS), which will verify states' commitments to the Treaty. Australia is playing a central role in establishing this system by hosting 20 IMS stations, the third largest number of stations of any Treaty signatory. Australia presently has the largest number of IMS certified stations.

Australia also co-sponsored with Canada, Sweden and VERTIC (the Verification Research, Training and Information Centre, a London-based international policy institute) a seminar on CTBT verification at the UN on 12 November, to coincide with the CTBT Conference. The seminar highlighted the strengths of the CTBT's verification system.

The CTBT now constitutes a powerful international standard against further nuclear testing, with 161 signatures and 87 ratifications, including, most recently, two regional countries, Singapore and Nauru. But the Treaty must enter into force for its full benefit to be realised. This requires all 44 countries with significant civilian nuclear technology to ratify it. So far, 31 of these 44 have done so. Australia does not underestimate the obstacles to be overcome to secure entry into force, but will work steadfastly with other supporters of the CTBT until our goal is achieved.

ANNEX I.5—MEDIA RELEASE

MEDIA RELEASE

MINISTER FOR FOREIGN AFFAIRS
ALEXANDER DOWNER

FA54 15 April 2002

NEW $10M STATION TO MONITOR NUCLEAR EXPLOSIONS

I am very pleased to open the recently completed Cape Leeuwin hydroacoustic monitoring station – one of 20 such stations to be built in Australia to detect clandestine nuclear explosions.

The $10 million station will form part of a worldwide chain of 321 stations now being established to monitor compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

The Cape Leeuwin station is significant as one of only six hydrophone stations in the global chain. Situated on the southwest tip of Australia, it will monitor for signs of underwater explosions over large areas of the Indian, Southern and South Pacific Oceans.

Over the last three decades, successive Australian governments have opposed nuclear testing. But it was not until the 1990s that the international community had the chance to negotiate a ban at the Conference on Disarmament in Geneva.

Adoption of the test-ban treaty by the Conference on Disarmament was blocked at the last minute but on Australia's initiative, the treaty was taken to the United Nations General Assembly in 1996 where it was finally passed.

The CTBT has now been signed by 165 countries and ratified by 90, including Australia. While the CTBT is not yet in force, a ban on nuclear testing has become a strong and widely accepted standard of international behaviour.

This new monitoring station is concrete evidence of Australia's continuing commitment to the CTBT. With 20 such stations and a laboratory in the pipeline, Australia will have the third-largest number of monitoring stations of any country.

Thirteen of our eventual 20 stations are already operating as part of the international monitoring system. Data from them is already being received in Vienna in preparation for the Test Ban Treaty's entry into force.

Australia will continue to urge other countries to sign and ratify the Treaty, especially those whose ratification is required to bring the Treaty into force.

We will also continue to work tirelessly to complete the verification system of which the Cape Leeuwin station is a vital part.

ANNEX I.6—MEDIA RELEASE

MEDIA RELEASE

MINISTER FOR FOREIGN AFFAIRS
ALEXANDER DOWNER

FA89 13 June 2002

NEW MEASURES TO FIGHT THE SPREAD OF CHEMICAL AND BIOLOGICAL WEAPONS

I welcome the decision by Australia Group countries to tighten their export controls on materials, equipment and technology which could be used in chemical or biological warfare.

Australia, as permanent chair of the Group, continues to play a pivotal role in international efforts to tackle this grave threat to global security.

The agreement last week by the Group's 34 participants aims to prevent the inadvertent or illicit spread of chemical and biological weapons, including to terrorist groups.

All members of the Group – which includes countries from Europe, the Americas and the Asia-Pacific – are parties to the Chemical Weapons Convention and the Biological Weapons Convention. These conventions legally oblige state parties not to aid the development and production of such weapons. Export controls play a central role in fulfilling this obligation.

Other key decisions at the Group's annual meeting in Paris included:

- To adopt formal guidelines governing the licensing of sensitive chemical and biological items, consistent with the Group's strong commitment to transparency;
- To include in these guidelines a 'catch-all' provision, reflecting the resolve of participating national governments to use all means at their disposal to fight the spread of chemical and biological weapons (CBW);
- To apply more rigorous controls to the export of fermenters;
- To add eight new toxins to the Group's biological control list;
- To control technology associated with dual-use biological equipment which could be used to manufacture biological weapons; and
- To control the intangible transfer of relevant information and knowledge.

The Group, created in 1985, has also released a booklet to promote awareness of the CBW threat. The booklet, *Fighting the spread of chemical and biological weapons: strengthening global security*, will complement the Australia Group website at www.australiagroup.net

ANNEX J—STATUS OF AUSTRALIAN IMS STATIONS

Table 24—Australian IMS Stations—Status as at 30 June 2002

	Status[1]	*Operator*[2]
Primary Seismic Stations		
Warramunga, NT	C	ANU
Alice Springs, NT	X	GA/USA
Stephens Creek, NSW	T	GA
Mawson, Antarctica	XU	GA
Auxiliary Seismic Stations		
Charters Towers, QLD	X	GA
Fitzroy Crossing, WA	T	GA
Narrogin, WA	X	GA
Infrasound Stations		
Warramunga, NT	C	ANU
Hobart, TAS	U	*GA*
Shannon, WA	U	*GA*
Cocos Islands	S	*GA*
Davis Base, Antarctica	S	*GA*
Radionuclide Stations		
Melbourne, VIC	C	ARPANSA
Perth, WA	C	ARPANSA
Townsville, QLD	C	ARPANSA
Darwin, NT	T	ARPANSA
Cocos Islands	U	*ARPANSA*
Macquarie Island, TAS	S	*ARPANSA*
Mawson, Antarctica	S	*ARPANSA*
Radionuclide Laboratory		
Melbourne, VIC	XU	ARPANSA
Hydroacoustic Stations		
Cape Leeuwin, WA	C	*GA*

1. Status codes

X existing station (upgrade required—except radionuclide lab).
S site survey work underway or completed.
U establishment/upgrade work underway or completed.
T testing and evaluation underway for certification against CTBT standards.
C certified against CTBT standards.

2. Operators

GA Geoscience Australia
ANU Australian National University
ARPANSA Australian Radiation Protection and Nuclear Safety Agency

(Anticipated operators shown with italics.)

ANNEX K—ASNO PUBLICATIONS AND PRESENTATIONS

Publications and presentations by ASNO staff (in some cases in collaboration with others) during 2001-2002 which are available to the public:

General

1. John Carlson and Russell Leslie, *Nuclear Non-Proliferation: The Role of Complementary Regimes*, Journal of Nuclear Materials Management, Summer 2002; INMM 43rd Annual Meeting, Orlando, Florida, USA 23-27 June 2002.

2. Russell Leslie, Annette Berriman, Malcolm Coxhead, John Howell and John Carlson, *Synergies Between the WMD Verification Regimes: Working Towards a Common Goal*, ESARDA 24th Annual Meeting, Luxembourg, 28-30 May 2002.

Safeguards

3. Leslie, R., Riggs, P. and Carlson, J., *The Role of Remote Monitoring Under Integrated Safeguards*, INMM 43rd Annual Meeting, Orlando, Florida, USA 23-27 June 2002.

4. Leslie, R., Truong, Q.S., Borstad, G., Staenz, K., Neville, R., Riggs, P., and Bragin, V., *Satellite Imagery for Safeguards Purposes: Utility of Panchromatic and Multispectral Imagery for Verification of Remote Uranium Mines*, INMM 43rd Annual Meeting, Orlando, Florida, USA 23-27 June 2002.

5. John Carlson and Russell Leslie, *Integrated Safeguards: A Case of the Good Being the Enemy of the Best?*, INMM 43rd Annual Meeting, Orlando, Florida, USA 23-27 June 2002.

6. David Donohue, Valeri Maiorov, Mikhail Ryjinski, Victor Bragin, Brian Ffrost, *Use of Gamma Spectrometry for the Verification of Uranium Mining Activities*, INMM 43rd Annual Meeting, Orlando, USA, 23-27 June 2002.

7. Andrew Leask, *Regional cooperation—nuclear training in Indonesia*, DFATNEWS Vol 9 No 5, May 2002.

8. Nick Doulgeris, Brian Ffrost, Andrew Leask and Russell Leslie, *Implementation of Physical Protection at Australian Uranium Mines*, BATAN/IAEA Symposium, Jakarta, Indonesia, May 2002.

9. Andrew Leask, Russell Leslie and Geoff Wainwright, *Combating the Illicit Trafficking of Nuclear and Radioactive Material in and from Australia,* BATAN/IAEA Symposium, Jakarta, Indonesia, May 2002.

10. Russell Leslie, *Nuclear safeguards—Australian regional outreach activities*, DFATNEWS Vol 9 No.3, March 2002.

11. John Carlson, *Nuclear Safeguards: Developments and Challenges*, Verification Yearbook 2001, VERTIC (Verification Research, Training and Information Centre, London), December 2001.

12. Victor Bragin, *ASNO contributes to the improvement of the IAEA verification activities at uranium mines*, DFATNEWS Vol 8 No.11, November 2001.

13. John Carlson, Victor Bragin and Russell Leslie, *Integrated Safeguards: Australian Views and Experience*, ESARDA/INMM/IAEA Symposium, Vienna, Austria, 29 October-2 November 2001.

14. Valeri Maiorov, Mikhail Ryjinski and Victor Bragin, *Detection of Uranium Mining Activities*, ESARDA/INMM/IAEA Symposium, Vienna, Austria, 29 October-2 November 2001.

15. Victor Bragin, John Carlson and Russell Leslie, *Implementation of the Additional Protocol: Verification Activities at Uranium Mines and Mills*, ESARDA/INMM/IAEA Symposium, Vienna, Austria, 29 October-2 November 2001.

16. Victor Bragin, John Carlson and Russell Leslie, *Integrated Safeguards: How Much Flexibility is Possible and Acceptable?,* ESARDA/INMM/IAEA Symposium, Vienna, Austria, 29 October-2 November 2001.

17. Victor Bragin, John Carlson, Russell Leslie, Rudolf Schenkel, John Magill and Klaus Mayer, *Proliferation Resistance and Safeguardability of Innovative Nuclear Cycles*, ESARDA/INMM/IAEA Symposium, Vienna, Austria, 29 October-2 November 2001.

18. Victor Bragin, *Australian Training Course on Nuclear Safeguards for DPRK and other Asian Personnel*, DFATNEWS Vol 8 No.8, August 2001.

19. John Carlson, Victor Bragin and Russell Leslie, *Integrated Safeguards—Australia's Views and Experience*, INMM 42nd Annual Meeting, Indian Wells, USA, 15-19 July 2001.

20. Russell Leslie, Victor Bragin and John Carlson, *Safeguards Inspections—Practical Unpredictability*, INMM 42nd Annual Meeting, Indian Wells, USA, 15-19 July 2001.

21. Russell Leslie, Victor Bragin, and John Carlson, *Integrated Safeguards—Research Reactors and Critical Facilities*, INMM 42nd Annual Meeting, Indian Wells, USA, 15-19 July 2001.

22. Russell Leslie, Victor Bragin and John Carlson, *Australian Safeguards Support Program*, INMM 42nd Annual Meeting, Indian Wells, USA, 15-19 July 2001.

Chemical/biological

23. Josy Meyer, *Australian Experiences with CWC Implementation,* CWC Workshop, Nadi, Fiji, 10-11 June, 2002.

24. Josy Meyer, *OPCW Workshop in the South Pacific,* DFATNEWS Vol 9 No. 6, June 2002.

25. John Howell, *Iraq's Biological Weapons Rationale,* Australian National Forensic Science Conference, Canberra, Australia, 13-17 May 2002.

26. John Howell, *Chemical and Biological Warfare-Related Regulation in Australia,* Medical Officer NBC Defence Course, Bonegilla, Victoria, Australia, 15-26 April, 2002.

27. John Howell, *Stronger Controls to Prevent Misuse of Chemicals,* PACIA Newsletter, January 2002.

28. John Howell, *ASNO and Chemical and Biological Regulation in Australia,* CBW Course, Geelong, Australia, 3-6 December, 2001.

29. Geoff Shaw, Josy Meyer, Robert Mathews and John Webb, *Chemical Weapons Convention Regional Workshop and Symposium*, OPCW Synthesis, Autumn/September 2001, pp 33-34.

30. Geoff Shaw, *The CWC and Challenge Inspections,* Alice Springs, Australia, September 2001.

CTBT

31. Malcolm Coxhead and Susan Coles, *CTBT: On-Site Inspection Point of Entry Activities—So much to do, so little time*, OSI Workshop 8, Vienna, Austria, 24-27 June 2002.

32. Malcolm Coxhead, *Foreign Minister opens new nuclear test monitoring station*, DFATNEWS Vol 9 No.4, April 2002.

33. Malcolm Coxhead and Susan Coles, *Managed Access—A Common Thread in Verification*, OSI Workshop 7, Beijing, China, 15-19 October 2001.

GLOSSARY OF ABBREVIATIONS, ACRONYMS AND DEFINITIONS

ABACC	Brazilian-Argentine Safeguards Agency.
Additional Protocol	Published as IAEA document INFCIRC/540, the Additional Protocol is designed to complement a State's Safeguards Agreement with the IAEA, in order to strengthen the effectiveness and improve the efficiency of the safeguards system.
ANSTO	Australian Nuclear Science and Technology Organisation.
AONM	Australian Obligated Nuclear Material is nuclear material which is subject to obligations pursuant to one of Australia's bilateral safeguards agreements. In practice it relates to Australian uranium and nuclear material derived from it (e.g. uranium hexafluoride, low enriched uranium, depleted uranium, plutonium).
AOPu	Australian Obligated Plutonium (i.e. plutonium which is AONM).
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency.
ASSP	Australian Safeguards Support Program.
BAPETEN	Nuclear Energy Control Board (Indonesia).
BATAN	National Nuclear Energy Agency (Indonesia).
BWC	Biological Wapons Convention—full title: Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction.
BWR	Boiling Water Reactor: an LWR in which the moderator/coolant is used directly to produce steam for electricity generation.
CD	Conference on Disarmament.
Challenge inspection	Under the CWC, an inspection that can be initiated by a State Party to resolve suspicions about a particular site.
Classical safeguards	The system of safeguards based on the IAEA's INFCIRC/153.
Complementary Access	The right of the IAEA pursuant the Additional Protocol to access a location to carry out verification activities.
Comprehensive safeguards agreement	Agreement between a state and the IAEA for the application of safeguards to all of the state's current and future nuclear activities (equivalent to 'full scope' safeguards)—based on INFCIRC/153.
Conversion	Processing of natural uranium into a gaseous compound, uranium hexafluoride, for use as the feedstock for uranium enrichment.
CPPNM	Convention on the Physical Protection of Nuclear Material.
CTBT	Comprehensive Nuclear-Test-Ban Treaty.
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organisation—Vienna based international organisation established to give effect to the CTBT.
CTBT PrepCom	Comprehensive Nuclear-Test-Ban Treaty Preparatory Commission.
CWC	Chemical Weapons Convention.

Depleted uranium	Uranium having a U-235 content less than that found in nature (i.e. as a result of uranium enrichment processes).
DFAT	Department of Foreign Affairs and Trade.
Direct-Use Material	Nuclear material defined *for safeguards purposes* as being usable for nuclear explosives without transmutation or further enrichment, e.g. plutonium, high-enriched uranium (HEU) and U-233.
Discrete organic chemical (DOC)	Any chemical belonging to the class of chemical compounds consisting of all compounds of carbon, except for its oxides, sulphides and metal carbonates, identifiable by chemical name, by structural formula, if known, and by Chemical Abstracts Service (CAS) registry number, if assigned. Long chain polymers are not included in this definition.
DOE	United States Department of Energy.
DPRK	Democratic People's Republic of Korea.
Enrichment	A physical or chemical process for increasing the proportion of a particular isotope. Uranium enrichment involves increasing the proportion of U-235 from its level in natural uranium, 0.711%: for LEU fuel the proportion of U-235 (the enrichment level) is typically increased to between 3% and 5%.
ESARDA	European Safeguards Research and Development Association.
Euratom	The Atomic Energy Agency of the European Union. Its Safeguards Office is responsible for the application of safeguards to all nuclear material in Austria, Belgium, Denmark, Finland, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Sweden; and to all nuclear material in civil facilities in France and the UK.
Facility	(for CWC purposes) A plant, plant site or production/processing unit. [NB. for legal purposes, the term 'Facility', as it appears in provisions of the *Chemical Weapons (Prohibition) Act*, has the same meaning as 'plant site'].
Facility Attachment	(for safeguards purposes) A document agreed between the IAEA and the relevant Member State which specifies the nuclear materials accountancy system for a specific facility, and defines the format and scope of inspection activities.
Fast breeder reactor (FBR)	A type of fast neutron reactor—see below.
Fast neutron	A neutron in the 'fast' energy range (>0.1 MeV).
Fast neutron reactor	A reactor that operates mainly with neutrons in the fast energy range. Because a moderator is not used, a fuel with a high energy density is required, usually plutonium (more specifically, MOX with a high proportion, e.g. 20-30%, of plutonium) or HEU. Through transmutation of U-238, a *fast breeder reactor* is designed to produce more plutonium than it consumes. However fast neutron reactors can also be operated as net plutonium consumers.
Fissile	Referring to a nuclide capable of undergoing fission by 'thermal' neutrons (e.g. U-233, U-235, Pu-239).

Fission	The splitting of an atomic nucleus into roughly equal parts, often by a neutron. In a fission reaction, a neutron collides with fissile nuclide (e.g. U-235) and splits, releasing energy and new neutrons. Many of these neutrons may go on to collide with other fissile nuclei, setting up a nuclear chain reaction.
Fissionable	Referring to a nuclide capable of undergoing fission by 'fast' neutrons (e.g. Pu-240, Pu-242).
FMCT	Proposed Fissile Material Cut-off Treaty.
Full Scope Safeguards	The application of IAEA safeguards to all of a state's present and future nuclear activities—now more commonly termed *comprehensive safeguards*.
GA	Geoscience Australia (formerly AGSO).
Graphite	A form of carbon, used as a moderator in certain types of nuclear reactor. Graphite is a very efficient moderator, enabling uranium to be used in a fission reactor without enrichment.
GW	Gigawatt (Giga = billion, 10^9).
GWe / GWt	Gigawatts of electrical / thermal power.
Heavy water (D_2O)	Water containing the 'heavy' hydrogen isotope deuterium (hydrogen 2) which consists of a proton and a neutron. D_2O occurs naturally as about one part in 6000 of ordinary water. D_2O is a very efficient moderator, enabling uranium to be used in a fission reactor without enrichment.
HEU	High enriched uranium. Uranium enriched to 20% or more in U-235. *Weapons-grade* HEU has been enriched to over 90% U-235.
HIFAR	High Flux Australian Reactor: the 10 MWt research reactor located at ANSTO's Lucas Heights Research Laboratories.
HTGCR	High temperature gas-cooled reactor.
Hydroacoustic	Term referring to underwater propagation of pressure waves (sounds).
IAEA	International Atomic Energy Agency.
ICR	Inventory Change Report. A term used in nuclear materials accountancy.
IDC	International Data Centre. Data gathered by monitoring stations of the CTBT IMS network are compiled, analysed and archived by the Vienna based IDC. IDC products giving the results of analyses are made available to CTBT signatories.
IMS	International Monitoring System—a network of 337 monitoring stations and analytical laboratories established pursuant to the CTBT which, together with the IDC, gather and analyse data with the aim of detecting any explosive nuclear testing.
Indirect-Use Material	Nuclear material that cannot be used for a nuclear explosive without transmutation or further enrichment, e.g. depleted uranium, natural uranium, low-enriched uranium (LEU), and thorium.
INFCIRC	Information Circular. A series of documents published by the IAEA setting out, *inter alia*, safeguards, physical protection and

	export control arrangements.
INFCIRC/66 Rev.2	The model safeguards agreement used by the IAEA since 1965. Essentially this agreement is facility-specific. In the case of non-nuclear-weapon states party to the NPT, it has been replaced by INFCIRC/153.
INFCIRC/153 (Corrected)	The model agreement used by the IAEA as a basis for negotiating safeguards agreements with non-nuclear-weapon States Party to the NPT.
INFCIRC/225 Rev.4.(Corr)	IAEA document entitled 'The Physical Protection of Nuclear Material and Nuclear Facilities'. Its recommendations reflect a consensus of views among IAEA Member States on desirable requirements for physical protection measures on nuclear material and facilities, that is, measures taken for their physical security.
Infrasound	Sound in the frequency range of 0.02 to 4 Hertz. One category of CTBT IMS stations will monitor sound at these frequencies with the aim of detecting explosive events such as a nuclear test explosion at a range up to 5000 km.
INMM	Institute of Nuclear Materials Management—an international professional association.
Integrated safeguards	The combination of 'classical' and strengthened safeguards measures to give optimal effectiveness and cost-efficiency.
ISD	International Security Division, DFAT.
Isotopes	Nuclides with the same number of protons, but different numbers of neutrons, e.g. U-235 (92 protons and 143 neutrons) and U-238 (92 protons and 146 neutrons). The number of neutrons in an atomic nucleus, while not significantly altering its chemistry, does alter its properties in nuclear reactions.
LEU	Low Enriched Uranium; uranium enriched to less than 20% in U-235. Commonly, LEU for use as LWR fuel is enriched to between 3% and 5% U-235.
LWR	Light Water Reactor. The most common type of power reactor, using ordinary (light) water as the moderator and coolant. Because light water is not an efficient moderator the uranium fuel must be slightly enriched (LEU).
MBA	Material Balance Area. A term used in nuclear materials accountancy.
MBR	Material Balance Report. A term used in nuclear materials accountancy.
Moata	ANSTO's 'university training reactor' (Moata means 'firestick' in an Aboriginal language). Now defuelled and awaiting decommissioning.
Moderator	A material used to slow *fast* neutrons to *thermal* speeds where they can readily be absorbed by U-235 or plutonium nuclei and initiate a fission reaction. The most commonly used moderator materials are light water, heavy water or graphite.
MOX	Mixed oxide reactor fuel, consisting of a mixture of uranium and plutonium oxides—for fresh LWR fuel the plutonium content is

	typically around 5-7%.
MUF	Material Unaccounted For. A term used in nuclear materials accountancy—the difference between operator records and the verified physical inventory.
MW	Megawatt (Mega = million, 10^6).
MWe / MWt	Megawatts of electrical / thermal power.
Natural uranium	In nature uranium consists predominantly of the isotope U-238 (approx. 99.3%), with the fissile isotope U-235 comprising only 0.711%.
NCG	National Consultative Group, established by the Minister for Foreign Affairs in 1998 to provide advice in the context of negotiations on strengthening the BWC.
NAC	Nuclear Accountancy and Control.
NNWS	Non-nuclear-weapon state(s)—see NWS.
NPT	Treaty on the Non-Proliferation of Nuclear Weapons.
Nuclide	Nuclear species characterised by the number of protons (atomic number) and the number of neutrons. The total number of protons and neutrons is called the mass number of the nuclide.
NWS	Nuclear-weapon state(s): those states recognised by the NPT as having nuclear weapons when the Treaty was negotiated (specifically, as at 1 January 1967), namely, US, UK, Russia, France and China.
OCPF	Other Chemical Production Facility: a facility that produces discrete organic chemicals in quantities exceeding thresholds defined in the CWC.
OPCW	Organization for the Prohibition of Chemical Weapons.
OSI	On-Site Inspection—a short notice 'challenge type inspection' provided for in the CTBT as a means for investigation concerns about serious non-compliance the testing prohibition.
PIL	Physical Inventory Listing. A term used in nuclear materials accountancy.
Plant	For CWC purposes, is defined as a relatively self-contained area, structure or building containing one or more units for the production, processing or consumption of a chemical, along with associated infrastructure.
Plant site	For CWC purposes, is defined as the local integration of one or more plants, with any intermediate administrative levels, which are under one operational control, and includes common infrastructure.
Production	For CWC purposes, is defined as the formation of a chemical through chemical reaction. Production of chemicals specified by the CWC is declarable, even if produced as intermediates and irrespective of whether or not they are isolated.
Programmatic	Refers to an agreed delineated fuel cycle program (facilities and activities).
PWR	Pressurised water reactor: an LWR in which the moderator/coolant heats a secondary cooling circuit that produces

	steam for electricity generation.
R&D	Research and Development.
Reprocessing	Processing of spent fuel to separate uranium and plutonium from highly radioactive fission products.
ROK	Republic of Korea.
S/RD	Shipper/Receiver Difference. A term used in nuclear materials accountancy.
SAGSI	Standing Advisory Group on Safeguards Implementation: an international group of experts advising the Director General of the IAEA.
SPNFZ	South Pacific Nuclear Free Zone.
SSAC	State System of Accounting for and Control of Nuclear Material: the national safeguards system required of each state under its safeguards agreement with the IAEA.
Toxin	Compound originating from microorganisms, animals or plants, irrespective of the method of production, whether natural or modified, that can death, disease or ill health to humans, animals or plants.
TW	Terawatt (tera = trillion, 10^{12}).
TWh	Terawatt hours.
U-233	Isotope 233 of uranium, produced through neutron irradiation of thorium-232.
U-235	Isotope 235 of uranium (occurs as 0.711% of natural uranium), comprising 92 protons and 143 neutrons.
U-238	Isotope 238 of uranium (occurs as about 99.3% of natural uranium), comprising 92 protons and 146 neutrons.
UF_6	Uranium hexafluoride, a gaseous compound of uranium and fluorine used as the feedstock for most enrichment processes.
UOC	Uranium Ore Concentrates (e.g. yellowcake).
U_3O_8 equivalent	Not all UOC has the same composition, thus all weights in this Report are given as the quantity of U_3O_8 that contains the same amount of uranium as the UOC in question.
WMD	Weapons of mass destruction (nuclear, chemical, biological).

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