AUSTRALIAN SAFEGUARDS AND NON-PROLIFERATION OFFICE

ANNUAL REPORT 2003-2004

Director General ASNO

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Cover:

An Ammunition Technical Officer from the Directorate of Munitions Operations and Support demilitarising an empty WWII 250 lb chemical bomb. *Photograph courtesy of Graphics/Guided Weapons Explosive Ordnance (GWEO), Defence Materiel Organisation.*

Australian Government

Australian Safeguards and Non-Proliferation Office

20 September 2004

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

Dear Mr Downer

I submit my Annual Report covering the operations of the Australian Safeguards and Non-Proliferation Office for the financial year ended 30 June 2004. This report is made pursuant to section 51 of the *Nuclear Non-Proliferation (Safeguards) Act 1987*, section 96 of the *Chemical Weapons (Prohibition) Act 1994* and section 71 of the *Comprehensive Nuclear Test-Ban Treaty Act 1998*.

As outlined in this Report, all relevant statutory and treaty requirements were met, and ASNO found no unauthorised use of nuclear materials or nuclear items in Australia. 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. All Australian Obligated Nuclear Material (AONM) was accounted for.

During the year ASNO continued its substantial contribution to the development and strengthening of IAEA safeguards and other international regimes concerned with weapons of mass destruction (WMD), including the Proliferation Security Initiative (PSI). Domestically, ASNO contributed to reviews of WMD-related legislation and administration, including security arrangements for hazardous materials, and was closely involved in safeguards and security aspects of ANSTO's replacement research reactor project.

Yours sincerely
John Carlson

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.

REPORTING REQUIREMENTS FOR COMMONWEALTH BODIES

The reporting requirements for Annual Reports are listed in *Requirements for Annual Reports for Departments, Executive Agencies and FMA Act Bodies—Department of Prime Minister and Cabinet June 2004*. The following table lists the locations of each such requirement included in this Annual Report.

Information included in this report

Table 1: 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 finances separately (some summary financial information is given at page 23 of this Report).

Certain information on the administration of ASNO appears in the 2003-04 Annual Report of the Department Foreign Affairs and Trade, specifically, that pertaining to:

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

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SCOPE OF THIS ANNUAL REPORT

The position of Director General Australian Safeguards and Non-Proliferation Office (ASNO) encompasses the statutory responsibilities of Director of Safeguards, Director, Chemical Weapons Convention Office (CWCO) and Director, Australian Comprehensive Test Ban Office (ACTBO).

The *Non-Proliferation Legislation Amendment Act 2003* amended the legislation administered by ASNO, *inter alia*, to enable the separate Offices and Director positions to be formally consolidated under a common title. In May 2004 the Minister approved designation of the Australian Safeguards Office and CWCO as ASNO, and the positions of Director of Safeguards and Director, Chemical Weapons Convention Office, as Director General ASNO. This confirms arrangements that have been in place informally for several years.

Following the proclamation of provisions of the *Comprehensive Nuclear Test-Ban Treaty Act 1998* on 11 June 2004, similar action is proposed in relation to ACTBO early in 2004-05.

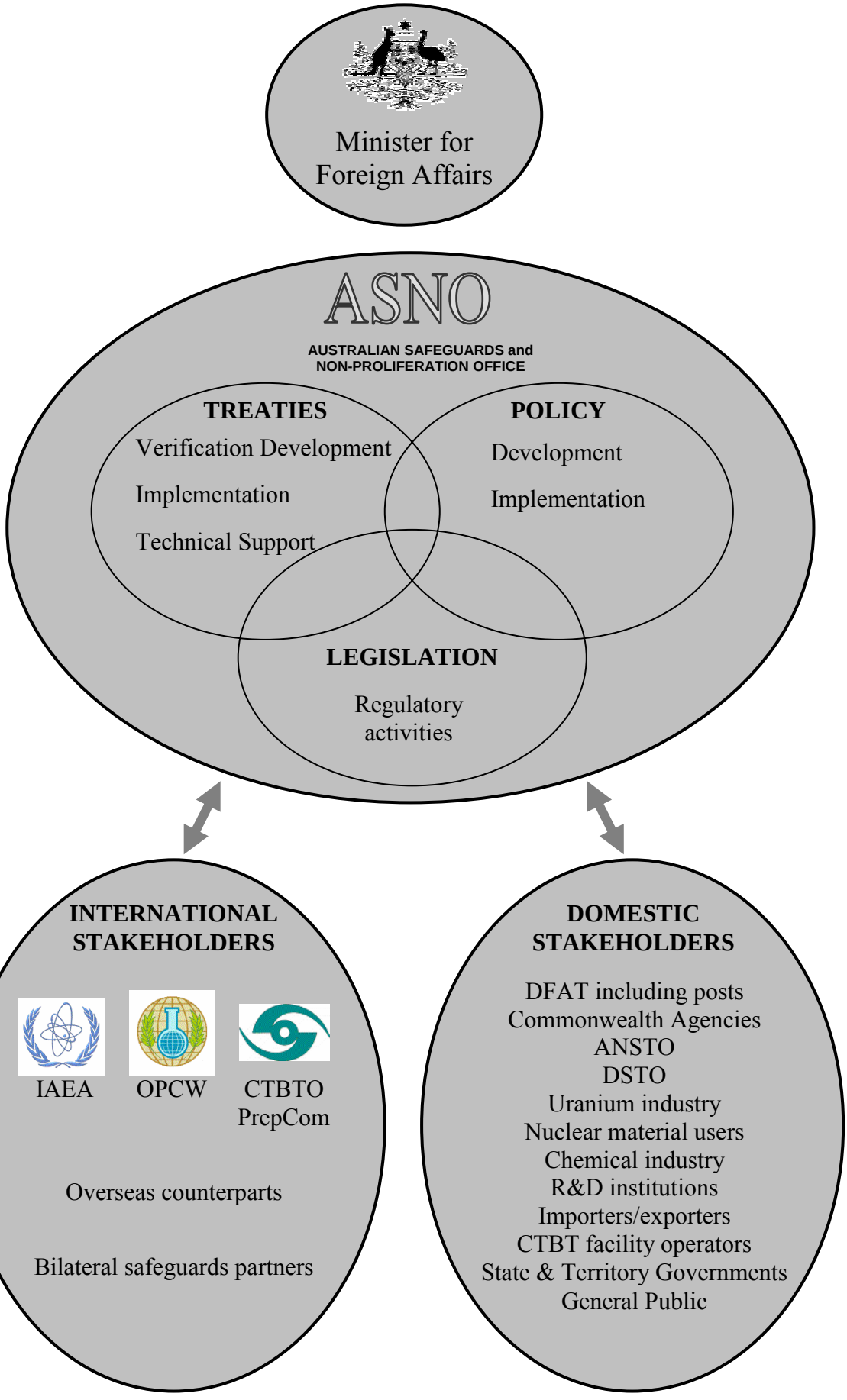


Figure 1: ASNO's operating environment

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 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.

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 Nuclear-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, including the Australia Group (AG), verification and implementation arrangements in support of the Biological Weapons Convention (BWC), and verification concepts for the proposed 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.

THE YEAR IN REVIEW

KEY RESULTS FOR ASNO:

- **Significant contribution to strengthening non-proliferation regimes and counter-proliferation activities:**
  - **substantial input to international efforts addressing proliferation challenges**
  - **ongoing support for development and strengthening of IAEA safeguards**
  - **outreach on IAEA safeguards, CWC implementation, CTBT ratification and BWC compliance**
  - **international training courses conducted for nuclear safeguards and physical protection**
  - **domestic security enhanced through new legislation and reviews.**
- **All treaty and statutory requirements met in respect of:**
  - **nuclear material and nuclear items in Australia**
  - **Australian uranium exports and derived material (Australian Obligated Nuclear Material)**
  - **chemicals and facilities covered by the CWC**
  - **establishment of CTBT monitoring stations.**

In the last 12 months there have been severe challenges to the nuclear non-proliferation regime, and some successes. Efforts to resolve concerns about the nuclear programs of the Democratic People's Republic of Korea (DPRK) and Iran are ongoing. ASNO has been closely involved in the development of Australian and international responses to these situations.

The DPRK remains in non-compliance with its safeguards agreement with the International Atomic Energy Agency (IAEA) , and continues to exclude IAEA safeguards inspectors. Six-Party Talks are in progress in an effort to resolve this situation.

The IAEA's investigations of Iran's nuclear activities are continuing. The Agency has found Iran to be in breach of its safeguards agreement, failing to declare an extensive range of nuclear activities, in some cases extending over two decades (see IAEA Safeguards statement on page 109). This also constitutes a breach of Iran's commitment under the Non-Proliferation Treaty (NPT) to place all nuclear materials under IAEA safeguards. It is of particular concern that many of Iran's undeclared nuclear activities have been in proliferation-sensitive areas, such as uranium enrichment, plutonium separation, and production of material that could be used in triggers for nuclear weapons. The IAEA has

reported that it is as yet unable to determine if Iran has declared all of its nuclear activities, nor whether Iran's nuclear activities have been for exclusively peaceful purposes.

On the positive side, Iran has signed an Additional Protocol (see page 85), and has undertaken to implement this provisionally pending ratification. On the other hand, the IAEA has reported that Iranian cooperation has been 'less than satisfactory' and that some important information (pertaining to the centrifuge enrichment program) has 'in some cases has been incomplete, and [lacked] the necessary clarity.'

A very positive development is Libya's renunciation of its programs for the development of weapons of mass destruction (WMD). Libya is cooperating with the IAEA and the Organisation for the Prohibition of Chemical Weapons (OPCW), and also with the U.S. and U.K. governments, to dismantle these programs. Libyan cooperation has been important in revealing the activities of the AQ Khan network for the illicit supply of uranium enrichment and nuclear weapon technology, and the activities of other criminals in this area. This in turn has helped cast light on the clandestine nuclear programs of Iran and the DPRK. International efforts to identify and terminate the activities of the Khan network are continuing.

In a changing security environment, the Government is giving increasing attention to counter-terrorism and counter-proliferation (of WMD). One example is Australia's participation in the Proliferation Security Initiative (PSI)—a coalition of countries cooperating to develop practical measures to prevent the illicit spread of WMD and WMD-related materials. The initiative was launched by U.S. President Bush in May 2003, and Australia is one of the core participating countries. More than 60 countries have expressed their support for the initiative. Other ASNO relevant activities included preparation of the *Non-Proliferation Legislation Amendment Act 2003*. This Act provides *inter alia* for strengthened security measures for nuclear facilities, materials and associated technology.

Figure 2: Question & Answer session at the workshop on Physical Protection of Research Reactors in February 2004. From left: Wolf-Dieter Gutschmidt, GRS, Germany; Prof A Djaloeis, BAPETEN, Indonesia; Nick Doulgeris, ASNO; Agustin Barcena, IAEA.

International safeguards

Australia is highly regarded internationally for its contribution to the strengthening of the IAEA safeguards system. Since 2001 ASNO's Director General, Mr John Carlson, has chaired the IAEA's Standing Advisory Group on Safeguards Implementation (SAGSI), the international expert group advising the IAEA on safeguards matters. During the year SAGSI worked closely with the IAEA in developing the concepts, methods and skills required for implementation of strengthened and integrated safeguards. SAGSI also completed a major review of the IAEA's safeguards approaches and procedures. In addition to SAGSI, ASNO contributed to the IAEA's safeguards system through projects under Australia's Safeguards Support Program (see page 134), consultancies undertaken on the IAEA's behalf, and involvement in IAEA working groups on key safeguards issues.

Figure 3: Participants of the June 2004 safeguards training seminar held in Sydney and Canberra. *Photo courtesy of Richard Gregorio Photographics.*

As noted earlier, there were serious developments with the DPRK and Iran. ASNO has been closely involved in efforts to resolve the Iranian nuclear issue. In February 2004 Mr Carlson visited Tehran for meetings with senior officials, registering the deep concern of Australia and the international community about Iran's nuclear activities, and the need for transparency, including complete cooperation with the IAEA. Mr Carlson offered to arrange training for Iranian officials on safeguards matters, including implementation of the Additional Protocol. Iran accepted this offer, and shortly afterwards Mr Russell Leslie (ASNO's Director International Safeguards) presented safeguards training for 46 Iranian staff in Tehran (see page 92). ASNO invited Iranian officials to the Australia/IAEA safeguards training seminar in June (see page 91), and four Iranians attended this course. During Mr Downer's visit to Tripoli in May 2004, Libya was also invited to participate in this training seminar, and one Libyan official attended.

The primary objectives of this training seminar were: to enhance the effectiveness and efficiency of international safeguards applied by the IAEA in regional countries, including implementation of strengthened safeguards pursuant to the Additional Protocol; and to enhance regional countries' control over their holdings of nuclear material so that material would be less vulnerable to theft or misuse by individuals or sub-national groups. In addition to the safeguards training seminar, ASNO, in partnership with the IAEA and the U.S. Department of Energy, conducted a course on the Physical Protection of Research Reactors at Lucas Heights in February. This was the first course of this kind for the IAEA, and the Agency has used it as a pilot course for developing an international program.

The Additional Protocol (AP) has now been ratified or signed by over three-quarters of non-nuclear-weapon states that are NPT Parties and have significant nuclear activities—

representing some 90% of nuclear facilities worldwide that are covered by comprehensive or full scope safeguards pursuant to the NPT (see Annex K). This is a clear indication that the combination of a comprehensive safeguards agreement and an AP is now effectively established as the NPT safeguards standard. Nonetheless, there are many countries that have not yet signed an AP. ASNO is working with the IAEA and counterparts in other countries, particularly Japan, to increase the number of AP ratifications and widen the application of strengthened safeguards.

An essential aspect of strengthened safeguards is the development of the concept of 'integrated safeguards', that is, the optimum combination of safeguards measures available under comprehensive safeguards agreements and the AP which achieves maximum effectiveness and efficiency within available resources. Australia has been closely involved with the IAEA in the development of integrated safeguards through our work with SAGSI and the Australian Safeguard Support Program. In 2001, Australia was the first state to qualify for integrated safeguards. As at 30 June 2004 integrated safeguards were being applied also in Norway and Indonesia. A major landmark is the qualification of Japan for the application of integrated safeguards—the first state with a large and complex nuclear fuel cycle to so qualify. As the application of safeguards in Japan has always been a major component of the IAEA safeguards budget, the move to integrated safeguards has the potential to have a substantial impact on the overall safeguards budget, freeing-up resources for other key safeguards work. Application of integrated safeguards in Japan is expected to commence during 2004-05.

During the year States Parties made good progress on work to strengthen the Convention on the Physical Protection of Nuclear Material (CPPNM). In April, on behalf of many signatories, including Australia, Austria submitted a clean text for a 'well defined amendment' to the IAEA, as depositary. Sponsoring states expect that a preparatory conference could be held in November 2004, followed by a Diplomatic Conference in February 2005 to agree on the final text. Since the revision process began in 1999, the number of States Party to the Convention has doubled. Support from two-thirds of all States Parties is required to bring a revised Convention into force.

Achieving a Fissile Material Cut-off Treaty (FMCT) is a priority for Australia, though commencement of FMCT negotiations continues to be deadlocked in the program of the Conference on Disarmament. An FMCT would complement the CTBT—together placing 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.

ASNO continues to assist regional countries to implement nuclear safeguards and the Additional Protocol, including associated responsibilities regarding export controls. With the Department of Defence, this year ASNO has provided such assistance to Thailand.

Bilateral safeguards

In 2003-04 Australia exported 9,099 tonnes of UOC (uranium ore concentrates), earning over $360 million. For detailed UOC export quantities see page 111. During the year, Australia was the world's second largest uranium producer. Australia's exports during 2003-04 were sufficient to fuel about 39 power reactors—thereby enabling the countries

concerned to avoid carbon dioxide emissions equivalent to some 85-90% of Australia's total net carbon dioxide emissions from all sources[1].

ASNO established that all Australian Obligated Nuclear Material (AONM) was satisfactorily accounted for in accordance with Australia's safeguards agreements and that AONM was used for exclusively peaceful purposes.

Domestic safeguards and nuclear security

The greater part of ASNO's inspection effort was devoted to regulating ANSTO's site at Lucas Heights. The number of inspections of other permit holders increased this year, with considerable effort expended in re-regulating depleted uranium and giving attention to holders of small quantities of nuclear material, reflecting more rigorous requirements by the IAEA. ASNO concluded that all 'small quantity' permit holders were meeting their permit requirements satisfactorily. In 2002, ASNO revised ANSTO's permits to reflect a performance-based approach. This year, most other permits have been similarly revised as they have come up for renewal.

Security at ANSTO, Lucas Heights, was kept under regular review during the year with a particular focus on the physical protection system being designed and constructed for the Replacement Research Reactor (RRR). Provisions of the *Non-Proliferation Legislation Amendment Act 2003* which pertained to security were implemented.

This year ASNO commenced and substantially advanced a full security risk review of the uranium industry in Australia, covering the uranium mines and transport infrastructure. This had become necessary due to significant changes since the last full review in 1996. The review was carried out by ASIO, and in cooperation with State and Territory governments. The review is expected to be completed later in 2004.

Chemical Weapons Convention

During the year ASNO facilitated three routine OPCW inspections including a 'tandem inspection' at Australia's defensive research facility, the Defence Science and Technology Organisation. The OPCW inspected the current facility at Maribyrnong and the new facility under construction at Fishermans Bend. These inspections proceeded well, enabling Australia to demonstrate its compliance with CWC treaty obligations. Australia was pleased to facilitate the OPCW conducting a 'sequential inspection', under which arrangement the inspection team travelled directly from Australia to New Zealand without first returning to OPCW headquarters in The Hague. This is a significant efficiency and cost effectiveness measure for the OPCW, but is not permitted by all CWC States Parties.

1. Based on data from National Greenhouse Gas Inventory 2002, http://www.greenhouse.gov.au/inventory/

Figure 4: ASNO and OPCW staff on a routine inspection of a Discrete Organic Chemical (DOC) facility in Victoria.

ASNO has been proactive within the region working with other national authorities and the OPCW. Specifically, ASNO has worked closely with PNG and Fiji, and was substantially involved in an OPCW sponsored regional seminar in Nadi on the universality and implementation of the CWC. This has strengthened the national counter-proliferation effort.

On the domestic front, ASNO made declarations to the OPCW in regard to old CW munitions found in eastern Australia. In each case, munitions were tested and found to contain no hazardous chemicals. The OPCW did not consider a confirmatory inspection necessary, and the munitions were destroyed by the Department of Defence.

ASNO continues to work closely with other Government agencies and with peak industry bodies, such as PACIA—the Plastics and Chemicals Industries Association—to effect outreach and improve implementation of the CWC in Australia.

ASNO continued its strong involvement in the Australia Group (AG), which is concerned with export controls for materials and equipment that could be used in the production of chemical and biological weapons. ASNO Assistant Secretary Mr Andrew Leask chaired the Implementation and Information Exchange Working Groups at the AG annual meeting in Paris in June 2004. Good outcomes included the addition to the AG biological control list of five plant pathogens that could potentially be used in WMD programs.

Although a CWC challenge inspection (CI) in Australia is most unlikely, ASNO has worked closely with the Department of Defence in the development of detailed contingency plans for such an event. In June, the Australian mission from The Hague attended a special seminar in Vienna concerning preparations for CI, sponsored by the European Union and the Austrian Government. From this conference, it was clear that Australia was among a handful of CWC States Parties that were well advanced in planning for a CI.

In conjunction with DFAT's International Security Division (ISD), and using funds provided by ISD, ASNO is contributing to Australia's efforts to strengthen counter-proliferation arrangements in the region. ASNO has provided technical and legal advice to PNG and Fiji to strengthen CWC implementation. Planning for WMD outreach to four other regional states is well advanced.

Biological and Toxins Weapons Convention (BWC)

Mr Leask led Australia's delegation to the BWC Experts Meeting in Geneva in August 2003. This was the first of three annual meetings—part of annual programs of work—

agreed at the BWC Review Conference in 2002 to explore ways of strengthening the BWC. While the meeting was essentially 'information sharing', in the absence of an international verification regime one outcome sought was that each State Party would strengthen domestic implementation of the BWC, which in turn would lead to enhanced regional security. Eighty-four States Parties attended the meeting. With DFAT's International Security Division, ASNO is following up with regional contacts on the matters arising from the meeting, thus contributing to international and national counter-proliferation efforts. Participation in this meeting was also valuable in terms of ASNO's input to the review of hazardous materials legislation by the Council of Australian Governments (COAG).

Comprehensive Nuclear-Test-Ban Treaty

At 30 June 2004 the CTBT had been signed by 172 countries and ratified by 114. This strong level of support indicates the importance the international community places on the norm against testing of nuclear weapons that the Treaty embodies. However, the specific requirement that 44 named countries must ratify to trigger the Treaty's entry-into-force (EIF) is not yet in sight. At 30 June 2004, 32 of those countries had ratified.

Work to establish the CTBT verification regime is continuing. More than half of the 337 facilities which will make up the International Monitoring System (IMS) are now operational. Australia will host a total of 21 such facilities, the third largest number of any country (see Figure 34). Work on the Australian facilities continued to make good progress. Sixteen of these facilities were operational at the end of 2003-04.

However, with EIF not yet in prospect, the level of funding that many countries are prepared to provide to the Preparatory Commission (PrepCom) of the CTBT Organisation remains under pressure. Australia, along with other countries, continues to argue that the PrepCom should be funded adequately for the tasks set down in its mandate.

Figure 5: Tabletop OSI inspection exercise in Russia in October 2003. *Malcolm Coxhead of ASNO is at lower right corner.*

ASNO has made also a strong contribution to the practical work of the PrepCom, and contributes actively to the development of arrangements for the conduct of an on-site inspection (OSI). In June 2004, ASNO's Mr Malcolm Coxhead was appointed as Task Leader for work within the PrepCom to develop an Operational Manual to guide the conduct of OSI.

ASNO management

Following the separation of one staff member, and as a result of the length of time required to recruit in a specialised area, ASNO was one officer short for 9 months of the year. This stretched the organisation during a particularly busy period. Corporate management in ASNO remains strong, and during the year Mr Leask was recognised as a Fellow of the U.K. Chartered Management Institute.

OUTLOOK: THE YEAR AHEAD

A number of key issues will set the course for ASNO's work program in the coming year. In particular, the work of the IAEA will remain vital to Australian interests. Reaching a satisfactory resolution of the Iranian nuclear problem will be a major challenge for all parties, Iran as well as the international community. The international community must also continue efforts to resolve the DPRK nuclear problem. Notwithstanding Libya's good cooperation, there is still much work needed to verify the dismantlement of its WMD programs. And there is the pressing need to deal effectively with the problem of illicit supply of proliferation-sensitive technology.

Achieving a good outcome from the 2005 NPT Review Conference will be a challenge, as parties seek to maintain a balance between the political objective of disarmament and the urgent practical issue of proliferation. While there are many political statements about strengthening the non-proliferation regime, developing practical and effective measures which actually reduce the risk of proliferation and have broad international support remains an ongoing challenge—and one that is at the heart of ASNO's work.

On safeguards more broadly, ASNO will work closely with the IAEA and counterpart organisations on the continuing development of strengthened and integrated safeguards, particularly through the Australian Safeguards Support Program and through substantial involvement in SAGSI.

Australia will continue to promote universal acceptance of strengthened IAEA safeguards through conclusion of Additional Protocols (AP). Australia will seek international endorsement that this is the new NPT safeguards standard, and press for the AP to become a condition of nuclear supply.

ASNO will closely follow nuclear fuel cycle developments worldwide, particularly those with non-proliferation and safeguards implications.

ASNO will contribute to the growing international debate on several key non-proliferation issues, including:

- a better legal understanding of the non-proliferation obligations required of the states which remain outside the NPT;
- the need to close off the possibility of a state evading non-proliferation obligations by withdrawal from the NPT;
- in the context of the NPT Article IV and the 'inalienable right to nuclear energy' for NPT non-nuclear weapon states, the limits to the right to pursue any form of nuclear technology. Here, the IAEA's nuclear fuel cycle study and other international efforts to develop an international framework for nuclear cooperation and supply assurances will assume increasing importance.

Working with DFAT's International Security Division, ASNO will assist with outreach to regional countries to strengthen not only safeguards, but to implement broader non-proliferation obligations covering export controls, the Australia Group, the CWC, the BWC and counter-proliferation strategies.

ASNO will continue its contribution to the Commonwealth-State review of security of hazardous materials, including toxic chemicals, biological agents and radiological sources.

Even before it has entered into force, the CTBT reinforces the international norm against

testing of nuclear weapons. The Treaty is therefore a high priority for Australia. In addition to the task of co-ordinating the establishment of International Monitoring System (IMS) stations in Australia, ASNO will continue to support efforts to encourage signature and ratification of the CTBT. ASNO will also continue its contribution to the development of the Treaty's verification regime—with a particular focus on the elaboration of procedures for the conduct of on-site inspections.

AUSTRALIAN SAFEGUARDS AND NON-PROLIFERATION OFFICE 2003 - 2004

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*, the *Comprehensive Nuclear Test-Ban Treaty Act 1998*, and the *Non-Proliferation Legislation Amendment Act 2003*—is the responsibility of the Minister for Foreign Affairs, the Hon. Alexander Downer MP.

Director General ASNO

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 ASNO also performs the functions of Director, Australian Comprehensive Test Ban Office (ACTBO). Background to the establishment of ASNO in 1998 is set out in ASNO's Annual Report for 1999-2000 (page 106).

The Director General ASNO reports directly to the responsible Minister, who since 1994 has been the Minister for Foreign Affairs.

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 29 May 2003, and his current appointment is until 31 December 2006.

The principal focus of ASNO's work is on international and domestic action against the proliferation of weapons of mass destruction (WMD)—nuclear, chemical and biological—and also radiological weapons. Thus, ASNO's work relates directly to international and national security. In particular, ASNO is working to strengthen the operation of treaty verification regimes and their supporting technical methods. In addition, ASNO performs important domestic regulatory functions—ensuring that Australia is in compliance with relevant treaty commitments, and that the public is protected through appropriate security standards for WMD-related materials.

Functions

The functions of the Director General ASNO include:

- ensuring the effective operation of the *Nuclear Non-Proliferation (Safeguards) Act 1987*, the *Chemical Weapons (Prohibition) Act 1994* and the *Comprehensive Nuclear Test-Ban Treaty Act 1998* 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);
- establishing bilateral nuclear safeguards agreements and monitoring compliance by Australia's treaty partners with the provisions of those agreements;

- 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 Function

On safeguards, ASNO has four main areas of responsibility:

- application of safeguards within Australia;
- ensuring the physical protection and security of nuclear items in Australia;
- 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 are 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 113);
- 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, often in conjunction with key international partners such as the U.S. Department of Energy;

- 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 function

ASNO is the focal point in Australia for liaison between stakeholders involved with CWC implementation, such as representatives 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.

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 in Australia. 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 reports this trade to the OPCW, together with details of related chemical exports, which are regulated by the Department of Defence.

ASNO provides technical support to DFAT and other agencies in multilateral and domestic efforts to further the objectives of the Biological Weapons Convention (BWC). If international agreement is reached on verification and other strengthening measures, it is envisaged that ASNO would undertake BWC responsibilities similar to those it performs under the CWC.

Figure 6: ASNO, OPCW and site representatives during an OPCW inspection at a DOC facility in Victoria.

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 possible OPCW inspections;
- facilitating OPCW inspections in Australia;
- 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 development of measures to strengthen the BWC.

Overview of CTBT Function

Article IV of the CTBT provides that its verification regime shall be capable of meeting the requirements of the Treaty when it enters into force. This requires a substantial program of preparation in advance of the Treaty's entry-into-force.

When the Treaty enters into force, the CTBT Organisation will be established as the Treaty secretariat. Meanwhile, to make the necessary preparations, a Preparatory Commission (PrepCom) was established in 1997, made up of CTBT States Signatories and supported by a Provisional Technical Secretariat (PTS). The tasks of the PrepCom include the establishment 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 under the CTBT, such as On-Site Inspections.

ASNO is Australia's designated national authority for the CTBT. This role is one of liaison and facilitation to ensure that the International Monitoring System (IMS) is established efficiently and relevant domestic arrangements are in place.

ASNO makes a strong contribution on behalf of Australia to the overall work of the PrepCom to develop the CTBT verification regime.

Key CTBT functions include:

- 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 of Australian policy relevant to the CTBT;
- promoting understanding of CTBT verification, including by acting as an interface between technical and policy specialists; and
- contributing to the development of Treaty verification, through the PrepCom and its working groups.

Advice to Government

ASNO staff have 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* forms the legislative basis for ASNO's nuclear safeguards activities. It took effect on 31 March 1987.

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

- the NPT;
- Australia's NPT safeguards agreement and Additional Protocol 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 Act establishes a statutory office, referred to as the Director General ASNO. The Director General's functions include ensuring the effective operation of Australia's safeguards system, and of Australia's system of bilateral safeguards agreements.

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 General ASNO.

Regulations and declarations under this Act are listed under the *Freedom of Information Act 1982* statements on page 118 of this Report.

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 in the area covered by the Treaty.

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.

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

The *Nuclear Non-Proliferation (Safeguards) (Consequential Amendments) Act 1988* took effect on 24 May 1988. This amended the *Patents Act 1952* to allow referral from the Patent Office (now IP Australia) to the Director General ASNO of patent applications which might constitute 'associated technology' under the Safeguards Act. The amendments give the Director General ASNO 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 27.

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.

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 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 ASNO to verify compliance with the Act; and
- provides for procedures should another State Party seek clarification concerning compliance with the Convention at any facility or other place or by any person 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, and have regard to, Australia's obligations under the Convention.

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.

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 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 Australian 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 Government with the authority to establish IMS stations and to make

provision for access to them for CTBT monitoring purposes. The Act makes provision for the Minister for Foreign Affairs to enter into arrangements with the CTBT Organization to facilitate cooperation in relation to monitoring stations under Australian control.

Article IV of the Treaty obliges States Parties to allow CTBT inspectors to inspect any place within their jurisdiction or control 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 Organization and its officials under Australian law in accordance with the Treaty.

The Act was assented to on 2 July 1998 but was not able to enter into effect, absent the entry-into-force of the CTBT, until amended by the *Non-Proliferation Legislation Amendment Act 2003*. On 11 June 2004 sections 3 to 7, Part 2, Division 1 of Part 4, Division 1 of Part 5, sections 68 to 72, sections 74, 75 and 78, and Schedule 1 to the Act came into effect following proclamation by the Governor-General. The proclaimed provisions:

- create the offence of causing a nuclear weapons test explosion, or any other nuclear explosion; and
- provide a framework for the establishment and operation of IMS facilities in Australia, and a legal basis for the functioning of Australia's CTBT National Authority.

Non-Proliferation Legislation Amendment Act 2003

The *Non-Proliferation Legislation Amendment Act 2003* (NPLA Act), foreshadowed in previous Annual Reports, received Royal Assent on 12 December 2003.

The NPLA Act amended the Safeguards Act to strengthen arrangements for the protection of, and application of non-proliferation safeguards to, nuclear material, facilities and associated information. Specifically, the Act:

- broadened the class of material which may be declared as associated material, to ensure effective controls on the full range of materials which are specially suited for use in nuclear fuel cycle activities or prohibited activities such as the production of nuclear weapons;
- introduced a permit requirement for the establishment of any new nuclear or related facility in Australia. This will ensure that non-proliferation safeguards measures can be fully integrated into the design of any new facility;
- introduced offences for conduct which breaches procedures set as a permit condition and intended to protect proliferation sensitive information, and for unauthorised communication of information which could prejudice the physical security of nuclear material;
- provided that a permit under the Safeguards Act may prescribe an area to which the permit holder must restrict access. A new offence is introduced for unauthorised entry to such an area; and

- updated penalty provisions in the Safeguards Act to bring the level of fines into line with current legislative practice.

The NPLA Act amended the commencement provisions of the CTBT Act so that key provisions of that Act could be proclaimed in advance of entry-into-force of the CTBT. It made several amendments to provisions in the Act to better enable Australia to respond effectively to any request for clarification or for an inspection to demonstrate compliance with the Treaty.

The NPLA Act amended the Safeguards, CWC and CTBT Acts to facilitate practical naming arrangements under the umbrella of ASNO, or any future administrative structure. These naming arrangements include recognition of alternative names for both the Office and Director specified under the relevant Acts.

RESOURCE OVERVIEW: CORPORATE MANAGEMENT

ASNO is required, as part of a Commonwealth Agency and in accordance with section 49 of the *Financial Management and Accountability Act 1997*, to submit to the Auditor-General annual financial statements. Details relating to these financial statements are contained in the Department of Foreign Affairs and Trade (DFAT) Annual Report for 2003-04.

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 2003-04.

STAFFING

ASNO is staffed through DFAT on the basis that it is a division within the Department. The Director General is a statutory officer, while all other staff were employed under the *Public Service Act 1999*, on a full-time basis.

Table 2: ASNO Administrative Costs - 2002-03 and 2003-04

	2002-03	*2003-04**
Salaries	$1,247,812	$1,385,637
Running Costs	$997,087**	$1,048,227**
Total	$2,244,899	$2,433,864

* The 2003-04 figures are ASNO's accrual budget.

** Includes amount for Geoscience Australia seismic monitoring ($550,791 in 2003-04), and extra funding provided to undertake a security review of the uranium industry.

During the reporting period, total running costs increased by $51,140 relative to the 2002-2003 financial year. The increase is explained by additional funding provided to undertake a security review of the uranium industry.

A summary of ASNO staffing as of 30 June 2004 is given in Table 3.

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 2003-04 ASNO's level of professional staff engaged on nuclear issues was about 6.75 person-years, a small decrease on last year due to staffing gaps. Nuclear work was supplement by staff from the CTBT Implementation Section, demonstrating the value of ASNO's multi-skilling program.

Table 3: Categories of Staff at 30 June 2004—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	3	1	4	(4)
APS level 6	1		1	(1)
APS level 5	0		0	(0)
APS level 4	1	1	2	(2)
Total	11	3	14	(14)

** Plus one additional employee on temporary contract for part of the year.

TRAINING

This year ASNO consolidated its multi-skilling program which is designed, specifically for the purpose of national inspections, to meld the nuclear and CWC inspectors into a single inspectorate. This program will continue in 2005 and takes into consideration the type and complexity of inspections, with the specific skills required for each.

Dr Annette Berriman and Mr Craig Everton undertook two courses; firstly the joint IAEA/ASNO/DOE course on physical protection of research reactors held in Australia in February (page 90) and, secondly, the IAEA/Australia safeguards course held in Sydney in June (see page 91). Dr Berriman had the role of joint coordinator for these courses.

ORGANISATION OF ASNO AT 30 JUNE 2004

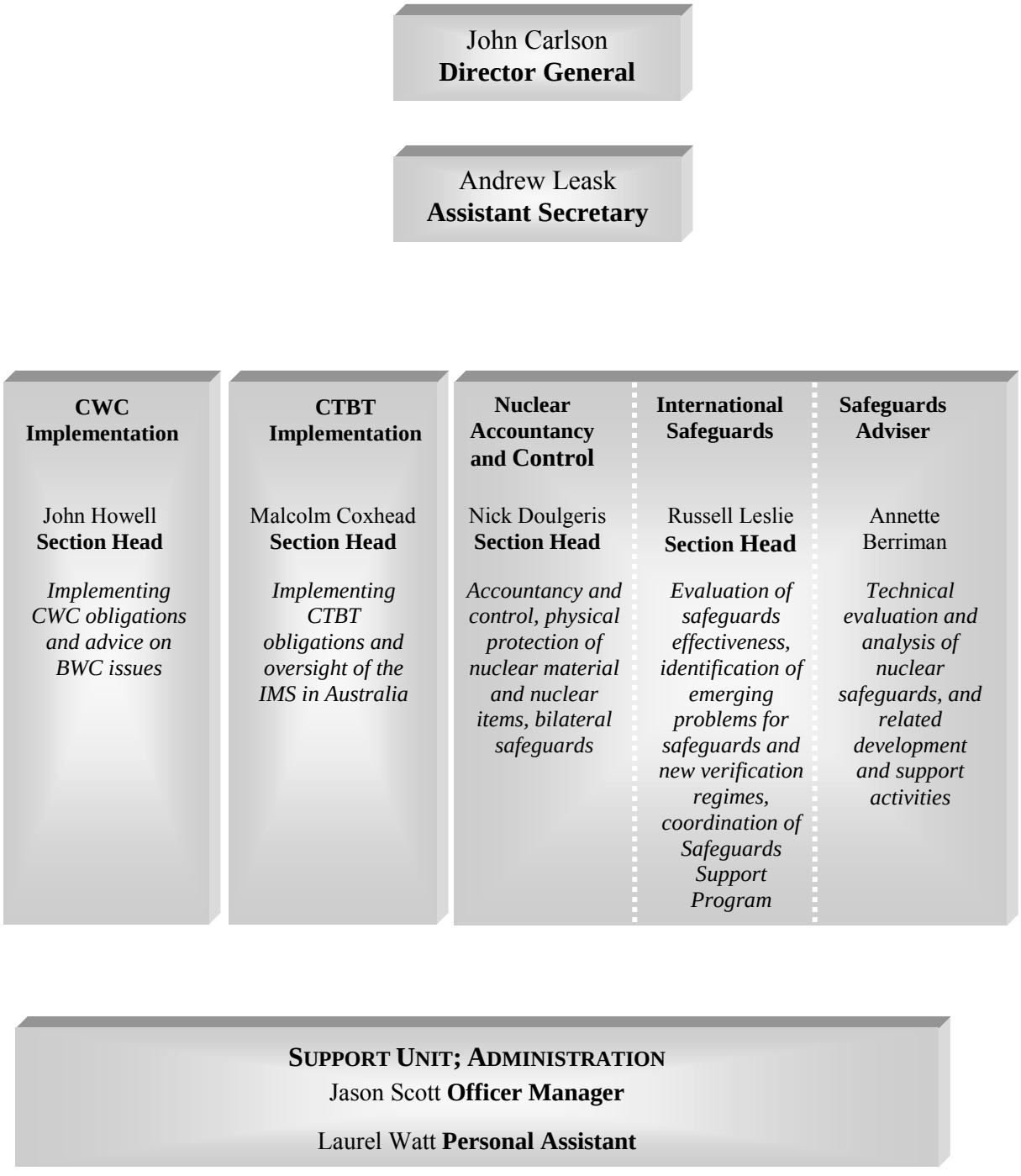


Figure 7: ASNO organisation chart

ASNO PERFORMANCE INDICATORS

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.

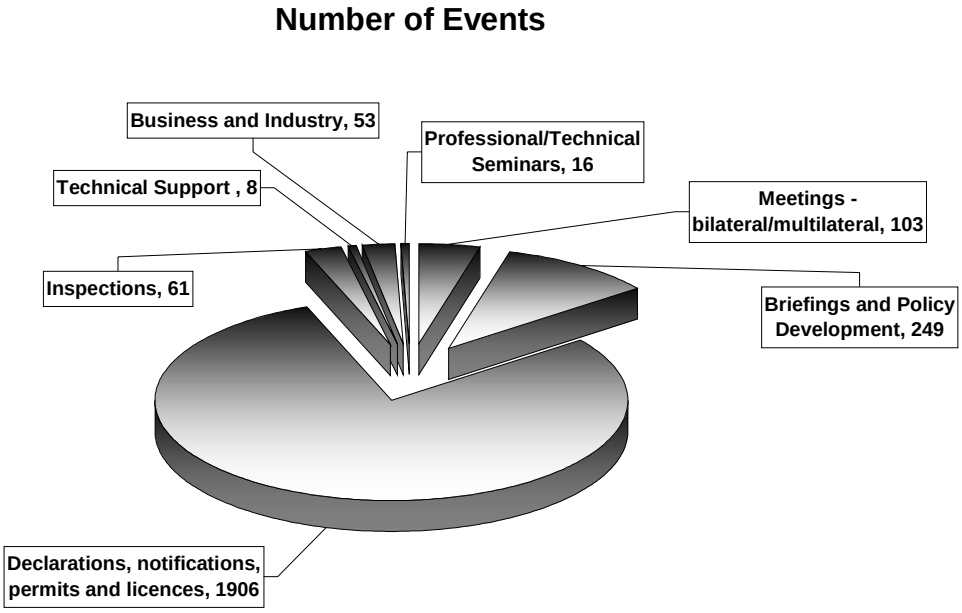


Figure 8: ASNO's performance against specific aims and organisational groupings.

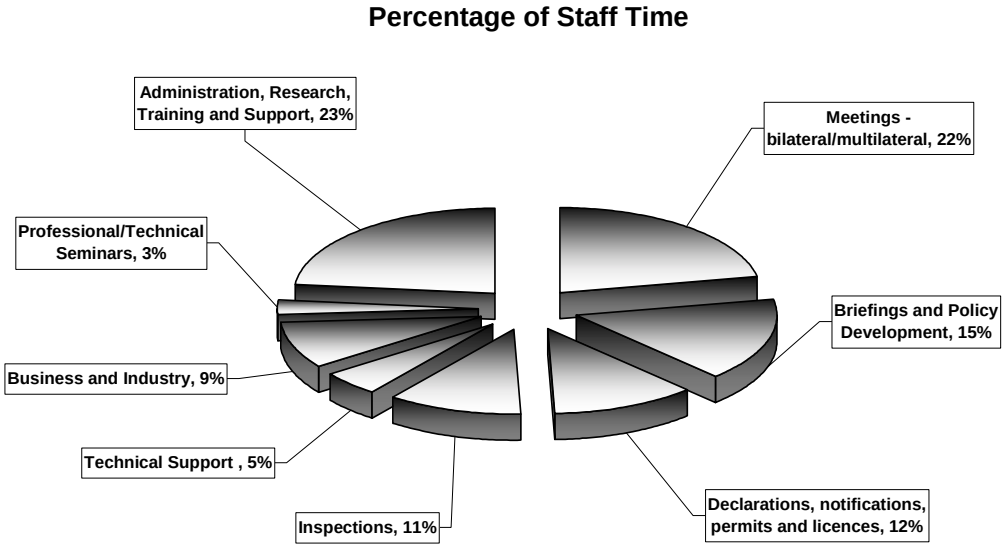


Figure 9: Percentage of staff time against organisational groupings.
Includes all preparation, planning, attendance and follow-up action where relevant.

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.

The fee is charged on each kilogram of production, and 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 has ceased production.

In October 2003 the fee was set at 6.0453 cents per kilogram of contained uranium produced during 2002–2003. This yielded $469,117 for Consolidated Revenue.

Figure 10: Commercial wellfield at Beverley mine site with the Northern Flinders Ranges in the background. *Photo courtesy of Heathgate Resources.*

PROGRAM ACTIVITIES

Figure 11: Beam hall of the Replacement Research Reactor (RRR) under construction at Lucas Heights. *Photo courtesy of ANSTO.*

ASNO's activities in 2003-04 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

Amendment to Nuclear Non-proliferation (Safeguards) Act 1987

On 12 December 2003 the *Non-Proliferation Legislation Amendment Act 2003* received Royal Assent. In addition to housekeeping changes, such as formalising 'ASNO' as the title of the implementing office for the *Nuclear Non-proliferation (Safeguards) Act 1987*, this amendment tightened security for nuclear materials and associated technology and at nuclear sites.

Permits and authorities

The main activity over the year was the granting of new permits. Following the re-regulation of depleted uranium in non-nuclear use the previous year, reflecting more rigorous IAEA requirements, most new permits were for radiography firms using depleted uranium as shielding. The first permit to establish a facility (ANSTO's Replacement Research Reactor) was also issued, following the introduction of this new type of permit in the changes to legislation mentioned above. Eighteen new permits or authorities were issued, three were varied, two expired and none was revoked.

Table 4: Status of safeguards permits and authorities in Australia, 30 June 2004

Permit or Authority to:	Number at End of Period	Granted	Varied	Revoked	Expired
Possess nuclear material	51	17	3	0	0
Possess associated items	21	0	0	0	0
Transport nuclear material	17	0	0	0	2
Transport associated items	0	0	0	0	0
Establish a facility	1	1	0	0	0
Communicate information contained in associated technology	17	0	0	0	0
Total	107	18	3	0	2

Replacement Research Reactor

The Australian Nuclear Science and Technology Organisation (ANSTO) is progressing its project to replace the ageing reactor, HIFAR. Until nuclear material has been transferred to the new facility ASNO's role is related primarily to regulation of security, and ensuring appropriate security features are incorporated in the facility's design and proposed operating procedures. During the year ASNO completed its assessment of major portions of the operational security arrangements. In addition to this on-going evaluation, ASNO has been providing access and information to the IAEA for safeguards purposes. ASNO expects to complete the security assessment by early 2005, after which it will focus on detailed safeguards arrangements.

Laser Enrichment R&D

An Australian company, Silex Systems Limited, is developing an innovative method of separating uranium isotopes using laser techniques. This work is being carried out in laboratories leased from ANSTO at Lucas Heights. Following the withdrawal of USEC Inc, Silex's U.S. partner, in April 2003, Silex Systems Limited has continued to develop the technology while exploring options for a new partner. Should the technology prove to be cost effective, it is envisaged that commercialisation would occur overseas with a new, yet to be determined partner.

Silex Systems Ltd holds a permit to possess 'associated technology'. ASNO monitors the progress of this research closely, with the objective of ensuring 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. The December 2003 changes to the safeguards legislation also strengthened the regulation of security requirements for this technology. ASNO ensures that all IAEA requirements are met with respect to the reporting of nuclear-related R&D.

Silex Systems Ltd is also developing enrichment technologies for silicon which will have uses in the computer chip industry. ASNO has assessed that the technology developed by Silex Systems Ltd for enrichment of stable isotopes has no potential for nuclear application,

i.e. has no non-proliferation/safeguards implications, but is monitoring developments to ensure there is no reason to change this assessment.

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 2004.

Annex B: Associated Items within Australia at 30 June 2004.

Annex C: Australian Obligated Nuclear Material Overseas:

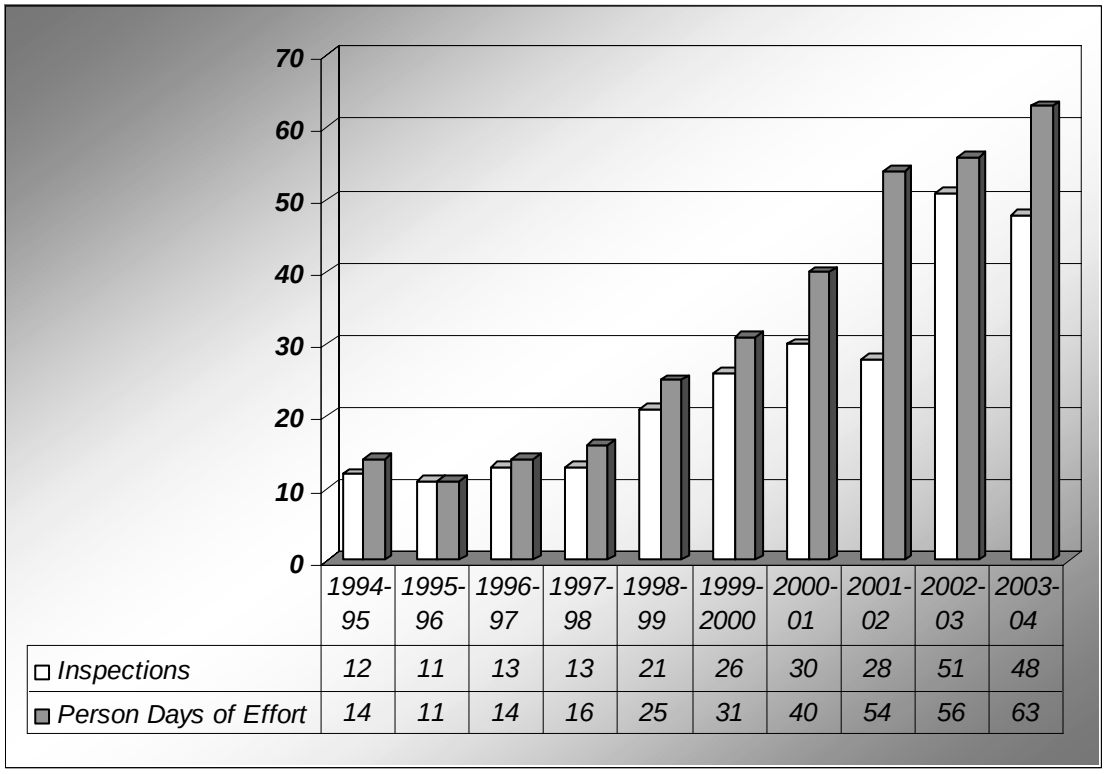
(i) Locations and Quantities of AONM at 31 December 2003.

(ii) Transfers of AONM during 2003.

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

Compliance with permit requirements

In 2003-04 ASNO carried out 48 domestic inspections to ensure that statutory and permit requirements were being met, broadly similar to the number conducted in the previous year (51). The number of national inspections over the last decade is shown in Figure 12.



	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04
Inspections	12	11	13	13	21	26	30	28	51	48
Person Days of Effort	14	11	14	16	25	31	40	54	56	63

Figure 12: National nuclear inspections by number and effort

The distribution of the inspections by type of permit holder is shown in Figure 13 and Figure 14, in terms of number of inspections and inspector days of effort.

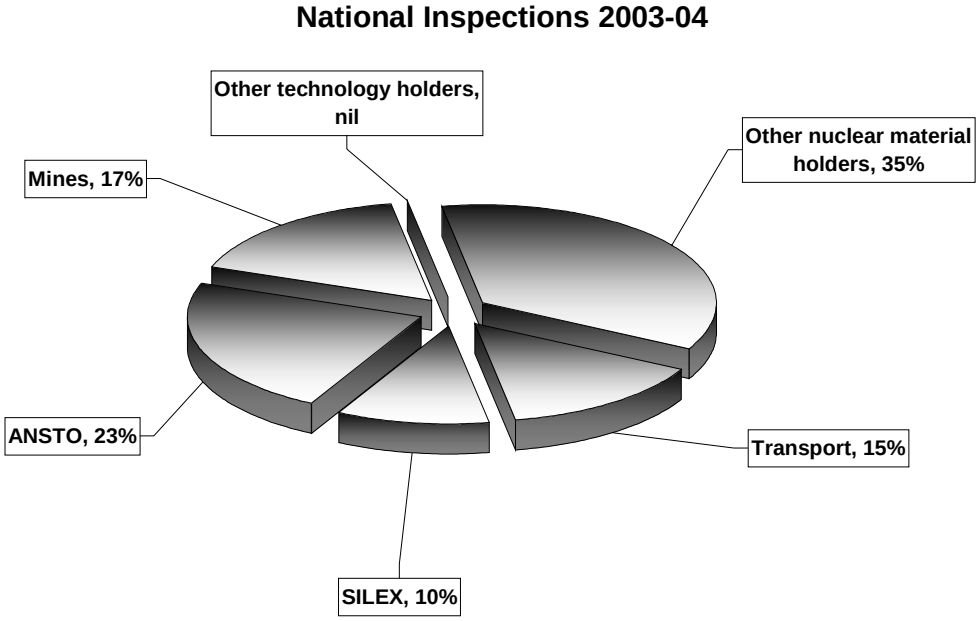


Figure 13: Distribution of national nuclear inspections by type of permit holder as a function of number of inspections.

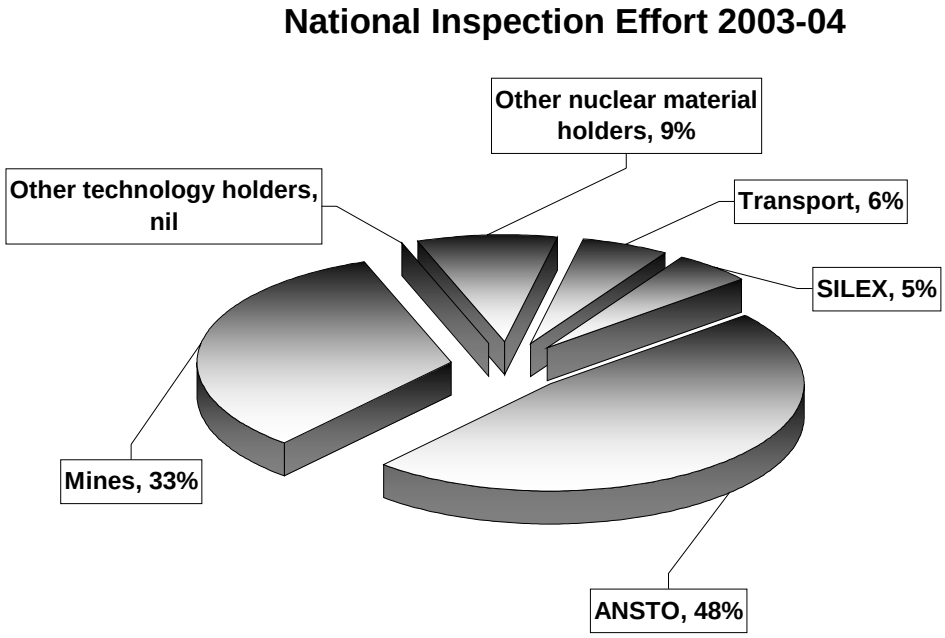


Figure 14: Distribution of national nuclear inspections by type of permit holder as a function of inspector days of effort.

ASNO's greatest inspection effort was at ANSTO's Lucas Heights site—to be expected since ANSTO has Australia's largest nuclear facilities (research reactors) and the nuclear

material of greatest safeguards significance. The inspection effort at ANSTO covered both nuclear materials accountancy and security. 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.

As reported last year, ASNO reviewed and significantly revised all of ANSTO's permits in 2003. ASNO carried out routine inspections of the nuclear material accounts through the year, and found a solid improvement in the accounts following full migration to a new database and the resolution of discrepancies in old data. In November 2003 ASNO carried out an inventory verification similar to the IAEA inspection in March 2003, where difficulties had arisen. ANSTO's performance in the November exercise was greatly improved on its March effort.

In April 2004 ASNO conducted an audit of the management structure and systems for nuclear materials accountancy. This audit identified a number of areas for improvement. ANSTO has worked on corrective measures for the issues raised, which at the end of June 2004 were nearly complete. ASNO has suggested to ANSTO that the safeguards system at Lucas Heights, having been established decades ago, is due for a comprehensive overhaul. ANSTO has accepted this advice and is working with ASNO on progressing a review.

ASNO continued to work closely with Silex Systems Limited to ensure that the accountancy and control system for the SILEX laboratory effectively protects both nuclear material and, more significantly, technology. During 2003-04 there were only minor changes to the inventory of nuclear material and technology due largely to the lack of a commercial partner. ASNO appreciates that Silex Systems Limited has always been highly responsive to ASNO requirements.

All three operating mines—Ranger, Olympic Dam and Beverley—along with the mine under development at Honeymoon, were inspected during the year. During ASNO's inspections of these projects, the operators were highly cooperative. The operators met all ASNO requirements and demonstrated a willingness to act upon ASNO advice.

The inspections at small holders of nuclear material and associated technology during the year were related mostly to familiarising them with changes to reporting and permit requirements—including the re-application of reporting requirements to their businesses, specifically in regard to depleted uranium. All permit holders were cooperative and a large number of items in these small holdings have now been declared to the IAEA. ASNO explained to small holders of nuclear material the need to prepare for the possibility of IAEA visits to their sites, pursuant to the Additional Protocol. This preparatory work proved beneficial, as in December 2003 the IAEA undertook for the first time a physical inventory verification at an Australian university.

Performance Assessment

The *Non-Proliferation Legislation Amendment Act 2003*, updating the provisions of the *Nuclear Non-Proliferation (Safeguards) Act 1987*, received Royal Assent on 12 December 2003.

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 that these entities are complying satisfactorily with permit conditions. ANSTO has completed the transfer of accounts to a new database and resolved a number of historical anomalies. Work is underway to improve management of the safeguards system at Lucas Heights. Administration of the Permit System was carried out in a timely manner. Notice of all

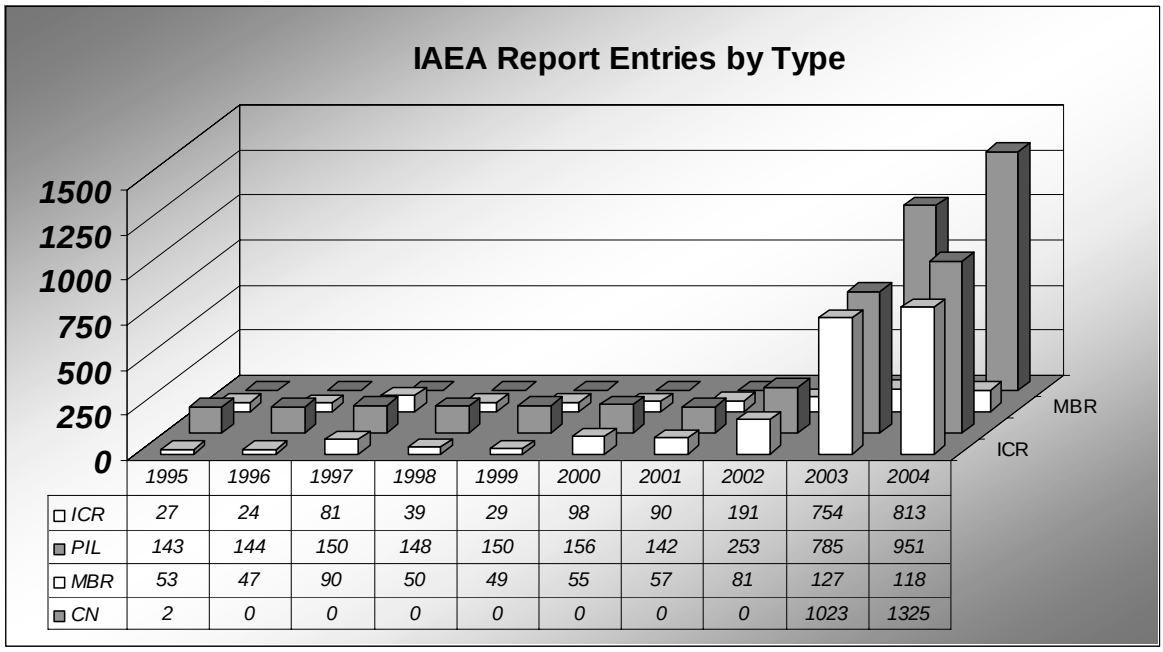
permit changes are published in the Commonwealth Gazette as required by the Safeguards Act.

Milestone A2

IAEA safeguards implemented satisfactorily in Australia.

Activities

ASNO operates Australia's State System of Accounting for and Control of Nuclear Material (SSAC) 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 and complementary access carried out by the IAEA at Australian facilities and relevant locations.

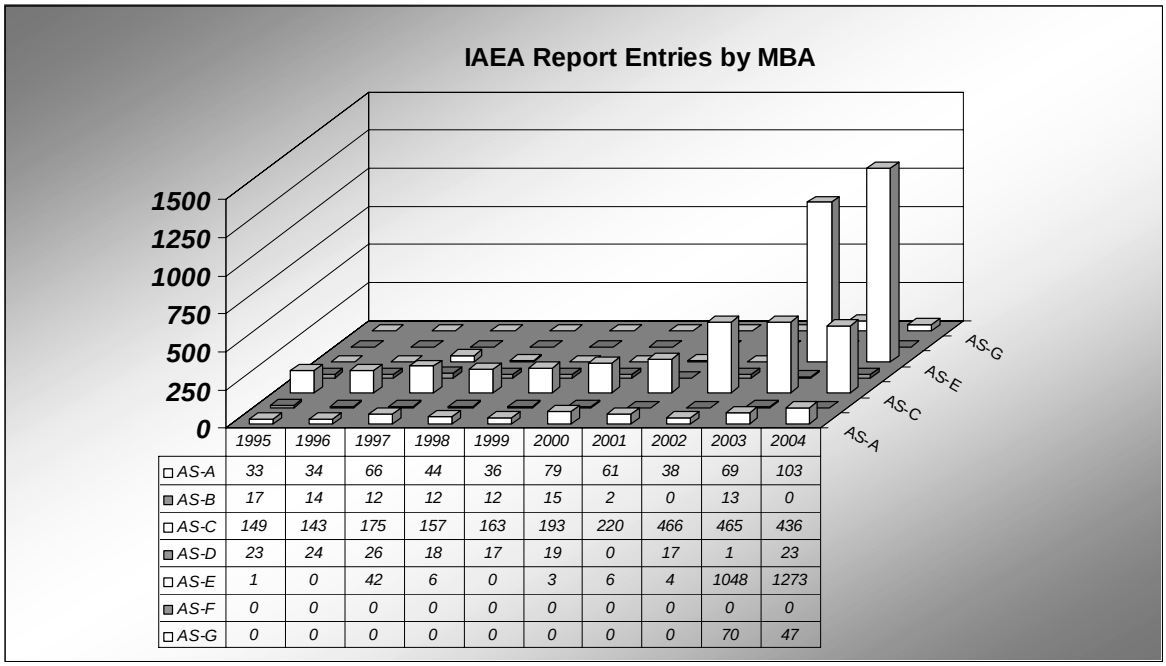


	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
ICR	27	24	81	39	29	98	90	191	754	813
PIL	143	144	150	148	150	156	142	253	785	951
MBR	53	47	90	50	49	55	57	81	127	118
CN	2	0	0	0	0	0	0	0	1023	1325

Figure 15: Reports and information submitted to the IAEA, arranged by types of report. Reports encompass Inventory Change Reports (ICRs), Physical Inventory Listings (PILs) and Material Balance Reports (MBRs). Concise Notes (CNs) are explanatory notes attached to the other reports. Information for years prior to 1995 are included in previous Annual Reports.

As part of ASNO's inspection effort, each month an ASNO officer audits the inventory record of nuclear material at the ANSTO site, which is the principal location of safeguardable nuclear material in Australia. ASNO reports to the IAEA inventory changes at Lucas Heights—on a monthly basis—as well as any changes elsewhere in Australia. In 2003-04 the number of batches, and hence transactions, reported for elsewhere in Australia continued to increase. This did not reflect an increase in material, but rather changes to reporting requirements. Due to the strengthening of the safeguards system, and in an effort to be as transparent as possible, ASNO has increased significantly the amount of information it has provided to the IAEA in recent years (see Figure 15 and Figure 16).

Following Agency inspections, ASNO provides the IAEA with substantial accounting reports. Details of Australian Accounting Reports to the IAEA during the year are in Annex D.



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
AS-A	33	34	66	44	36	79	61	38	69	103
AS-B	17	14	12	12	12	15	2	0	13	0
AS-C	149	143	175	157	163	193	220	466	465	436
AS-D	23	24	26	18	17	19	0	17	1	23
AS-E	1	0	42	6	0	3	6	4	1048	1273
AS-F	0	0	0	0	0	0	0	0	0	0
AS-G	0	0	0	0	0	0	0	0	70	47

Figure 16: Reports and information submitted to the IAEA, arranged by Material Balance Area (see Table 5). The numbers in this plot are totals across all report types described in Figure 15. Information for years prior to 1995 are included in previous Annual Reports.

IAEA inspections in Australia

The IAEA carries out routine inspections of Australian nuclear facilities, with the aim of verifying that nuclear material inventories are as declared by the operator and the national safeguards authority (ASNO). Each inspection deals with what is described as a 'Material Balance Area' (MBA), of which Australia currently has seven (see Table 5). To date Australia has had only one MBA for each facility, but it is expected that additional MBAs will be added in the future to facilitate more efficient reporting and inspection.

During 2003-04 the IAEA conducted two scheduled inspections and one short notice inspection at Lucas Heights, all of which included complementary access pursuant to the Additional Protocol; one inventory verification inspection elsewhere; and one complementary access elsewhere (see Annex D for details). One of the scheduled inspections was to verify the initial design information for AS-F, the Replacement Research Reactor at Lucas Heights which is currently under construction.

Table 5: Material Balance Areas in Australia

Location	*MBA*	*Facility*
Lucas Heights	AS-A	HIFAR reactor
Lucas Heights	AS-B	Moata reactor[2]
Lucas Heights	AS-C	Research and Development Laboratories
Lucas Heights	AS-D	Vault Storage
Elsewhere	AS-E	Other locations in Australia
Lucas Heights	AS-F	Replacement Research Reactor
Lucas Heights	AS-G	Silex Laboratories

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, thereby simplifying the IAEA inspectors' task. During 2003-04 there were difficulties at one inspection arising from operational delays and industrial action. ASNO made a major contribution to overcoming this problem and the IAEA inspectors were able to conclude the inspection satisfactorily.

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

For the R&D Laboratories at ANSTO (AS-C) in 2003-04 there was a small MUF for enriched uranium. The Physical Inventory was less than the Book Inventory by 5.64 grams of uranium element and 0.13 grams of ^{235}U isotope. Enriched uranium is used in processing operations in AS-C and this level of MUF is to be expected given the measurement uncertainties and processing losses. Also, there was 3.30 kg MUF (3.27 kg depleted uranium with the remainder being natural uranium and thorium) in AS-E (locations other than Lucas Heights). This was primarily due to returning to safeguards material that had been exempted in the 1970s. It was found that the quantity now measured was less than the amount originally recorded as being exempted. Given the long time period involved it is not possible to determine the reason for the difference.

The IAEA reports all conclusions drawn from its routine safeguards inspections in Australia, including comments on any MUF, in the statements provided pursuant to

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

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).

Figure 17: IAEA inspectors performing inventory verifications at an Australian university.

AS-E Physical Inventory Verification

In 2003-04 the IAEA carried out an initial inventory verification for MBA AS-E (locations other than Lucas Heights). This MBA had contained virtually no nuclear material for many years. However, recent changes to the IAEA's exemption and reporting requirements have added a substantial amount of material to this MBA. Therefore, the IAEA carried out an 'initial' inventory verification. This MBA comprises many locations around the country, all holding small quantities of material. The IAEA verified this by inspecting one location in detail, a university, and then reviewing the accounts held by ASNO for the other locations. The IAEA confirmed that the physical inventory declared for AS-E was verified and satisfied Agency requirements.

During this review the IAEA noted that ASNO had not provided all the past annual reports for MBA AS-E. ASNO had provided inventory listings only for years 1975, 1987, 1990, 1996 and 2003. ASNO explained that reports for other years would have been either 'nil reports' or reports with only a couple of items that did not change from year to year. Further, the IAEA had not previously commented on the reporting frequency. The IAEA confirmed that it requires such reports each year—ASNO will submit reports accordingly. The Agency confirmed that the records for this MBA satisfied its requirements.

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 and complementary access in Australia. There were no new national inspectors declared in 2003-04 since all appropriate ASNO staff were already designated. In addition to formal designation, inspectors must be trained. During 2003-04 the principal form of training was on-the-job; junior inspectors participating as observers to gain experience.

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 44 new designations during 2003-04. At 30 June 2004 there were 365 IAEA staff declared as Agency Inspectors pursuant to the Act.

Since 1990, the Director of Safeguards (now Director General ASNO) has had the right to appoint and declare inspectors under delegation from the Minister.

Performance Assessment

All routine IAEA inspections were concluded satisfactorily, including the initial inventory verification for MBA AS-E and the initial design information verification for AS-F.

IAEA statements during 2003-04 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, with the exception that annual reports for MBA AS-E had not been provided every year. However, as noted, the Agency confirmed that the current records for this MBA did satisfy its requirements.

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. 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.

As in the past, ASNO conducted inspections of the physical protection measures applied at uranium mines. However, this year, it conducted a full review of security not only of the uranium mines, but also all the associated transport infrastructure nationally. ASIO consultants were used to effect this work. The investigative activity is complete, but the

report is not due for some months. This review was not prompted by specific concerns but was simply part of a process of updating risk reviews from time-to-time.

The main focus of physical protection assessment for the year was for the Replacement Research Reactor at Lucas Heights. As this was the first project of this type since new anti-terrorism plans were introduced Government-wide, considerable review and development of assessment procedures were required. Some elements of the process were agreed between ASNO and ARPANSA—which also has an interest in protection against sabotage. The overall security strategy and the layout of physical protection measures proposed by ANSTO were approved. Assessment of procedures and additional details in the security plan is still required before approval to operate the facility is given.

Other changes to physical protection at Lucas Heights, as part of site upgrades, were also assessed by ASNO during the year.

Performance Assessment

ASNO successfully adapted and applied risk assessment methodology to the physical protection assessment process. Approval was given for the major physical measures being built into the structure of the replacement research reactor. Assessment of the overall plan and procedures for the operational security system will be conducted once ANSTO submits the final comprehensive plan (expected October 2004).

Through inspections, ASNO determined that current physical protection arrangements at ANSTO, the Australian uranium mines and associated operations, and Silex Systems Ltd were being implemented satisfactorily.

OUTPUT B: BILATERAL SAFEGUARDS

Development and implementation of bilateral safeguards measures that ensure nuclear material and associated 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 their jurisdiction.

Performance Assessment

Reporting by conversion facilities, safeguards authorities and shipping agencies confirms that all AONM transferred from Australia safely reached its destination. 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 2003 and 30 June 2004 there were 57 shipments of UOC from Australia. These were from the Ranger mine, Northern Territory, and the Olympic Dam and Beverley mines in South Australia. Exports totalled 9,099 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 111.

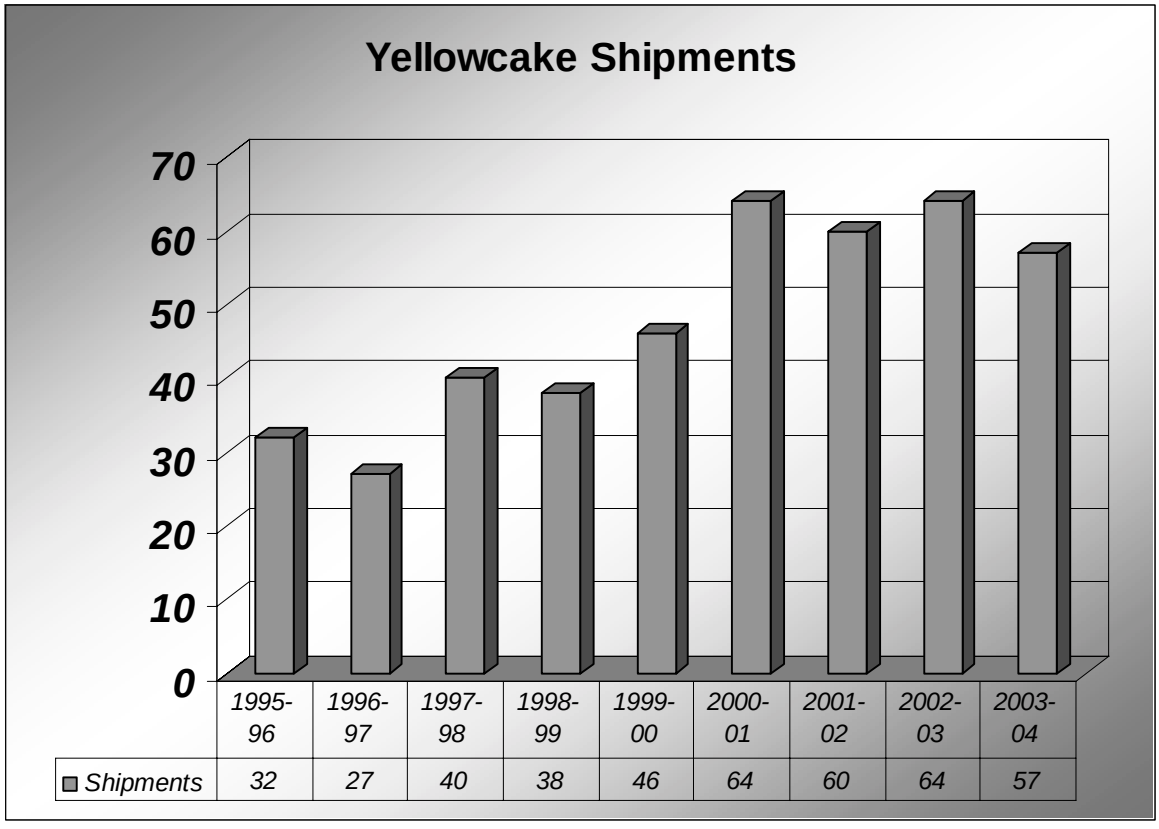


Figure 18: UOC shipments (transfers to conversion facilities).

Exporters shipped UOC to conversion facilities in the U.K., the U.S., France and Canada. ASNO notified each export to the safeguards authorities in the 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; 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.

The number of shipments has been generally increasing in recent years. This is due to smaller, more frequent, shipments rather than an increase in production levels. However, as the effort for ASNO is similar for each shipment regardless of its size, the increase in shipments has created an increased workload for the Office, which has been met largely through enhanced use of IT systems. This year the number of shipments declined slightly for operational reasons but it is expected to increase again in the future.

Operation of bilateral agreements

Reports from ASNO's counterpart organisations were mostly provided in a timely fashion and in the agreed format, which enabled analysis and reconciliation with ASNO's records.

In the case of the U.S., ASNO has been working with its U.S. counterpart (Department of Energy—DOE) for some time to resolve a number of problems in balancing the accounts. The discrepancies from past periods, noted in last year's Annual Report, have now been resolved, with only minor issues remaining to be dealt with. ASNO appreciates the substantial effort that DOE has devoted to this exercise. The figures shown in Annex C are final, compared with last year when they were provisional.

As in previous years, ASNO officers visited all major bilateral partners to reconcile the AONM accounts. During April and May 2004 Mr Nick Doulgeris held technical discussions with ASNO's counterpart organisations in the U.S., Canada, Hungary, Czech Republic, Euratom, U.K. and Japan. Also, Dr Stephan Bayer took part in the Hungary, Czech Republic and Euratom meetings and met with ASNO's new counterparts in France. These discussions covered accession of new member states to the European Union, reconciliation of AONM inventories and transactions under the respective Agreements, and a range of technical issues germane to their operation.

During the year Mr John Carlson took the opportunity to discuss bilateral matters with a number of counterparts on the margins of SAGSI meetings (see Output C).

Laser enrichment technology

The arrangements established by ASNO with the U.S. covering the transfer of SILEX laser enrichment technology govern both the way in which the technology is to be protected and what the technology can be used for (exclusively peaceful purposes). Following USEC's withdrawal from the SILEX project, there were no new transfers of technology. However, the government-to-government arrangements for the protection of sensitive information continued to cover material and information already transferred.

Performance Assessment

On the basis of reporting, other information and analysis, ASNO concludes that 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 provided 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 11 June 2004 there were no outstanding unconfirmed shipments to Australia (i.e. imports). Receipt of all of Australia's exports up to 16 March 2004 has been confirmed through the IAEA's transit matching system.

As at 31 December 2003 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 U.K. and the U.S. Australia's other bilateral partners—the Czech Republic, Egypt, Hungary, the Philippines and the Russian Federation—did not hold any AONM in 2003.

Given that AONM located overseas has been accounted for satisfactorily and is subject to IAEA safeguards, and drawing on the IAEA's Safeguards Statement for 2003 (see page 109), 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 professional 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 the IAEA's Standing Advisory Group on Safeguards Implementation (SAGSI), which is chaired by Mr John Carlson;
- provision of training in nuclear security, specifically through hosting a course jointly with the IAEA and U.S. DOE on the security of nuclear research facilities;
- provision of training on nuclear safeguards, nuclear materials accountancy and compliance with the additional protocol under a structured outreach program funded by AusAID;
- promotion of safeguards and non-proliferation concepts through experts meetings, conferences and publications and discussions with counterparts in other countries;

- 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.

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.

During the year SAGSI conducted a comprehensive review of the IAEA's inspection criteria. This was in response to a call from the IAEA Board of Governors for review of the operation of the IAEA in the context of a departure from zero-real growth budgetary constraints. The SAGSI review looked *inter alia* at the application of the criteria, their role in the evaluation of safeguards effectiveness, and the development of safeguards implementation and evaluation under integrated safeguards.

Other topics examined by SAGSI during the year included:

- further development of integrated safeguards, including state-level approaches;
- the state evaluation process;
- transfers of spent fuel to 'difficult to access' storage, and a range of issues relating to spent fuel verification.

Safeguards evaluation

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 member states via the IAEA's secure GOVATOM web-site;
- appreciation of practical issues derived from participation in SAGSI and the operation of Australia's Safeguards Support Program in support of the IAEA; 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 2003 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 2003, page 109). However, substantial challenges are posed by the revelations of an illicit supply network for sensitive nuclear technology and by the continuing problems with DPRK and Iran, as discussed in other parts of this Report.

Performance Assessment

ASNO has worked 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 48). The IAEA has expressed appreciation for with these services. This work has contributed to more effective international safeguards.

Activities

IAEA safeguards and security training courses

The Government of the Republic of South Africa invited ASNO to assist in a regional safeguards training course in October 2003 and the Japan Atomic Energy Research Institute issued a similar invitation for its course in December 2003. For the first time the China Atomic Energy Authority sought ASNO's assistance with a pilot facility level accountancy course in China, which was held in May 2004. Mr Nick Doulgeris presented a series of lectures at the Japanese course, and both lectured and acted as a facilitator for the course in China. Mr Russell Leslie lectured and acted as a facilitator for the South African course.

ASNO hosted a training course on the physical protection of research reactors and large radioactive sources from 2-13 February 2004 (see page 90). This course was conducted on behalf of the IAEA and was partially funded from the IAEA's extra-budgetary Nuclear Security Fund. The preparation and delivery of the course relied heavily on assistance provided by the U.S. Sandia National Laboratory. Sandia involvement was funded by the U.S. Department of Energy (using an Action Sheet under the Memorandum of Understanding between DOE and ASNO).

Further, ASNO hosted a regional seminar entitled the 'Australia/IAEA Regional Training Seminar on National Safeguards and the Additional Protocol'. This was the fifth course of its type that has been held in Australia since 1986 (see the report on this course at page 91).

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 (i.e. compliance) 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.

Other work

ASNO has been developing outreach activities to assist countries in the region with the fulfilment of their non-proliferation and physical protection obligations. In September 2003 Mr Leslie provided assistance to the Thai Office of Atoms for Peace in its efforts to prepare for the eventual implementation of the Additional Protocol in Thailand. Mr Leslie also visited Iran in April 2004 to provide assistance on nuclear materials accountancy and issues relating to compliance with the additional protocol.

Under its memorandum of understanding (MOU) with the Indonesian nuclear regulatory authority (BAPETEN) ASNO provided a one week course on the performance of non-destructive assay (NDA) of nuclear materials in Sydney during June 2004 (see the report on this course at page 93).

All of this work was well received and led to requests for further assistance.

ASNO supported Australia's Mission to the IAEA in Vienna by providing staff to join Australia's delegation to the IAEA Board of Governors at the September 2003, March 2004, and June 2004 Board meetings, and for the IAEA General Conference 2003. Briefing materials and other assistance were provided to the Vienna Mission on request.

ASNO staff presented papers at the July 2003 annual meeting of the Institute of Nuclear Materials Management.

Performance Assessment

Australia's participation in international work is making a significant, effective and highly regarded contribution to strengthening the IAEA safeguards system. DFAT and the Australian Mission in Vienna have appreciated the technical support provided by ASNO to Australia's work with the IAEA.

Activities

Developments in Nuclear Technology

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 new nuclear technologies at an early stage of development—ASNO is supporting international work in this area.

Performance Assessment

While 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 ensure non-proliferation and safeguards aspects are fully taken into consideration.

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:

- The outreach program to regional countries concerning the Additional Protocol—commenced in FY2001-02 and continued in FY2002-03—was placed on a firmer financial footing and substantially expanded during FY2003-04 with the establishment of a formal program structure agreed with AusAID and an overall program budget of $315,000. The major activity under this program during the year was the provision of the Australia/IAEA Regional Training Seminar on National Safeguards and the Additional Protocol in Sydney and Canberra in June 2004.
- Extensive discussions with senior IAEA officials (including the Director General, Dr ElBaradei and the Deputy Director General for Safeguards, Dr Goldschmidt) as well as with senior officials of several governments and industry representatives, including from Canada, China, DPRK, Indonesia, Iran, Japan, the ROK, the Russian Federation, the U.K. and the U.S.

Performance Assessment

ASNO has achieved highly effective links with the IAEA and a wide range of safeguards organisations and regional counterparts. As a result 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 technical and policy advice on nuclear safeguards, from both international and domestic perspectives.

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—assists the IAEA develop the concepts, equipment and procedures needed to meet new challenges in a cost-effective way. 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 modest—this year totalling about $372,000 (comprising contributions from ANSTO and ASNO, but not including AusAID outreach funding). ANSTO expended approximately $172,000 on work in support of IAEA safeguards development and implementation, and ASNO expended a further $200,000 on consultancy services and participation in SAGSI—this figure includes relevant salary costs.

ASNO has a long-standing safeguards R&D Arrangement (MOU) with the U.S. Department of Energy (DOE). This MOU continues to provide real advantages to ASNO, allowing it access to both DOE headquarters staff and to staff at major U.S. laboratories. Furthermore, the MOU provides scope for cooperation across a range of fields. The Sandia National Laboratory provided the bulk of the syllabus and teaching staff for the February 2004 physical protection course under the ASNO/DOE MOU. Indeed it would not have been possible to provide a course of the needed scale and quality without Sandia's invaluable assistance. Similarly under the MOU the DOE provided lecturers and other assistance for the June 2004 Australia/IAEA Regional Training Seminar on National Safeguards and the Additional Protocol.

ASNO continues to explore options for collaborative projects with Indonesia's Nuclear Energy Control Board (BAPETEN) under the ASNO/BAPETEN MOU. The first major practical activity under this MOU took place in June 2004 and involved training four BAPETEN inspectors in non-destructive assay of nuclear material (see report at page 93).

The largest 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.

A major area of developmental work for ASNO is in the area of information analysis and the use of information in safeguards decision-making. This is an important aspect of giving greater recognition to state-specific factors in safeguards implementation, e.g. in exercising judgments on appropriate safeguards intensity. ASNO has a collaborative project with DOE and Los Alamos National Laboratory on development of a concept for 'information-driven' safeguards.

ASNO provides support to the IAEA's Division of Safeguards Information Technology. In order for the IAEA to provide an assurance that states' nuclear programs are purely peaceful, the Agency must have greater knowledge about states' nuclear and nuclear-related activities. This knowledge is based not only on information provided by the state, but also on data available to the IAEA through its own activities, information from other states and from open sources. To assist the IAEA in managing and analysing this vast array of information, ASNO through a new three year Australian Safeguards Support Program project, is providing support for the IAEA's Division of Safeguards Information Technology. During 2003-04, this project covered two tasks, summarised in Annex H.

Performance Assessment

The results of several projects progressed and completed under the Australian Safeguards Assistance Program have been incorporated into practices of the IAEA in 2003. The IAEA has expressed appreciation for the valuable and vital contribution provided to the Agency's safeguards efforts under the Australian Safeguards Support Program.

This work has contributed to more effective international safeguards.

Milestone C4

Based on the work of the CPPNM Legal and Technical Experts Group (1999-2003), inter-sessional work to draft a clean text of a 'well-defined amendment' to strengthen the CPPNM was completed.

Activities

With the Australian Mission in Vienna, ASNO worked closely with the U.S., the U.K., Canada, France, and Austria, to develop a clean text for the draft amendment of the CPPNM. The result was that in April Austria submitted the draft amendment to the IAEA—which is Depositary for the Convention—asking the IAEA Director General to circulate it to all Parties in accordance with Article 20 of the Convention, which sets out the mechanisms for amending the Convention. While this proposed amendment received good support (24 member states) it is not a consensus text. A diplomatic conference, tentatively scheduled for early 2005, will have the authority to amend the Convention, for which a two-thirds majority of all States Parties is required.

Performance Assessment

Text of a 'well-defined amendment' to strengthen the CPPNM submitted to the Depositary; diplomatic conference tentatively planned for early 2005.

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

As Australia's CWC National Authority, ASNO has been proactive and highly effective in its work with the OPCW. In accordance with Australia's CWC obligations, ASNO prepared and submitted a number of major annual declarations and notifications to the OPCW's Technical Secretariat. In September and October 2003, ASNO submitted CWC Article VI declarations on activities anticipated for 2004 for a total of 10 Australian facilities working with Scheduled chemicals. In March 2004, ASNO made declarations for 2003 on international transfers of Scheduled chemicals and for 45 facilities with CWC-relevant chemical consumption, production or processing. These declarations were compiled using information gathered through the operation of the *Chemical Weapons (Prohibition) Act 1994*, as well as information obtained from Australian Customs data, import and export-licensing records and industry surveys. ASNO also responded to OPCW notes verbales in relation to clarification requests, including explaining causes for mismatches between aggregate national declarations of trade by relevant State Parties.

Figure 19: Empty World War II Chemical Warfare Munitions found near Lithgow.

In accordance with obligations under Article X of the CWC, and to promote transparency between States Parties, in June 2004 ASNO submitted an annual declaration of Australia's national chemical defence program to the OPCW. In doing so, ASNO trialled a new declaration template being developed by States Parties in conjunction with the OPCW, and worked closely with the Department of Defence and Emergency Management Australia in compiling the data.

ASNO notified the OPCW of the intended relocation in August 2004 of Australia's Schedule 1 Protective Purposes Facility, operated by the Defence Science and Technology Organisation (DSTO), from Maribyrnong to Fishermans Bend in Melbourne. As part of this process ASNO worked with the OPCW and DSTO to develop a formal Facility Arrangement in respect of compliance inspections as required under the Convention, and this was approved by the OPCW Executive Council at its 37th session in June 2004 (see page 100).

In May 2003, eight corroded World War II chemical munitions were uncovered during excavation work near Lithgow in New South Wales. ASNO subsequently notified the OPCW Technical Secretariat of the discovery, including the assessment that the munitions were not usable, and submitted a destruction plan in accordance with relevant provisions under the Convention. In June 2004, after consultation with the OPCW, the Department of Defence destroyed the munitions, having determined that they contained no chemical warfare agent.

An ASNO officer visited the OPCW in The Hague on two occasions to attend meetings, including the 5th Annual Meeting of National Authorities and the 8th Conference of the States Parties, and to hold discussions with the OPCW Technical Secretariat. The Australian Embassy in The Hague coordinated a number of meetings with senior OPCW officials during a visit by ASNO's Assistant Secretary Mr Andrew Leask. These discussions and other correspondence during the year covered a broad range of topics including: negotiations on an OPCW privileges and immunities agreement; improvements to the Handbook on Chemicals; action plans for CWC universality and implementation; membership of the Scientific Advisory Board; 'captive use' of Schedule 1 chemicals; nominating Brisbane as a new inspection point of entry; sequential OPCW inspections; Schedule 2 facility agreements; and end-user assurance for Schedule 3 chemical trade.

The OPCW conducted three successful routine facility inspections in Australia during the year to verify declarations. The first two were sequential and visited the existing Schedule 1 Protective Purposes Facility and its replacement, as mentioned above, both in Melbourne. The third inspection, in May, was also in Melbourne, this time at a 'discrete organic chemical' (DOC) facility producing phosphorous, sulphur or fluorine compounds (PSF-DOC). All inspections proceeded smoothly and the OPCW findings were in accordance with ASNO's declarations of the facilities. Australia continues to have very good relations with the OPCW Technical Secretariat based on cooperative, efficient and transparent procedures.

On behalf of ASNO, Mr Eckersley from Australia's Embassy in The Hague attended and presented papers at two international events. Mr Eckersley highlighted Australia's considerable experience in tracking CWC chemicals at the second annual OPCW meeting on practical aspects of controlling trade in CWC chemicals held in Barcelona in September 2003, which attracted 82 participants from 48 States Parties. The second event which he attended was an EU Seminar on CWC challenge inspections held in Vienna in June 2004 with more than 100 participants attending from 33 countries. Mr Eckersley discussed Australia's preparations, which are well advanced, for challenge inspections and tabled a paper.

Figure 20: ASNO, OPCW and facility representatives during an OPCW Inspection at Australia's Schedule 1 Protective Purposes Facility, Melbourne. (ASNO's Mr Howell, Dr Meyer and Mr Doulgeris are respectively 1st left, 5th from left and far right).

Australia has informed the OPCW Technical Secretariat of Australia's willingness to assist with the Action Plan on Implementation of obligations under Article VII of the Convention. This may include assisting other countries in Australia's region with establishment of their national authorities and drafting CWC legislation.

Dealings with other States Parties

ASNO has had extensive and fruitful dealings with other State Parties, especially in the region, including in conjunction with the OPCW. As part of its ongoing work on regional implementation of the CWC, Dr Josy Meyer attended an OPCW workshop and a Fijian industry/government CWC seminar, and held several bilateral discussions in Suva and Nadi in June (see article on page 95). These events were of particular benefit to a number of the participating CWC States Parties which are yet to develop the legislative and administrative systems necessary to fully implement the CWC.

Dr Meyer also presented at the First Asia Group CWC National Authorities Meeting in Singapore in October 2003. This provided a forum for countries to outline their experiences with the implementation of the CWC. The article on page 95 describes this meeting in more detail.

ASNO works closely with a number of States Parties on issues including: reconciling declarations of aggregate national data of trade in CWC Scheduled chemicals; providing comment on Fiji's Draft CWC legislation; providing advice and technical documents to

China, Vietnam, Thailand, New Zealand, Papua New Guinea as well as Taiwan, China. In addition, ASNO had ongoing dialogue with the CWC National Authorities in Canada and the United Kingdom, in particular, in relation to preparations for challenge inspections and tracking trade in CWC Scheduled chemicals.

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. Australia was one of the 22% of States Parties that were able to meet the March deadline for the main annual CWC declaration.

Implementation of the CWC was advanced through agreement with the OPCW on the (new) Schedule 1 Facility Arrangement.

As a reflection of the high standard of its CWC implementation and systems, ASNO continues to receive and respond to requests for assistance and to share its experience, especially in regard to tracking CWC chemicals.

Figure 21: Dr Meyer presenting at the First Annual Meeting of National Authorities of States Parties in Asia, Singapore, October 2003.

Consequent to the CWC meeting in Fiji, ASNO received a letter of appreciation from the Fiji Ministry of Home Affairs, Immigration and National Disaster Management. Increasingly the OPCW and regional countries are looking toward Australia to assist with CWC implementation.

Milestone D2

CWC-relevant activities and facilities effectively regulated and other CWC obligations implemented.

Activities

Permits and Notifications

During the year ASNO identified two additional facilities that required a permit under the *Chemical Weapons (Prohibition) Act 1994* (the Act) to process Schedule 2 chemicals, while the operators of another facility notified ASNO that production of Schedule 3 chemicals had ceased, and that its permit was no longer required.

Fifty-five[3] facilities submitted valid notifications under subsection 29(1) of the Act in relation to production of discrete organic chemicals during 2003.

Table 6: Permits for CWC Scheduled Chemical Facilities held at 30 June 2004

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	8	1	1	11	3

Industry Consultations

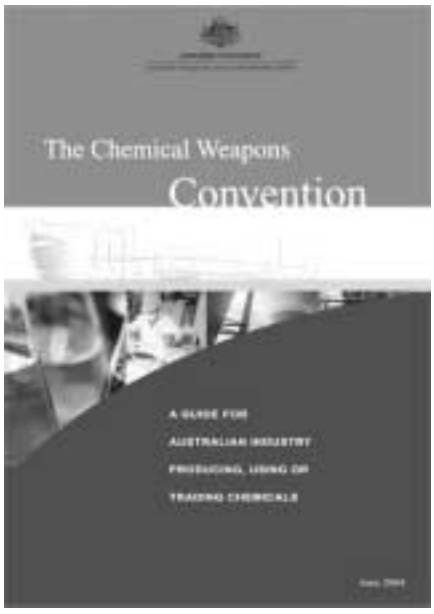


Figure 22: June 2004 CWC guide for the chemical industry

Throughout the year, ASNO continued to operate an on-site industry consultation and outreach program focussed primarily on facilities producing discrete organic chemicals. Approximately 20 facilities were visited. 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 OPCW inspections.

ASNO officers also took the opportunity to speak at a regulatory affairs meeting of the Plastics and Chemicals Industries Association (PACIA) in Queensland.

In June, ASNO released its updated flagship publication 'The Chemical Weapons Convention: A Guide for Australian Industry Producing, Using or Trading Chemicals'. Distribution is underway both domestically and to regional partners.

3. This figure now includes all facilities for which notifications were provided. Several companies operate a number of facilities (two or three) in separate locations. Therefore the figure is higher than for previous years where only the total number of companies was provided.

Customs (Prohibited Imports) Regulations

During the year, ASNO issued 44 import permits covering Schedule 2 and 3 chemicals. ASNO also continued liaison with the Australian Customs Service on improvements to facilitating, processing and monitoring chemical imports and exports.

ASNO has been collaborating with the Department of Defence on a major update to the CD ROM entitled 'International Chemical Trade Control' containing information for importers and exporters of chemicals, which was first published in 2003. The CD is due for its second release in late 2004.

In April, ASNO contributed to a course on sensitive goods trade control presented by the U.S. Department of Energy in Sydney, and then hosted a series of associated meetings in Canberra (article on page 98 refers).

Other Activities

As part of its contribution to Government efforts to address the threat of chemical terrorism, ASNO attended and presented at a number of relevant meetings. ASNO activities and publications raise awareness and provide guidance to chemical companies in regard to chemical counter-terrorism. Also, ASNO has contributed extensively to the review of national hazardous materials legislation being undertaken for the Council of Australian Governments.

ASNO worked with Department of Defence facilities and agencies to develop contingency plans to manage a CWC challenge inspection—although the possibility of one occurring in Australia is remote. The last major elements of this work were completed in February 2004, and now include a higher management plan, a logistics support plan, and internal site management plans.

Performance Assessment

The system of permits and notifications continued to operate well and was subject to some refinements. Client feedback praised ASNO for its responsiveness and the efficient and effective domestic implementation of the CWC.

Regulation of industry was strengthened through publication of 'The Chemical Weapons Convention: A Guide for Australian Industry Producing, Using or Trading Chemicals'.

ASNO contributed strongly in important new areas including on chemical counter-terrorism and the tracking of sensitive goods. On behalf of ASNO, Mr Eckersley attended and presented papers at a European Union seminar in Vienna in June 2004. It was evident that Australia's preparations were some of the most advanced in respect of development of a management plan.

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

To make preparation for the entry-into-force of the CTBT a Preparatory Commission (PrepCom) was established in 1997 made up of CTBT States Signatories, and supported by a Provisional Technical Secretariat (PTS). The primary task of the PrepCom is to develop and establish the Treaty's verification regime, with the following components:

- an International Monitoring System (IMS), comprising 321 seismic, radionuclide, infrasound and hydroacoustic monitoring stations and 16 radionuclide laboratories around the globe;
- arrangements for, and a capacity to conduct, an On Site Inspection (OSI) to determine whether a nuclear explosion has taken place; and
- arrangements through which States Parties will be able to consult and/or seek clarification if concerns arise about treaty compliance, and voluntary confidence building measures where States Parties would give notice of large conventional explosions.

Establishment of Australian IMS stations

Australia will host 20 stations and one laboratory in the IMS (see Annex J)—the third largest number of facilities of any country. ASNO co-ordinates work to upgrade, establish and operate in liaison with the PrepCom's Provisional Technical Secretariat (PTS), with institutions constructing and operating the stations, and with relevant Commonwealth and State and Territory agencies. This work has proceeded smoothly throughout the year, although resolving land use issues ahead of the installation of IMS stations continues to be a significant task for ASNO.

CTBTO Preparatory Commission

ASNO participates in the technical working group sessions of the PrepCom, in conjunction with Australia's Mission in Vienna and with technical specialists from Geoscience Australia and ARPANSA. ASNO contributes to the full range of issues dealt with by the working group, with a particular focus on the development of arrangements for the conduct of an OSI.

ASNO contributes actively to the work developing arrangements for the future conduct of OSI. In June 2004 ASNO's Mr Malcolm Coxhead was appointed as Task Leader for the elaboration of the OSI Operational Manual in the technical working group. Further, ASNO participated in or contributed to OSI training and exercise activities during the year, including a tabletop inspection exercise in Russia in September-October 2003.

In June 2004, Mr Richard Starr was appointed to co-chair a review of the structure of the Provisional Technical Secretariat. The review will be conducted during 2004-05. Before retiring, Mr Starr held appointments as Australia's Ambassador for Disarmament in Geneva and Permanent Representative to the UN for Arms Control and Disarmament from 1994 to 1996. He was Australia's chief negotiator for the CTBT negotiations. In 2002-03 Mr Starr led a team that reviewed the PrepCom's OSI development program.

Pressure to reduce the cost for operating IMS stations is already occurring as a consequence of budget pressures in the PrepCom. Australia will feel the effects more keenly than most other States Signatories, due to the large number of stations hosted.

Regional Outreach

ASNO contributes to DFAT efforts to promote support for the CTBT, in particular its ratification by additional countries.

Performance Assessment

At the end of 2003-04 around 55% of the 337 facilities in the IMS had been installed and were operating substantially to specification. The most recent projections suggest the system will be largely completed by around 2009. However, in the absence of firm movements towards the CTBT's entry-into-force, the readiness of states to fully fund the work of the PrepCom has reduced, and this projection may need to be revised.

Progress with the establishment of Australian IMS facilities has remained strong with 16 of the 21 now operating substantially to specification, including 11 which have been certified (see Annex J). Several of the remaining stations will be constructed at remote locations (Macquarie Island and Antarctica), so the completion of all Australian stations may take several years.

During 2003-04 work to establish two Australian IMS facilities was completed, and one of these was certified as meeting CTBT requirements. Other achievements include:

- certification by the PTS of the newly constructed infrasound monitoring station at the Buckland Military Training Area in central Tasmania;
- establishment of Australia's Treaty-mandated radionuclide analysis laboratory in Melbourne, and commencement of evaluation of its performance against Treaty standards;
- completion of the site survey for an infrasound station on the Cocos Islands; and
- commencement of planning for new radionuclide and infrasound stations at Macquarie Island, and in Antarctica.

In May-June 2004 Australian stations participated in the preliminary phase of the first system-wide performance test of the IMS. The main phase of the test will occur in 2004-05.

At the CTBTO PrepCom 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.

Milestone E2

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

Activities

The *Comprehensive Nuclear Test-Ban Treaty Act 1998* was assented to on 2 July 1998 but was not able to enter into effect, absent the entry-into-force of the CTBT, until amended by the *Non-Proliferation Legislation Amendment Act 2003*. On 11 June 2004 key provisions of the Act came into effect following proclamation by the Governor-General. These are detailed at page 18.

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 DFAT.

In 2000 Australia concluded an arrangement with the PrepCom to facilitate establishment and operation of IMS stations in Australia. The implementation of that arrangement includes access to Australia's Indirect Tax Concession Scheme. ASNO has assisted the PTS during 2003-04 in relation to claims made under that scheme.

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. Several Australians normally participate in this training each year. In 2003-04 a DFAT officer attended introductory training on CTBT On-Site Inspection.

Performance Assessment

The Nuclear Monitoring contract with Geoscience Australia (GA) was performed satisfactorily throughout the year. Its terms are reviewed each year to ensure they continue to be appropriate to Australia's needs.

Australia is widely regarded as an active participant in and contributor to the practical work of preparing for entry-into-force of the CTBT. Generally, participation in training activities has presented useful opportunities to strengthen this involvement and promote Australia's interests, although this was limited in 2003-04.

OUTPUT F: NEW NON-PROLIFERATION REGIMES

Contribution to the development of new and strengthened WMD non-proliferation regimes—including the Australia Group—and international and domestic measures in support of BWC objectives, and development of verification concepts for the proposed FMCT.

Milestone F1

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

Activities

ASNO continued to provide technical support to DFAT in efforts to develop means of strengthening the BWC. This support was more varied than previously as the international community explored alternatives to the Verification Protocol negotiations which collapsed in 2002.

At the BWC Review conference in 2002, States Parties agreed to a three year program of work, a series of Experts Meetings, designed to help strengthen the BWC at the level of national implementation. Mr Andrew Leask led Australia's delegation to the first Experts Meeting in Geneva in August. While the meeting was essentially 'information sharing', in the absence of an international verification regime one outcome sought was that each State Party would strengthen domestic implementation of the BWC, which in turn would lead to the enhancement of regional security. Eighty-four state parties attended the meeting. Analysis from the material presented here enabled ASNO to have a significant input to the COAG hazardous materials review. With DFAT's International Security Division, ASNO is pursuing regional contacts to follow-up counter-proliferation gains arising from the meeting.

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.

The Department of Prime Minister and Cabinet has expressed appreciation for ASNO's high quality, objective and timely contributions to the COAG Review of Hazardous Materials.

ASNO received favourable comment on the timeliness and value of its activities and continues to receive requests for briefings.

Milestone F2

Provision of effective technical and operational support to the Australia Group.

Activities

Mr Andrew Leask attended the June 2004 meeting of the Australia Group (AG) in Paris, chairing the implementation and information sharing working groups. The AG is an informal forum of countries which harmonise their export controls to ensure that dual-use goods are prevented from reaching proliferant chemical and biological warfare programs.

With UN Security Council Resolution 1540 in mind, and the growing acceptance of the AG as an international benchmark for preventing chemical and biological weapons proliferation, the meeting was particularly successful. As part of the work of the Implementation Group, the AG agreed to add five plant pathogens[4] to the controls lists and expand medical exemptions for conotoxins. Consideration of further additions and inclusion of aerosol sprayers suitable for dispersal of biological agents was progressed with a view to intersessional agreement.

Performance Assessment

ASNO has increased its level of involvement in the AG at the behest of DFAT and received strong praise for its efforts. Australia's lead role is widely appreciated and identifies it as a driving force behind counter-proliferation. An important outcome associated with ASNO's presence was the addition of five plant pathogens to the control lists.

Figure 23: Australian delegation to the June 2003 Australia Group meeting in Paris. In front row from left: Brian Hurrell, Australian Customs Service; Peter Shannon, ISD, DFAT; Andrew Leask, ASNO.

4. *Xanthomonas campestris* pv *oryzae; Clavibacter michiganensis* subsp. *Sepedonicum; Ralstonai solanacearum;* Potato Andean latent tymovirus; Potat spindle tuber viroid.

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. It provided similar assistance for ministerial briefings to several other agencies including the Department of Industry, Tourism and Resources, the Department of Education, Science and Training, and the Department of Defence.

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

Performance Assessment

During the reporting period ASNO submitted a total of 68 Ministerial briefs, Ministerial correspondence, Parliamentary Question briefs and press releases. ASNO made a major contribution to DFAT policy advice, analysis and other briefings on nuclear, CWC, BWC, CTBT and other related 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, BWC, CTBT issues and associated non-proliferation regimes. ASNO has presented various papers at conferences and in international publications—see Annex L 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.

ASNO staff have provided background briefings to the media and non-government organisations on a range of topics relevant to ASNO's sphere of work and expertise.

In conjunction with DFAT and the Department of Defence, ASNO effected outreach to universities in NSW and Victoria, and industry, to address issues pertaining to the export of knowledge (intangible technology) and equipment.

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

ASNO's web site (http://www.asno.dfat.gov.au) was modified to bring it in line with the Departmental standard and material was updated. All ASNO publications were listed, with many new documents linked to the web site.

Performance Assessment

ASNO has used a wide range of material to inform the public and officials about current nuclear, CW-related and CTBT issues. Some of these materials, such as the CD-ROM for chemical traders, have been sought after by foreign authorities with responsibilities similar to ASNO.

Industry has expressed appreciation for efforts to keep it informed about changes under IAEA safeguards, the CWC and legislation. An evaluation of ASNO's relationship with industry shows that dissemination of information has fostered an acceptance and broader understanding of relevant treaties and their verification mechanisms.

CURRENT TOPICS

Figure 24: OPCW and ASNO staff conducting a routine inspection of a DOC facility in Victoria.

NUCLEAR PROLIFERATION CHALLENGES:

1. STRENGTHENING THE NON-PROLIFERATION REGIME

This is an update of an article on the same topic in ASNO's 2002-03 Annual Report.

1. Introduction

While international political and strategic circumstances have changed substantially over the last 30 years, the Nuclear Non-Proliferation Treaty remains the keystone of the nuclear non-proliferation regime. Despite current concerns, the NPT has been an outstanding success. In the 1960s, before the NPT was negotiated, it was widely assumed that nuclear proliferation was inevitable and there would be some 25 nuclear-armed states by the 1990s. This has not happened. Instead there continue to be five recognised nuclear-weapon states (U.S., Russia, U.K., France, and China), and in addition four 'nuclear-capable' states—India, Israel and Pakistan, which have remained outside the NPT, and the DPRK which has purported to withdraw from the NPT.

Notwithstanding this overall success, however, in recent years the NPT has come under serious challenge. Three states—Iraq, DPRK and Libya—have violated the Treaty by pursuing nuclear weapon programs. A fourth state—Iran—has committed serious safeguards breaches[5], and at the time of writing this article IAEA investigations are ongoing. In addition to these challenges, there is a more general challenge to NPT objectives—the spread of centrifuge enrichment technology and know-how.

2. Proliferation challenges

Iraq exploited weaknesses inherent in the classical safeguards system to conceal its proliferation efforts, discovered following the first Gulf War. The response to this has been the development of strengthened safeguards, including the Additional Protocol (see below). While Iraq is no longer considered a proliferation threat, many of the weaknesses revealed by Iraq—particularly limits on IAEA inspectors' access rights—remain for those states that have yet to conclude an Additional Protocol.

DPRK The IAEA Board of Governors found in 1993 that the DPRK was in non-compliance with its safeguards agreement—there was evidence of undeclared plutonium production, and the DPRK had refused to allow the IAEA to conduct special inspections. Under the Agreed Framework concluded between the DPRK and the U.S. in 1994 the DPRK was to freeze its nuclear programs, but in the early 2000s indications began to emerge that it had embarked on a clandestine centrifuge enrichment program. In 2002 the DPRK expelled IAEA inspectors monitoring the freeze, and in 2003 announced its intention to withdraw from the NPT. Subsequently the DPRK has restarted reactor operations, appears to have reprocessed at least some of the spent fuel held at its Yongbyon site, and has said it has nuclear weapons. As at the end of the period covered by this Report, a resolution to this situation was being sought through the 'Six-Party Talks', involving the DPRK, U.S., China, Japan, ROK and Russia.

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5. NPT Article III requires non-nuclear-weapon states to accept IAEA safeguards and to follow IAEA safeguards procedures in respect of all nuclear material. Iran's failures to declare all nuclear material and nuclear activities constitute not only breaches of its safeguards agreement, but failure to comply with Article III.

Libya For some time Libya had been suspected of involvement in uranium enrichment, based on centrifuge technology, but no clear evidence had come to light. During 2003 Libya initiated discussions with U.K. and U.S. officials, which led to a decision by the Libyan leadership to renounce nuclear and other WMD programs. Libya has been cooperating with the IAEA since December 2003 in verifying and dismantling its nuclear program. The major element in this program was centrifuge technology acquired from an illicit supplier, the 'AQ Khan network' (see below). There were plans to supply a substantial centrifuge installation—more than sufficient to support a nuclear weapon program—on a 'turn-key' basis. Even more serious, the Khan network had also provided Libya with the design for a nuclear weapon.

As noted, Libya is cooperating with the IAEA. In March 2004 Libya signed an Additional Protocol, and undertook to implement it fully pending its formal entry-into-force. Libyan authorities are to be commended for the recognition that Libya's national interests are best served through observing treaty commitments and normalising its international relations. While the Libyan situation is being resolved satisfactorily, it is disturbing to see how readily proliferation-sensitive technology—and even a nuclear weapon design—can be obtained on the black market, and how difficult it is to detect clandestine nuclear activities of this kind.

Iran There is widespread concern about Iran's development of uranium enrichment and its plans for a large heavy water-moderated research reactor. These activities would give Iran the capability to produce fissile material for nuclear weapons. The IAEA has found a number of serious breaches of Iran's safeguards agreement (see article on page 85), and as at the end of the period covered by this Report (30 June 2004) the IAEA's investigations were ongoing. While it is encouraging that Iran has signed an Additional Protocol and undertaken to implement it on a provisional basis, Iran has given no indication of when the Additional Protocol will be given legal effect.

Centrifuge enrichment Due to its inherent characteristics—including relatively small physical size, relative absence of physical indicators—centrifuge enrichment presents major challenges: how to effectively safeguard declared centrifuge enrichment facilities; how to detect undeclared facilities; and how to limit the further spread of this technology.

A common factor in all four cases mentioned above has been the pursuit of clandestine centrifuge enrichment programs—the willingness of governments to pursue technology and components illicitly, and the willingness of unscrupulous individuals to supply these. Particularly striking have been the activities of AQ Khan, a scientist who was instrumental in the development of Pakistan's nuclear weapons program, and his associates—they had established an extensive network of manufacturers and middle-men involving companies in several countries. Some of these companies may have been unaware of the nature of the items they were contracted to produce.

The centrifuge technology which is at the heart of these current problems is based on technology stolen from Urenco's Netherlands operation in the 1970s by Khan, who worked for Urenco at that time. Although Khan's conduct is particularly reprehensible, it would be a mistake to consider this a peculiarly Pakistani problem—a number of European nationals were involved in the supply of centrifuge technology to Iraq in the 1980s, and a disturbing feature of current revelations is that some of these criminal operations have become family affairs—sons following in their fathers' footsteps. This indicates not only criminal greed, but inadequate laws and law enforcement.

Dealing with proliferators The greatest single challenge currently facing the international community is, how to deal with determined proliferators? In particular, how

do we deal with proliferators: (a) with **undeclared** centrifuge enrichment; or (b) with declared enrichment facilities operated under safeguards, but which provide the capability for rapid **break-out** from non-proliferation commitments?

3. The role of IAEA safeguards

For most states the commitment not to acquire nuclear weapons has been carefully made and is strongly held. Observance of their legal obligations under the NPT or other treaties which foreclose the nuclear weapon option does not depend on the deterrent effect of verification activities. Nonetheless, it is an important maxim of international arms control to **'trust, but verify'**. The establishment of a credible verification mechanism to provide confidence that all parties are honouring their treaty commitments plays a vital part in reinforcing these commitments.

The verification mechanism for the NPT comprises safeguards applied by the IAEA. Safeguards may be described as a system of technical measures—inspections, measurements, information analysis, etc—to verify the performance of legal commitments, namely, commitments given by states under the NPT and related international agreements to use nuclear materials and facilities for exclusively peaceful purposes.

It needs to be appreciated that the safeguards system is only part of the non-proliferation regime—an essential part, to be sure, but by no means the only barrier against proliferation. The non-proliferation regime comprises complex interacting and mutually reinforcing elements. Important elements complementing the NPT include:

- restraint in the supply and the acquisition of proliferation-sensitive technologies;
- multilateral regimes such as the CTBT and proposed FMCT;
- various regional and bilateral regimes;
- the range of security and arms control arrangements outside the nuclear area (including other WMD regimes);
- the development of proliferation-resistant technologies, and
- especially important—political incentives and sanctions in support of non-proliferation objectives.

Ultimately proliferation is a **political** problem that must be addressed at the political level. The disciplined, impartial treaty verification provided by IAEA safeguards is an essential component of the non-proliferation regime, but the effectiveness of the regime depends on the preparedness of governments—especially the P-5 [6] —to take action to uphold compliance.

4. Expectations of safeguards—what can safeguards deliver?

In any critique of safeguards, it is essential to have a realistic appreciation of what safeguards can achieve. Many of the criticisms of safeguards are more properly directed at failings in national intelligence, and failings in the political incentives and sanctions underlying the non-proliferation regime.

Safeguards serve a vital **confidence-building** role—by assisting states which recognise it is in their own interest to demonstrate to their neighbours and the international community that they are honouring their treaty commitments, and by enabling them to gain assurance

6. The permanent members of the Security Council—China, France, Russia, U.K. and U.S.

that others are doing likewise. Thus safeguards operate in a political environment, giving expression to political undertakings as well as legal commitments.

Clearly safeguards must be **credible**. This requires that they be technically sound, but credibility ultimately involves political as much as technical judgments. Maintaining and enhancing credibility is a complex matter and will be the underlying theme of safeguards development for some time.

The task of safeguards is not **prevention** as such, except in so far as risk of detection may act as a deterrent to would-be proliferators—the IAEA is not an international policeman. Rather, safeguards serve an essential political objective by exercising a positive influence on the behaviour of states. Safeguards do this by:

- providing assurance to reinforce non-proliferation commitments; and
- deterring non-compliance through the risk of timely detection.

That being said, however, safeguards make a major contribution towards prevention, by:

- raising the level of difficulty for the would-be proliferator to proceed undetected—hopefully dissuading the proliferator from the attempt; and
- providing the international community with timely warning—and the opportunity to intervene—through detection of proliferation programs.

Detection of undeclared nuclear activities

The IAEA has over 40 years experience verifying **declared** nuclear activities. The current safeguards system provides a high degree of assurance about declared activities—the principal issue here is how to reduce routine safeguards operations while maintaining the necessary detection capability. What this means in practice—how to determine the appropriate detection capability and the level of safeguards effort to achieve this—is one of the principal themes of current safeguards development.

The greatest single challenge—of critical importance to the credibility of the safeguards system—is to effectively address the issue of **undeclared** nuclear activities. It is vital that the IAEA is able to present authoritative conclusions about the absence of such activities in a state.

How realistic is it to expect the IAEA to be able to detect undeclared nuclear activities? This is a much less definitive goal than the verification of declared material, and the level of assurance which can be provided will be less certain. The difficulties encountered in Iraq in the 1990s, where there was a very intrusive verification regime following the first Gulf War, show this is not an easy task.

On the other hand, compared with individual states, the IAEA has considerable advantages to build on in pursuing this task. In addition to its expertise, the IAEA has comprehensive information bases, rights of access (the ability to 'get under the roof'), and increasingly sophisticated verification methods. However, there are limits to what the IAEA can achieve alone. States have more extensive resources and specialised capabilities—effective action to counter undeclared activities requires a partnership between states and the IAEA, in which states make available information obtained through national means, including intelligence activities.

In contrast to the quantitative nature of 'traditional' safeguards, dealing with declared nuclear material and activities, efforts directed towards the detection of undeclared activities are largely qualitative. New and improved verification techniques—including

environmental analysis and satellite imagery—are important, but a major focus is the collection and analysis of information. By definition this is going beyond the categories of information used in the 'traditional' system—a key issue is how far this can be broadened, and how to ensure that broadening the information base does not adversely affect the integrity of safeguards operations and conclusions.

5. Progress with the strengthened safeguards system

The 'traditional' safeguards system developed for the NPT was primarily focused on verifying declared nuclear materials and activities—it was assumed that development of fuel cycle capabilities independent of declared facilities would be beyond the resources of most states, and in any event would be readily detectable. The discoveries made about Iraq's clandestine enrichment program demonstrated that these assumptions were no longer valid, and an extensive program to strengthen IAEA safeguards has been underway since the early 1990s.

This program is focusing particularly on establishing the technical capabilities and legal authority necessary for detection of **undeclared** nuclear activities. Central to these efforts is the effective use of **information**—involving collection and analysis of information that can enhance the agency's knowledge and understanding of nuclear programs—and more extensive rights of **access** to nuclear and nuclear-related locations, including for the resolution of questions arising from information analysis.

Additional Protocol

Underpinning the program to strengthen safeguards is the additional protocol (AP)—a legal instrument complementary to safeguards agreements, which establishes the Agency's rights to more extensive information and physical access. The Model Additional Protocol was agreed by the IAEA Board of Governors in 1997.

Viewed in terms of total NPT membership, the rate of uptake of the AP remains disappointing—as at 30 June 2004 less than half the Parties to the NPT had ratified or signed an AP. This delay in accepting the AP has adverse consequences for strengthening the safeguards system—e.g. in terms of access to confirm absence of significant nuclear activities, or availability of import/export information—and every effort must be made to improve the situation. Nonetheless, in terms of safeguards implementation in states known to have **significant nuclear activities**, the situation is more positive—APs have now been ratified or signed by **three-quarters** of such states.

Already over 90% of all nuclear facilities subject to comprehensive safeguards (i.e. based on the 'INFCIRC/153' model agreement) are in states that have at least signed an AP, and over 70% of such facilities are in states with an AP in force. The status of APs for states with comprehensive safeguards agreements and significant nuclear activities, as at 30 June 2004, is summarised in the following table. Further details are in Annex K of this Report.

INFCIRC/153 agreement alone, no AP	14
INFCIRC/153 agreement, plus AP signed	7
INFCIRC/153 agreement, plus AP in force	42

It can be seen that the combination of a comprehensive safeguards agreement and an additional protocol is now firmly established as the contemporary NPT safeguards standard. The additional protocol cannot be considered optional. Non-nuclear weapon states Party to

the NPT have accepted 'the Agency's safeguards system'[7]. This means the safeguards system as it exists from time to time—**safeguards are not a menu**, it is not acceptable for states to pick and choose to suit themselves.

It is of concern that 14 NPT non-nuclear weapon states with significant nuclear activities have yet to sign APs—while some of these are making the necessary preparations, others appear to have no intention to sign. For those states that have not signed APs (or sign but unreasonably delay ratification), the question whether the standard safeguards agreement alone provides adequate assurance can be expected to receive increasing attention.

6. Further strengthening steps

Some steps for further strengthening the safeguards regime are outlined as follows.

Enhancing the IAEA's technical capabilities

The detection of undeclared nuclear activities presents a considerable challenge. It is important for all states in a position to do so to assist the IAEA in developing the necessary capabilities and skills. Because of the inherent characteristics of **centrifuge enrichment**—including relatively small physical size, relative absence of physical indicators—detection presents particular challenges

Increased sharing of information

National information The preparedness of states to share information with the IAEA is essential to an effective safeguards system. There are limits to what can be realistically expected of the IAEA, without the assistance of states, in the detection of undeclared nuclear activities. States need to contribute through the sharing of unclassified information and analyses, the sharing (under appropriate protection) of information from national intelligence sources, and assisting the IAEA in developing necessary information collection and analysis skills. Much has been done in these areas, but there is plenty of opportunity to do more.

Information-sharing with other verification agencies and secretariats Information-sharing can be improved, both within nuclear-related areas, such as the Nuclear Suppliers Group (NSG), the Zangger Committee, and the CTBT Organisation, and also with other WMD areas, such as the Chemical Weapons Convention and the Missile Technology Control Regime.

The NSG is a particularly important area to look at. Patterns of acquisition of **dual-use items** would serve as a useful indicator of possible proliferation efforts. Yet currently there is little or no sharing between NSG members of information on exports of dual-use items (apart from denial notifications), and there is no arrangement for the sharing of such information with the IAEA. In the case of items **specially designed/prepared** for nuclear use, the additional protocol requires the reporting of transfers to the IAEA—here, it might be asked whether there is scope for suppliers to voluntarily bring this into general application ahead of AP ratifications.

As to the relevance of other WMD regimes, experience shows that a state pursuing one form of WMD is likely to be interested in others, as well as in suitable delivery systems. Often these states have used the same research institutions and front companies across different WMD areas. Thus knowledge of procurement efforts in other areas may be very useful for the IAEA, and *vice versa*.

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7. NPT Article III.1.

Constraints on the spread of proliferation-sensitive technology

The proliferation of nuclear weapons is in **no-one's** interest. Governments must be persuaded that the short-term commercial advantage of assisting nuclear programs in states of proliferation concern are more than offset by the long-term risks to themselves as well as others.

There is a need not only to ensure that NSG members' export controls are as effective as possible, but to try to secure the cooperation of states outside the NSG to apply similar controls. As already noted, Iraq had been able to obtain centrifuge components and other sensitive nuclear items through illegal supply from European sources. Since then European export controls have been substantially improved, and tougher laws introduced against complicity in WMD programs. Nonetheless, as noted earlier, it has been found that some of the individuals involved in illicit supply in the 1980s are still active in these areas—clearly there is a need for more effective action against these criminals.

Revelations about the extent of the Khan network have been a particular shock. Now, there must be concerns about whether enrichment technology will spread from Iran, illegally or otherwise—and the DPRK has indicated a willingness to trade in fissile material. Hence, a number of governments have formed the **Proliferation Security Initiative** (PSI) to cooperate to counter WMD-related transfers. The PSI is rapidly developing a practical interdiction capability between an increasing number of participants—more than 60 states have expressed support for this Initiative.

The conclusion of an additional protocol should be seen as a basic condition for nuclear supply. But this in itself is not sufficient—it is important to exercise restraint in supply **and acquisition** of sensitive technology, especially in regions of tension. The confidence that safeguards are intended to provide will be undermined if there is concern that states, in the guise of safeguarded 'civil' programs, are developing 'virtual' nuclear weapons capabilities. Here, an issue that needs to be addressed is the claim that the NPT gives states an unlimited right to pursue **any** nuclear technology, regardless of the impact on the Treaty's objectives.

Given the particular problems posed by **centrifuge enrichment** technology—increasing availability, ease of concealment (including through clandestine replication of safeguarded facilities)—the time has come for a careful look at a program of action in this area in support of non-proliferation. This could encompass not only enhanced export controls and enhanced verification/detection capabilities, but also development of political responses—such as **assurance of nuclear fuel supply** as a means of diminishing the incentive to develop indigenous enrichment capabilities, maybe even the establishment of multi-nation enrichment arrangements. This subject is discussed further in the article following on 'Addressing the Spread of Sensitive Nuclear Technology'.

UNSC Resolution 1540

An important development is the adoption by the Security Council on 28 April 2004 of Resolution 1540, which sets out measures to be taken by UN Member States to counteract the spread of WMD, including adoption and enforcement of appropriate legislation. The Resolution requires states to outline the steps they have taken or intend to take to implement the Resolution by October 2004.

Promotion of proliferation-resistant fuel cycle technologies

This is forward-looking—there are obvious advantages if it is possible to develop technologies that minimize opportunities for production or separation of weapons-usable

materials. Such concepts have been discussed in detail elsewhere, e.g. ASNO's paper 'Towards a Proliferation-Resistant Nuclear Fuel Cycle'[8].

Complementary regimes

For a discussion of how other regimes—such as the CTBT, the proposed FMCT, regional and bilateral regimes, arrangements covering nuclear weapons dismantlement and irreversibility—see ASNO's paper 'Nuclear Non-Proliferation: the Role of Complementary Regimes'[9].

7. NPT issues

Current proliferation challenges raise important questions for the NPT, which require further analysis and reflection by governments, namely:

- ensuring the use of nuclear technology is consistent with NPT objectives;
- ensuring states cannot evade their non-proliferation commitments by withdrawing from the NPT.

These are discussed further in the article following on 'NPT Issues'.

8. G-8 Action Plan on Non-proliferation

Many of the issues outlined above were recognised by the statement of 9 June 2004 from the G-8's Sea Island Summit[10]. Amongst the actions announced in this statement were:

- establishment of new measures to ensure that sensitive nuclear items with proliferation potential will not be exported to states that may seek to use them for weapons purposes, or allow them to fall into terrorist hands. The G-8 aims to have appropriate measures in place by its next Summit (June 2005)—and meanwhile it was agreed not to inaugurate new initiatives involving transfer of enrichment and reprocessing equipment and technologies to additional states;
- development of new measures to ensure reliable access to nuclear materials, equipment and technology, including nuclear fuel, for all states, consistent with maintaining non-proliferation commitments and standards;
- establishing the additional protocol as an essential standard for nuclear supply, by the end of 2005;
- suspension of nuclear fuel cycle cooperation with states that violate their nuclear non-proliferation and safeguards obligations;
- strong support for the Proliferation Security Initiative.

9. Conclusions

At its Evian Summit, in June 2003, the G-8 recognised the proliferation of weapons of mass destruction and their delivery systems, together with international terrorism, as the pre-eminent threat to international peace and security. The G-8 further recognised that 'this challenge requires a long-term strategy and multi-faceted approaches'.

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8. INMM 2000 Annual Meeting.
9. Journal of Nuclear Materials Management, Summer 2002.
10. The Group of Eight comprises Canada, France, Germany, Italy, Japan, Russia, U.K. and U.S.

The non-proliferation regime comprises complex interacting and mutually reinforcing elements. Some of these are multilateral, others are based on national action. Verification is essential to the effective operation of the non-proliferation regime—safeguards reinforce norms of behaviour, increase the difficulties confronting the proliferator (by constraining the use of declared facilities), and provide a mechanism for identifying non-compliance.

Of course there is scope for further improvements in the safeguards system—what is needed is a partnership between states and the IAEA, building on what is already in place. The strengths of IAEA safeguards include regular access to the state (in which measures such as environmental sampling can be carried out, as well as general observation—the inspector's 'nose'), a strong body of expertise in verification/investigation techniques, and **impartiality**—important to international confidence-building and to securing support for enforcement action.

Detecting undeclared nuclear activities will always be difficult—especially centrifuge enrichment, a common factor in current problem cases. Safeguards techniques are improving substantially, but national intelligence will continue to have a major role. Compared with national intelligence, however, the IAEA has considerable advantages—specialised detection skills, and especially the ability of inspectors to get 'under the roof' at places of interest. The best results will come from close collaboration.

Clearly there is a need for greater focus on the areas of highest proliferation potential. This may be contentious—but it is important to promote a positive appreciation by states that safeguards are not an **imposition**, but a means of enhancing their own national security. Universalisation of the additional protocol is an essential part of rationalising safeguards effort—this warrants full support by all governments.

It should be a matter of the highest priority for the international community to ensure there is no increase in the number of nuclear-armed states. Indeed, in 1992 the Security Council declared that:

> 'The proliferation of all weapons of mass destruction constitutes a threat to international peace and security'[11].

Ultimately, the effectiveness of safeguards, and the non-proliferation regime as a whole, depends on the preparedness of governments to take all necessary action—including enforcement action—to uphold compliance.

11. Statement by President of Security Council, 31 January 1992, UNSC document S/23500.

2. NPT ISSUES

The Nuclear Non-Proliferation Treaty entered into effect in 1970. The Treaty provides for a Review Conference of Parties every five years—the next Review Conference will be held in 2005, the Treaty's 35th anniversary.

Current proliferation challenges raise important questions for the NPT, which require careful analysis and consideration by governments. It is essential that these questions receive serious attention at the forthcoming Review Conference.

The NPT delivers vital security benefits to all non-nuclear weapon states

The NPT is commonly described as a 'two-way bargain', by which the non-nuclear-weapon states (NNWS) forswear nuclear weapons, and the nuclear-weapon states (NWS) undertake to disarm. This description overlooks a vitally important point—that the NPT is also a bargain between the NNWS themselves. It is fundamental to the decision by each NNWS not to pursue nuclear weapons that other NNWS maintain their commitment not to do so. Efforts by some NNWS to acquire nuclear weapons not only undermine the preparedness of the NWS to pursue disarmament further, they also threaten the national security of all Parties—NNWS and NWS alike—and endanger the non-proliferation regime as a whole.

It is essential to maintain a realistic appreciation of the security benefits the NPT delivers—argument about the pace of disarmament must not distract attention from the vital interest each Party has in ensuring that all NNWS honour their non-proliferation commitments.

Ensuring pursuit of nuclear technology is consistent with NPT objectives

Article IV.1 of the NPT refers to '… the inalienable right … to develop research, production and use of nuclear energy for peaceful purposes …' This has been cited by some as supporting the right of every state to develop a full nuclear fuel cycle, including the technologies of uranium enrichment and plutonium separation (reprocessing). Enrichment and reprocessing are part of the peaceful fuel cycle, but these technologies are also needed to produce fissile material for nuclear weapons. For this reason there is increasing recognition of the need for effective international action to limit the spread of these 'proliferation-sensitive' technologies.

The argument that Article IV establishes a **right** for every state to develop the entire fuel cycle overlooks the history leading to the negotiation of the NPT, and also overlooks the NPT's objectives and its actual provisions. The principal objectives of the NPT are: to prevent the spread of nuclear weapons; to advance nuclear disarmament; and to facilitate cooperation in the peaceful uses of nuclear energy. These objectives are closely inter-related—limiting the spread of the capability to make nuclear weapons is an essential element.

The actual terms of Article IV refer to the use of **nuclear energy**—the Article does not refer to specific technologies such as enrichment and reprocessing. The negotiators of the NPT envisaged that nuclear materials and nuclear technologies—such as reactors and fuel—would be made available, for exclusively peaceful purposes, to those in compliance with the Treaty. It was never envisaged that every state is entitled to develop the full nuclear fuel cycle—and the dangers of this should be obvious.

Article IV is not unqualified. Article IV.1 expressly states that activities pursuant to it must be in conformity with Articles I and II. Taking this point further, activities that may **prejudice** the objectives of the NPT can also be seen as being inconsistent with Article IV.1. For example, if concern about a state's intentions in developing enrichment or reprocessing were to prompt other states to pursue these technologies—resulting in competition to achieve capabilities that could support a nuclear weapons program—clearly this would adversely affect international peace and security and would be inconsistent with NPT objectives.

Another aspect of potential prejudice to NPT objectives is the difficulty of maintaining effective control over sensitive technology as more and more states and personnel become involved. The wider the involvement, the greater the risk of illicit dissemination of technology to other countries and to sub-national groups.

A further issue relates to Article III.1 of the NPT, i.e. the obligation to accept IAEA safeguards and to follow safeguards procedures in respect of all nuclear material. Not only should activities pursuant to Article IV be in conformity with Article III, but states in material breach of Article III cannot expect to claim rights under other provisions of the NPT such as Article IV.

Article IV involves much more than an issue of legal interpretation—and it is dangerous to view this Article simply in terms of rights to technology and technology transfer. Where enrichment and reprocessing are involved, far more is at stake—these technologies can have profound implications for international peace and security.

There is increasing international recognition that limits are needed on the spread of proliferation-sensitive technologies. In particular, enrichment and reprocessing should not be pursued in regions of tension, where there is the danger of 'virtual' arms races and break-out from the NPT.

The right in Article IV is for **a Party in good standing to be given the opportunity to enjoy the benefits of using nuclear energy**, including through **cooperation** with other Parties. Action to develop an international framework under which states can be assured of access to nuclear fuel and reactors—obviating any need to develop sensitive technologies indigenously—is outlined in the article 'Addressing the Spread of Sensitive Nuclear Technology' (page 77).

Can states evade their non-proliferation commitments by withdrawing from the NPT?

In line with normal treaty practice, the NPT has a withdrawal provision (Article X). This is not open-ended—a Party seeking to withdraw must show that 'extraordinary events, related to the subject matter of this Treaty, have jeopardised the supreme interests of its country.' To underline the seriousness of proposed withdrawal, notice must be given not only to all other Parties, but also to the Security Council.

Since the NPT entered into force, 34 years ago, circumstances have changed, bringing the issue of withdrawal under particular scrutiny. The Treaty, with 188 Parties, is now essentially **universal**: only three states, India, Israel and Pakistan, remain outside it (although the DPRK announced its withdrawal in 2003, the validity of this has not been determined).

The universal character of the NPT is such that the non-proliferation norm can be seen to represent customary international law. Even the three non-Parties are affected by this norm—while they have not committed against developing nuclear weapons themselves, they are bound not to assist others to do so in violation of NPT commitments.

The subject matter of the NPT—prevention of the proliferation of nuclear weapons—is of fundamental importance to international peace and security. This importance is magnified by the universal character of the Treaty—the impact of withdrawal is qualitatively greater now, when there are only three states outside the Treaty, compared with earlier periods when there were significant non-Parties. The withdrawal provision may have seemed appropriate then, but its appropriateness should be viewed differently today.

The case of the DPRK—the only attempted withdrawal—highlights a particularly important issue. That state was in clear violation of the NPT when it gave notice of withdrawal, and remains in violation. It is a principle of international law that states withdrawing from treaties remain bound by commitments violated prior to withdrawal—the act of withdrawal does not absolve them from breaches existing at that time.

Conclusion

The international community needs to take a strong stand of **zero tolerance** of additional states attempting to develop nuclear weapons. This includes taking effective action to ensure that projects involving proliferation-sensitive technologies do not impact adversely on non-proliferation objectives. Also required is a strong position on the withdrawal question—the non-proliferation commitment of NPT Parties, even if they attempt to withdraw from the Treaty, must be **inviolate**.

3. ADDRESSING THE SPREAD OF SENSITIVE NUCLEAR TECHNOLOGY

Introduction

The gradual spread of proliferation-sensitive technologies—enrichment and reprocessing—raises two issues of fundamental importance for the non-proliferation regime: the potential for break-out from NPT commitments; and the risk of illicit transfer of sensitive technologies to other states or to sub-national entities. The more states that have sensitive facilities—and the greater the number of such facilities and numbers of personnel involved—the greater the level of concern about these issues.

Clearly it is undesirable for **every** state that has nuclear research and/or nuclear energy programs to establish its own enrichment and reprocessing capabilities. In addition to the recognised nuclear-weapon states (NWS), currently there are 66 states with nuclear research and/or nuclear energy programs. At least 11 of these already have enrichment capabilities—existing or past operational or R&D activities—and at least 8 have reprocessing capabilities, a total of 15 states in all (see Table 7).

Is there an alternative to the spread of sensitive capabilities to more and more states? Is it possible to agree on international guidelines for the possession of these capabilities—and to establish an alternative to national facilities for ensuring that legitimate energy and economic interests are met?

In view of current plans to establish new uranium enrichment facilities, it is timely to examine whether there are ways of reconciling the interests of individual states with the interests of the international community. Considering the critical importance of non-proliferation to international peace and security, is it appropriate to assert national 'rights'—emphasising the pre-eminence of the nation-state—or should approaches be sought based on international cooperation—approaches such as international supply assurances, or even in appropriate cases multination ownership and operation of sensitive facilities?

NPT aspects

The NPT is often cited as supporting the right of states to develop national nuclear capabilities. Article IV.1 of the NPT refers to:

> '… the inalienable right … to develop research, production and use of nuclear energy for peaceful purposes …'

However—as discussed in the accompanying article on 'NPT Issues'—the 'inalienable right' under Article IV.1 is not **unqualified**, nor is it clearly a right to pursue proliferation-sensitive technologies—upholding non-proliferation objectives must be the principal consideration. Where NPT objectives could be prejudiced, directly or indirectly, the state should be prepared to exercise restraint in the pursuit of these technologies, and to explore other ways of meeting legitimate interests in nuclear energy and nuclear applications.

Cooperative approaches

What alternatives are there for meeting states' legitimate energy needs and economic interests? In current circumstances, where the world enrichment market is over-supplied, there is limited economic rationale for developing indigenous enrichment capabilities, nor would certainty of supply appear to be a problem. However, states concerned about future supply conditions may wish for greater certainty than simply relying on the market place.

An obvious approach to this issue would seem to be the development of **multilateral supply assurances**—existing technology holders could undertake, collectively, to ensure enrichment services will be available to a particular state on non-discriminatory terms. The content of such assurances has yet to be developed, but might include:

- From the suppliers' perspective, a requirement for the state to have an additional protocol in place—and for the IAEA to be satisfied with safeguards implementation in the state;
- From the consumers' perspective, something like most-favoured-nation provisions (to ensure existing technology holders do not exploit their commercial advantage).

More ambitiously, the concept of **multination fuel cycle centres** might be examined further. This concept was a major feature of INFCE—the International Nuclear Fuel Cycle Evaluation, the report of which was published in 1980. The essential features of this concept are:

- Sensitive fuel cycle facilities would not be wholly owned and controlled by a single state, but would be established by groups of states, e.g. in a particular region. Several states would be involved, partly to ensure security of supply, partly to ensure that the facility is not misused.
- Important details would need to be resolved, e.g.:
  - locating the facility in a politically stable area where the risk of expropriation by the host state is unlikely (how to determine this?)—and developing treaty arrangements to preserve the multination integrity of the facility;
  - limiting sensitive technology to existing technology-holders—avoiding the risk of proliferation of sensitive technology. How to ensure non-technology-holders are sufficiently involved to monitor the use of the facility, while protecting against access to technology secrets?

At this stage the concept of multination fuel cycle centres may fare no better now than it did in the 1980s—in circumstances of market oversupply and slow demand growth, there is no pressing need to establish new facilities—but it may be a concept worth developing further, especially where, despite the overall market conditions just described, there are some states determined to establish indigenous capabilities in proliferation-sensitive areas.

Current developments

At its meeting of 9 June 2004, the G-8 announced that members will work to establish new measures covering the export of sensitive nuclear items having export potential. At this stage it is not clear what these new measures might be, but there has been discussion of **criteria** against which proposed enrichment or reprocessing projects can be assessed. Such criteria might include:

- whether the state concerned is in full compliance with NPT safeguards obligations;
- whether the state is located in a region of tension;
- whether the proposed project has a convincing rationale in terms of the state's energy program or economic circumstances; and
- maybe in the future, whether the proposed project will be under multination control.

The G-8 will also address the 'demand' side of the equation—developing new measures to ensure reliable access to nuclear materials, equipment and technology, including nuclear

fuel and related services, at market conditions, for all states, consistent with maintaining non-proliferation commitments and standards.

In addition, the IAEA Director General Mohamed ElBaradei has drawn attention to the considerable advantages—in safety, security and non-proliferation—that would be gained from international cooperation in the front and the back end of the nuclear fuel cycle, and recently established a group of international experts to study the feasibility of cooperative approaches in these areas. It is too early to anticipate the likely recommendations of this study, but there may be substantial areas of commonality between the G-8 and IAEA outcomes—e.g. in the area of multilateral supply assurances.

Conclusions

The further spread of national capabilities in enrichment and reprocessing could work against NPT objectives. In the longer term, the best solution will be to develop nuclear fuel cycle technologies that do not require enrichment or currently-used reprocessing technologies (i.e. involving plutonium separation). In the meantime, as an alternative to further states establishing national enrichment or reprocessing capabilities, cooperative approaches should be developed. In the first instance these could include multilateral supply assurances—in the future, multination fuel cycle centres could play an important role.

In the context of review of the NPT, there should be an examination of Article IV issues—that the 'right' to pursue nuclear technologies is not unqualified, that this right does not automatically extend to proliferation-sensitive technologies, and that in all cases upholding non-proliferation objectives must be the predominant consideration.

Table 7: Enrichment and reprocessing – NNWS.

State	Enrichment	Reprocessing	AP status
Argentina	diffusion	—	no—waiting for Brazil
Australia	centrifuge—shut down, laser R&D	—	in force
Belgium	—	shut down	in force
Brazil	centrifuge	under construction	no
DPRK	centrifuge?	✓	no—NPT status?
Germany	centrifuge	shut down	in force
India	—	✓	non-NPT
Iran	centrifuge	—	provisionally in force
Israel	—	✓	non-NPT
Italy	—	shut down	in force
Japan	centrifuge	✓	in force
Libya	centrifuge—being dismantled	—	provisionally in force
Netherlands	centrifuge	—	in force
Pakistan	centrifuge	—	non-NPT
South Africa	helical nozzle—shut down	—	in force

4. THE ISSUE OF NON-COMPLIANCE

1. Introduction

It is notable that although the IAEA Board of Governors has determined four states have been in non-compliance with their safeguards agreements—Iraq, Romania, DPRK and Libya—and is considering this issue in the case of Iran, there is no established definition of 'non-compliance'.

As will be discussed, some forms of non-compliance—such as refusal to allow IAEA inspections—will be obvious. More difficult are circumstances involving **ambiguity**—if inspectors discover undeclared nuclear material or activities, does this indicate an intention to produce nuclear weapons? An important objective of safeguards is to provide timely warning of proliferation, giving the international community the opportunity to intervene. Thus warning signs, even of an incipient nature, may be very significant and could be dangerous to ignore. On the other hand, inadvertent safeguards breaches do occur—and it is necessary to be able to distinguish between breaches that have significant safeguards implications and those that are less serious (what the G-8 has referred to as 'technical' violations)[12].

Lack of a definition may be seen as advantageous—allowing the Board of Governors flexibility to deal with complex cases—but this comes at a cost. Confusion in this vitally important area could have adverse consequences for the integrity and credibility of the safeguards system.

2. Definitions

The IAEA Safeguards Glossary describes non-compliance as 'violation by a state of its safeguards agreement with the IAEA'[13], and gives a number of illustrations. While the Glossary is not legally authoritative, this is a good starting point for discussion.

The terms 'compliance' and 'non-compliance' are used in the IAEA Statute (Article XII.C). The Statute is drafted on the basis of there being either an 'Agency project' or an 'arrangement where the Agency is requested by the parties concerned to apply safeguards'. 'Compliance' is defined by reference, *inter alia*, to 'the undertaking against … furtherance of any military purpose' and to safeguards inspections and related measures. The Statute provides that inspectors 'shall report any non-compliance to the (IAEA) Director General who shall thereupon transmit the report to the Board of Governors'.

While the Statute (which entered into force in 1957) pre-dates the NPT and NPT safeguards agreements (i.e. INFCIRC/153), there are close links between the Statute and these agreements—NPT safeguards agreements fall into the class of 'arrangements where the Agency is requested by the parties concerned to apply safeguards' (Article XII.A), and INFCIRC/153 (paragraph 19) makes express reference to the procedures under Article XII.C of the Statute. Thus the Statute's non-compliance provisions have been reflected in INFCIRC/153 agreements—and they have been invoked by the Board in the cases referred to above.

INFCIRC/153 does not specifically refer to 'non-compliance', but is couched in terms of a finding by the Board 'that the Agency is not able to verify that there has been no diversion

12. G-8 Action Plan on Nonproliferation, 9 June 2004.
13. IAEA Safeguards Glossary, 2001 edition, item 2.2.

of nuclear material required to be safeguarded under the Agreement to nuclear weapons or other nuclear explosive devices' (INFCIRC/153 paragraph 19). In the event of such finding, the Board may make the reports provided for in Article XII.C of the Statute (see part 6 below).

Thus in effect there appear to be two routes to a non-compliance finding:

- a report of non-compliance by inspectors pursuant to Article XII.C of the Statute; or
- a finding by the Board, pursuant to paragraph 19 of INFCIRC/153, that the Agency is not able to verify that there has been no diversion.

3. What constitutes 'non-compliance'?

The NPT requires non-nuclear-weapon states to accept IAEA safeguards—and to follow safeguards procedures—on all nuclear material in all peaceful nuclear activities within their territory, jurisdiction or control, in order to verify fulfilment of their obligations under the Treaty, with a view to preventing diversion of nuclear energy from peaceful purposes to nuclear weapons or other nuclear explosive devices (Article III.1). This requirement is reflected in the language of NPT safeguards agreements, based on document INFCIRC/153.

From this it may be inferred that non-compliance could include, *inter alia*:

- failure to accept IAEA safeguards—including failure to cooperate with the IAEA in the application of safeguards (this would include refusal or obstruction of inspector access);
- failure to declare all nuclear material, nuclear facilities and nuclear activities to the IAEA for application of safeguards;
- other serious breaches of the safeguards agreement—including failure to maintain records and make reports, and interference with safeguards equipment;
- diversion of nuclear material to nuclear weapons, or to purposes unknown (see below).

Two issues have arisen in the Board:

- whether **any** failure to declare nuclear material or nuclear activities constitutes non-compliance;
- the onus of proof—the extent to which the Agency has to find evidence of an intention to produce nuclear weapons.

There is another definitional issue, the meaning of 'diversion'. While diversion is commonly taken to mean removal of nuclear material from safeguarded activities, more correctly the term encompasses both nuclear material removed from safeguards and nuclear material that has not been declared to safeguards. The basic obligation is to accept safeguards and follow safeguards procedures on **all** nuclear material—any significant departure from this obligation could indicate diversion.

4. Safeguards breaches

The issue of whether a safeguards breach is sufficiently significant or serious to be considered 'non-compliance' clearly involves matters of judgment. Some failures may be inadvertent, or insignificant, and should not be regarded as non-compliance. Doubtless it is for this reason that Article XII.C of the Statute has two elements—a report by the inspectors, and a finding by the Board ('The Board shall call upon the … state to remedy … any non-compliance which **it finds to have occurred**' (bolding added)—it is clearly open to the Board to decide that matters reported by the inspectors do **not** constitute non-compliance. What considerations are relevant in reaching this decision?

Some Governors have noted that many states may have nuclear material which for one reason or another has not been declared to the IAEA. Indeed, the Agency's annual Safeguards Conclusion (reported in the Safeguards Implementation Report and the Annual Report) states: 'all nuclear material … had been placed under safeguards … **or was otherwise adequately accounted for**' (bolding added). The latter phrase would cover situations e.g. where some material has not been correctly reported, but the Agency is satisfied there are no significant safeguards implications.

In determining whether a safeguards breach, such as failure to declare nuclear material, is significant from the safeguards perspective, relevant considerations might include the following:

- the nature of the nuclear material involved, e.g. category, quantity and form—especially whether direct-use material (plutonium or HEU);
- the nature of any processing involved—especially if any proliferation-sensitive processes (enrichment, plutonium separation, conversion to metal, etc). In this regard, failure to declare even a small quantity of nuclear material may be significant, if the material was being used in the development of proliferation-sensitive processes;
- whether the breach or failure appears to be systematic—part of a pattern of failures;
- whether the breach or failure appears to be intentional. If the state argues that the failure is inadvertent, then the Board could look at considerations such as those outlined above in deciding whether the state's explanation is plausible.

Another way of looking at this issue is to consider the potential consequences of the failure—especially whether these are such as to warrant reporting to the Security Council under the Article XII.C provisions. On this basis, safeguards failures involving small quantities of relatively insignificant material, while regrettable, are not likely to warrant Security Council attention. In contrast, safeguards failures that could relate to efforts to develop nuclear weapons—and activities involving enrichment or plutonium separation have this potential—may well be of interest to the Security Council.

5. Onus of proof

Paragraph 28 of INFCIRC/153 provides that:

> 'the objective of safeguards is the timely detection of diversion of … nuclear material … to the manufacture of nuclear weapons … or **for purposes unknown** …' (bolding added).

Proving the existence of a nuclear weapon program could be quite difficult. Commonly, mention is made to the need to discover a 'smoking gun', but this expression is not elaborated. Discovery of a nuclear weapon, or nuclear material in the form of weapon components, would meet this test, but is unlikely to occur in practice. For this reason, INFCIRC/153 takes a practical approach—it is sufficient for the Agency to show:

- there has been a failure to declare nuclear material and/or a nuclear activity;
- the failure is considered to be significant—e.g. because of the nature of the nuclear material and/or activity; and
- the purpose of the use of the nuclear material or the nuclear activity is not clearly 'exclusively peaceful'—in other words, the purpose may be considered 'unknown'.

Regarding the last point, since the obligation on the state is to declare all nuclear material in peaceful uses, and to follow safeguards procedures for all nuclear material, it is a

reasonable starting presumption that nuclear material and activities **not** declared might not be exclusively peaceful. **The 'smoking gun' may well be the failure to declare nuclear material and/or nuclear activities.**

This initial presumption may be dispelled by investigation along the lines discussed in part 4 above. However, the Agency should not have to meet an impracticably high standard of proof. If, for example, the Agency discovers undeclared nuclear material being used in connection with proliferation-sensitive activities, it should bring this to the attention of the international community (via the Board), so the international community can decide how to respond to the situation.

6. Consequences of a non-compliance finding

Article XII.C of the Statute provides that:

- the Board shall call upon the state to remedy any non-compliance which it finds to have occurred;
- the Board shall report the non-compliance to all members (of the IAEA) and to the Security Council and UN General Assembly.

Paragraph 19 of INFCIRC/153 provides that, in the case of a finding by the Board that the Agency is not able to verify that there has been no diversion, the Board **may** *inter alia* make the reports provided for in Article XII.C. In taking such action the Board 'shall afford the state every reasonable opportunity to furnish the Board with any necessary reassurance'.

There has been some concern about the 'automaticity' of Article XII.C, i.e. that once a non-compliance finding is reached the issue **must** go to the Security Council. There is a view that the Board should have discretion, as it has under INFCIRC/153 paragraph 19—it is felt referral to the Security Council could increase tensions and hamper further investigations by the Agency. Two points can be made here:

- Referral to the Security Council is not the end of the matter as far as the Agency is concerned. The state remains obliged to cooperate under the safeguards agreement—and Article XII.C makes it clear the Board can call for remedial measures. Thus, referral to the Security Council is not a final step, but part of the process of re-establishing compliance;
- What is of most consequence to the state concerned is not referral as such, but the terms or context of the referral. There is a major difference between referral as a matter of record—the state has been found in non-compliance but is cooperating fully to remedy the situation—and referral where the state is not cooperating and the Security Council has to consider action to enforce compliance.

7. Non-compliance precedents

The following is a very brief outline of previous non-compliance findings. As mentioned earlier, there have been four such findings, with consequential referral to the Security Council: Iraq (1991), Romania (1992), DPRK (1993), and Libya (2004).

In only one case—Libya—was there clear evidence of a nuclear weapon program at the time of the non-compliance finding. Since when the matter came to the Board Libya was cooperating fully with the IAEA and relevant Member States (U.S. and U.K.) in the dismantling of this program, referral to the Security Council was seen mainly as a matter of record.

The Romanian finding was based on undeclared separation of a small quantity of plutonium, some years before (under a previous political regime)—again, referral was a matter of record.

The DPRK finding was also based on evidence of undeclared plutonium separation—of an uncertain but possibly substantial quantity—together with refusal to allow the IAEA access for special inspections. Security Council action was called for—though the situation ended up being addressed through political arrangements (the Agreed Framework) and is currently the subject of another political process (the Six-Party Talks).

The Iraqi finding was based on several grounds—undeclared separation of small quantities of plutonium, undeclared nuclear material, undeclared enrichment activities, and obstruction of IAEA inspectors. It is notable that the Board was prepared to reach a non-compliance finding although IAEA investigations were ongoing—and it was only later that clear proof of a nuclear weapon program emerged.

8. Conclusions

Reaching a non-compliance finding may involve difficult political judgments, but the basic issues concern matters of fact, e.g.:

- has there been a safeguards failure—e.g. nuclear material removed from safeguards or not declared to safeguards, or failure to declare a significant nuclear activity?
- what is the significance of this failure in terms of safeguards objectives—e.g. do the nuclear material and/or activity have potential proliferation significance? Could this suggest a possible nuclear weapons purpose—or is the purpose unknown (i.e. it is not clear that the purpose is exclusively peaceful)?

and/or

- is there a substantial failure of cooperation, such that the Agency cannot implement the safeguards agreement satisfactorily?

There is sufficient discretion—in Article XII.C as well as paragraph 19—for the Board to avoid inappropriate non-compliance findings. Further, the Board has discretion in deciding on the terms of referral to the Security Council—whether as a matter of record or as a matter requiring action.

Preparedness by the Board to reach non-compliance findings in appropriate cases is important to upholding the integrity of the safeguards system, and as a necessary step in resolving serious cases of unsatisfactory safeguards performance. Clarification of the issues involved will be useful for all concerned.

IRAN – NUCLEAR DEVELOPMENTS

This article outlines developments as at 30 June 2004. Developments were ongoing as the Report was being prepared.

Background to the Iranian nuclear program was outlined in ASNO's Annual Report for 2002-03. During 2003-04 Iran's performance of its safeguards obligations remained the subject of investigation by the IAEA, and consideration by the IAEA Board of Governors.

1. Main matters under investigation

These can be briefly summarised as follows:

Uranium enrichment

Iran has commenced operation of a pilot plant for uranium enrichment, using centrifuge technology, at Natanz. It has also constructed a large underground facility at Natanz, which is intended to accommodate some 60,000 centrifuges. The IAEA established that the centrifuge design, 'P-1', was supplied by the AQ Khan network (referred to elsewhere in this Report). The Khan network had supplied some centrifuges and components, but Iran has proceeded to establish an indigenous manufacturing capability.

One matter under investigation is the IAEA's discovery, through environmental sampling, of HEU (high enriched uranium) particles in areas where Iran has operated these centrifuges. This raises an issue of fundamental importance—**has Iran been producing HEU or seeking to do so?** Iran maintains the presence of HEU particles was the result of contamination of equipment before it was imported by Iran. The IAEA considers that the characteristics of the HEU particles found are not consistent with Iran's explanations, and is continuing to investigate.

Another matter under investigation is the extent of development of a more advanced centrifuge, the 'P-2'. Initially Iran had not declared any P-2 related activity, but the IAEA found that design documents had been obtained from the Khan network in the 1990s. Iran subsequently stated that only a limited R&D program had been conducted with the P-2 design, but the IAEA found that an Iranian contractor had sought to import at least 4,000 magnets suitable for P-2 centrifuges. Iranian authorities maintain these efforts by the contractor were not authorised. The key question here is—**is there, or are preparations being made for, an undeclared enrichment program based on the P-2 centrifuge**? The IAEA's investigations are continuing.

Iran had also been conducting R&D into a laser-based enrichment process, AVLIS (atomic vapour laser isotopic separation). Initially Iran stated that enrichment levels of only 3% had been achieved, but subsequently reported levels of up to 15%. The IAEA is still assessing the significance of this work.

Plutonium separation

Iran admitted carrying out small-scale experiments for plutonium separation some 12-16 years ago. The IAEA has found discrepancies in both the quantity of plutonium involved and the time period over which this work was conducted—the quantity still appears to be

small, but the significance of this kind of experimentation is of concern. The IAEA is still assessing this.

Polonium experiments

Polonium is a material with limited uses—polonium-210 is of significance as it could be used with beryllium as a neutron generator in a nuclear weapon triggering device. The IAEA is still assessing experiments by Iran to produce Po-210 some 12 years ago.

Heavy water reactor

Another issue of concern is Iran's plan to build a large (40 MWt) heavy water-moderated, natural uranium-fuelled research reactor. This type of reactor is well suited to plutonium production. Construction of a heavy water plant to supply this reactor is well advanced. The IAEA is continuing to investigate Iran's stated intentions for this reactor, and questions regarding associated hot cells.

2. Cooperation with the IAEA

After initial difficulties, some very serious (delays in allowing inspectors access, and modification of buildings), the IAEA reports that cooperation by Iran is forthcoming. There continue to be problems, however, and the IAEA has expressed concern at changing and contradictory information.

A very positive development—welcomed by Australia and many others—was Iran's signature of an additional protocol on 18 December 2003 and an undertaking to implement this on a provisional basis. However, Iran has given no indication of when the protocol will be brought into legal effect. Iran's initial protocol declarations were submitted to the IAEA on 21 May 2004, and are being assessed.

3. Suspension of enrichment, enrichment-related and reprocessing activities

In October 2003 the Foreign Ministers of France, Germany and the U.K. (the 'Trio') had obtained Iran's agreement to suspend enrichment and enrichment-related activities, and any work relating to reprocessing. The IAEA Board of Governors also asked Iran to suspend these activities. However, Iran continued with the manufacture of certain centrifuge components, on the basis of 'contractual obligations', and more recently has stated—contrary to the understanding of the IAEA and the EU Trio—that the suspension agreement does not extend to uranium conversion (production of UF_6 feedstock for centrifuge enrichment). Iran has proceeded with testing at the Esfahan conversion facility, and has indicated that production of substantial quantity of UF_6 is imminent. The Board of Governors has asked Iran, as a confidence-building measure, not to proceed with UF_6 production.

4. IAEA's conclusions to 30 June 2004

In his report of 10 November 2003 to the Board of Governors, IAEA Director General ElBaradei stated that 'Iran had concealed many aspects of its nuclear activities, with resultant breaches of its obligation to comply with the provisions of the Safeguards Agreement'.

This conclusion was reflected in the IAEA's Safeguards Statement for 2003, which stated that:

> 'The Islamic Republic of Iran …, having been engaged in undeclared nuclear activities, was in breach of its obligation to comply with its safeguards agreement.'[14]

The Board of Governors remains seized of the matter and is awaiting the further results of the IAEA's investigations.

14. This Statement also referred to Libya, and has been re-cast here in the singular.

CWC AND BWC: OVERVIEW OF RECENT MAJOR INITIATIVES

Chemical Weapons Convention (CWC)

Over the last two years the OPCW and States Parties have moved to enhance implementation and universality of the CWC. During this period, the number of States Parties has increased from 145 to 164 (six of these additions being countries in the South Pacific). In October 2003, the 8th Conference of States Parties adopted two Action Plans: one covering national implementation measures under Article VII of the Convention and the second addressing universality of the CWC. This work has been reinforced by the UN Security Council in Resolution 1540.

This Resolution, adopted by the Security Council on 28 April 2004, outlines measures to be taken by UN Member States to counter-act the spread of weapons of mass destruction, including adoption and enforcement of appropriate legislation. Under Resolution 1540, UN Member States are required to outline the steps they have taken or intend to take to implement the Resolution by October 2004.

The national implementation measures proposed by the OPCW focus on establishment of a national authority and enactment of CWC implementing legislation. The Action Plan on Implementation sets a deadline of November 2005 for completion of this work, after which the OPCW will focus on assisting States Parties with their enforcement arrangements.

The OPCW is undertaking this work—implementation and universality—in concert with assisting States Parties on a regional basis. Australia (through ASNO's activities) is involved in these programs through participation in regional workshops and direct assistance to regional States Parties (see page 95).

Biological and Toxins Weapons Convention (BWC)

Preventing the development, production, stockpiling or use of biological weapons remains a pressing problem for the international community, at the heart of which is universalisation of the BWC and its effective implementation by States Parties. Following the collapse in 2002 of negotiations on a Verification Protocol for the Convention, work to strengthen the Convention is being undertaken though a process involving States Parties and Experts Meetings.

At the Fifth BWC Review Conference, in 2002, States Parties agreed, *inter alia*, to hold three annual meetings of the States Parties prior to the Sixth Review Conference in 2006, to discuss and promote common understanding and effective action to strengthen the BWC. Each of these annual meetings is to be preceded by a Meeting of Experts with the following set agendas:

- for the 2003 Experts Meeting—the adoption of necessary national measures to implement the prohibitions set forth in the Convention, including the enactment of penal legislation; and national mechanisms to establish and maintain the security and oversight of pathogenic micro-organisms and toxins;
- for the 2004 Experts Meeting—enhancing international capabilities for responding to, investigating and mitigating the effects of cases of alleged use of biological or toxin weapons or suspicious outbreaks of disease; and,

- strengthening and broadening national and international institutional efforts and existing mechanisms for the surveillance, detection, diagnosis and combating of infectious diseases affecting humans, animals, and plants;
- for the 2005 Experts Meeting—the content, promulgation, and adoption of codes of conduct for scientists.

Seeing this as an important mechanism to enhance BWC implementation and keep the BWC on the international agenda, Australia has made a strong contribution to the work of the Experts Group, principally through ASNO and the International Security Division, DFAT.

Clearly this work is not a substitute for a multilaterally negotiated verification protocol. But, in the absence of such, it is an appropriate forum in which to progress the aims and objectives of the BWC, particularly given the current focus on counter-terrorism and Security Council Resolution 1540.

The first Experts Meeting was held in August 2003. This Meeting facilitated the sharing of ideas, concepts, issues, programs of assistance and possible solutions. Further, it enabled networks to be established—which should assist Australia's regional outreach programs—and has been of considerable assistance in the COAG Review of Hazardous Materials. It is clear that although there are no international verification arrangements in place, enhanced domestic implementation of BWC obligations will increase regional security and must be encouraged.

The second Experts Meeting was held in July 2004, just outside the period covered by this Report, and the third Meeting is scheduled for June 2005.

NUCLEAR SAFEGUARDS AND RELATED TRAINING COURSES CONDUCTED BY ASNO

Each year ASNO conducts a number of training courses and professional seminars for participants from counterpart organisations in our region and elsewhere.

Physical Protection course

From 2-13 February 2004, ASNO hosted a training course in Sydney on the Security of Nuclear Research Facilities. The course was jointly conducted by ASNO, the IAEA, and the U.S. Sandia National Laboratories. Funded through the regional aid program of the Australian Agency for International Development (AusAID), the U.S. Department of Energy and the IAEA's Nuclear Security Fund (to which Australia contributes), this course is part of Australia's significant contribution to international efforts to improve nuclear security.

This course was the first of its kind anywhere in the world, focusing on the security of research facilities and radioactive sources, and is part of a worldwide effort to secure and protect nuclear materials and facilities from theft, sabotage and terrorism.

Twenty-one nuclear regulatory and facility officials from China, Indonesia, Malaysia, the Philippines, the Republic of Korea, Thailand, Vietnam and Australia participated in the two-week course together with lecturers from Australia, Germany, Indonesia, the U.S. and the IAEA.

Along with lectures and group discussions, the participants toured ANSTO's facilities at Lucas Heights and the medical cyclotron at Camperdown, both in Sydney. They also undertook sub-group exercises on how to identify and deal with threats at nuclear facilities.

Figure 25: Delegates from SE Asia attending lectures on the Physical Protection of Nuclear Research Facilities course.

Being a first-of-type, organisers recognised that course evaluation would be a critical element for long-term success of this new venture. ASNO has participated in a major

course review at IAEA headquarters in Vienna. Some curriculum changes are planned to which ASNO will contribute.

Figure 26: Alexander Osipov of the IAEA lecturing at the SSAC course.

Australia/IAEA Regional Training Seminar on National Safeguards and the Additional Protocol

In 1985 Japan and Australia reached an informal understanding with the IAEA to alternate as hosts for training courses on State Systems for Accountancy and Control (SSAC) for the IAEA's Far East Region and Southeast Asia and Pacific Region. These courses are conducted jointly with the IAEA. Since 1985, Japan has hosted five such courses and, until the course discussed here, Australia had hosted four. In 2004 Australia hosted the 'Australia-IAEA Regional Training Seminar on National Safeguards and the Additional Protocol' (7-25 June 2004) in Sydney and Canberra—the fifth Australian course in this series. Funding ($252,000) was provided by AusAID. ANSTO provided valuable assistance to ASNO.

The first two weeks of the course were spent at ANSTO's Lucas Heights Science and Technology Centre (LHSTC) in Sydney, and made use of ANSTO's nuclear facilities, principally the HIFAR' research reactor. The third week was conducted in Canberra. The course was designed to build the capacity of regional states in the effective accounting for nuclear material and application of nuclear safeguards. The primary outcome will be enhanced security with a commensurate reduction in the risk that nuclear material could fall into the wrong hands.

The final list of full participants comprised two from China, seven from Indonesia, one from Japan, three from the Republic of Korea, two from the Philippines, and one each from Malaysia, Mongolia, Myanmar, Thailand and Vietnam, and one from Australia. In addition to these participants, the Australian Government invited out-of-region observers from Iran

and Libya. Four observers came from Iran and one from Libya. In practice the observers received exactly the same training as the full course participants.

The teaching staff comprised six instructors from the IAEA, four from ASNO (including a former staff member, Mr John Hill, who is now a contractor), one from ANSTO, one from the Arms Control and Counter-Proliferation Branch of DFAT, two from the U.S., two from the Indonesian nuclear regulatory authority BAPETEN, and one each from Japan and the ROK. Additional ANSTO staff helped groups of participants during exercises and provided information on a Lucas Heights tour. On the advice of the IAEA, the U.S. Department of Energy sent an additional four personnel to observe the seminar, as preparation for a reworking of the syllabus for similar courses in the U.S. These personnel also helped by leading discussion groups in training exercises.

Participants completed daily course evaluation questionnaires, and a further evaluation questionnaire at the end of the course. Responses to those questionnaires, taken together with observation of the participants' performance in exercises and conversations with participants and visiting instructors, suggest that the course was very effective in enhancing the participants' and observers' understanding of nuclear materials accountancy and control, international safeguards, and the Additional Protocol.

Safeguards training for Iran

As a concrete step in the process of resolving Iranian safeguards issues, Australia offered Iran training on nuclear safeguards and related matters. Iran accepted Australia's offer and the first element of the training was conducted in Tehran from 4-8 April 2004. This was very well attended with a total of 46 participants.

Figure 27: Nuclear safeguards training course in Iran. Russell Leslie from ASNO is third from left in front row.

ASNO's Mr Russell Leslie provided training on nuclear materials accountancy and on issues related to compliance with the Additional Protocol. The training consisted of two days of lectures followed by two days of hands-on training in the use of the IAEA's

'Protocol Reporter' software and ASNO's 'NUMBAT' nuclear materials accountancy program.

The Iranian officials were enthusiastic participants in the training—with a number of detailed questions on the ways in which states are expected to interact with IAEA inspectors and the types of problems typically encountered when preparing reports on nuclear activities for the IAEA. The timing of the training was particularly important as Iran was due to make its initial declaration under the Additional Protocol by June 2004. ASNO was able to provide the Iranian officials with help and guidance on particular reporting issues.

As a follow-up to the training in Tehran, four Iranian officials attended the Australia-IAEA Regional Training Seminar on National Safeguards and the Additional Protocol which was held in Sydney and Canberra 7-25 June 2004 (see page 91). Further training, either in Iran or Australia may be conducted if requested by Iran.

Figure 28: Craig Everton from ASNO and four Indonesian participants on the NDA course in Sydney in June-July 2004.

Non-Destructive Assay Course

ASNO and Indonesia's nuclear regulatory authority BAPETEN have a memorandum of understanding (MOU) that covers, *inter alia*, the provision of training and capacity building in the execution of regulatory responsibilities.

Under this MOU training was conducted in Sydney in late June 2004 with the aim of introducing Indonesian nuclear regulators to the concepts of the non-destructive assay (NDA) of nuclear materials. ASNO took advantage of this opportunity to train a new ASNO staff member (Mr Craig Everton).

The training was conducted with the cooperation of both the IAEA and ANSTO. The IAEA provided five pieces of equipment for use during the training. ANSTO made

available laboratory space at the Lucas Heights Science and Technology Centre and also provided access to a range of nuclear materials that were used as part of the practical exercises for the course.

The participants were trained in the operation of each of the three types of measurement system available. The aim was to demonstrate the types of measurement techniques that are applicable to different types of materials and to convey to them the importance of important measurement control measures.

The training is a useful example of the types of ongoing cooperation that helps develop regional capabilities and ensure nuclear regulators in the Asia-Pacific region work together well.

CWC REGIONAL OUTREACH

The Australian Government places great importance on promoting peace and security in the region. This approach underpins a strong commitment to the Chemical Weapons Convention (CWC), and the Government's aim to prevent dual-use chemicals from contributing to WMD programs. If the CWC is to be effective, States Parties must put in place the necessary measures for domestic implementation and enforcement. Therefore, it is no surprise that the 8th Conference of States Parties from 20-24 October 2003 adopted an action plan for implementation of obligations under Article VII, setting clear timelines including for the enactment by States Parties of CWC legislation by the end of 2005. In response, the Australian Government has indicated its willingness to assist the Organisation for the Prohibition of Chemical Weapons (OPCW) with outreach activities to requesting countries. This article highlights ASNO's engagement in regional multilateral and bilateral activities over the past year aimed at promoting universality to the Convention as well as its full, timely and effective implementation.

Figure 29: Participants at the First Regional Meeting of National Authorities of States Parties in Asia, held in Singapore, October 2003. *Photo courtesy of the Government of Singapore.*

Australia welcomed and supported the Government of Singapore's initiative to host the first annual meeting of national authorities of CWC States Parties in Asia from 29-31 October 2003, to which ASNO provided a speaker (Dr Josy Meyer). The inaugural meeting, jointly organised by the OPCW, was opened by the OPCW Director General Mr Rogelio Pfirter, and attracted participants from more than 24 States Parties. Australia, with the U.K. and the U.S., sought to encourage full implementation of CWC obligations through sharing experiences of CWC implementation at a practical level. A positive outcome of the meeting was the establishment of a network of national authority

representatives to facilitate future regional dialogue on CWC implementation issues. China offered to host the second annual meeting to be held in Beijing in September 2004.

Figure 30: Participants at the CWC Regional Workshop in Nadi, Fiji, June 2004.

Another opportunity to collaborate with countries in Australia's immediate region, came through a request from the Fijian Ministry of Home Affairs, Immigration and National Disaster Management to provide comments on their draft CWC legislation. ASNO responded directly to this request. Also, ASNO encouraged Fiji and Papua New Guinea to attend a workshop jointly organised by the OPCW and the Pacific Islands Forum Secretariat, held in Nadi from 14-15 June 2004.

The CWC workshop was well attended by representatives from New Zealand, the International Committee of the Red Cross, and from 10 Pacific Island Countries, with only two of these not yet members of the Convention (Vanuatu and the Solomon Islands). Attendance levels were optimised by scheduling the meeting immediately prior to the Forum Regional Security Committee Meeting in Nadi. Dr Meyer attended on behalf of Australia to give a presentation on CWC implementation and was funded by the International Security Division (DFAT). The workshop focussed on implementation and universality of the Convention, with a practical emphasis on the establishment of a national authority and CWC implementing legislation.

The Cook Islands' draft CWC legislation was distributed electronically and used as the basis for discussions and further refinement. Fiji and other States Parties who were yet to draft their own legislation (this included the Federated States of Micronesia, Kiribati, PNG and Tonga) appreciated this aspect of the workshop because it added momentum to their own domestic legislative processes. Palau, like the Cook Islands, is awaiting consideration of its CWC legislation by Parliament. ASNO is encouraged by the number of ratifications and accessions to the Convention (five) among Pacific Island Countries that have occurred

in the past two years since the first CWC meeting that was held in Nadi in June 2002 (also attended by Australia and reported in ASNO Annual Report 2001-2002).

Fiji expressed its appreciation to Australia for informing it about the CWC workshop, enabling it to not only participate but also to have the opportunity to secure the OPCW's attendance at a national seminar on CWC implementation held in Suva following the workshop. This national seminar was held on 16 June in Suva, where the OPCW and ASNO (Dr Meyer) were invited to speak to more than 60 Fijian industry and government representatives brought together for initial consultations on Fiji's draft CWC legislation. Dr Meyer's presentation explained the role of the National Authority in implementing the Convention in Australia. At the same time copies of ASNO's recent publication 'A Guide to Australian Industry Producing, Using or Trading Chemicals' were distributed.

In the margins of the National Seminar, Dr Meyer discussed and handed over materials to Fiji and PNG in respect of Australia's permit and notification systems used to monitor chemical activities and trade that enable Australia to make annual industry declarations to the OPCW. The representative from PNG expressed his appreciation to ASNO and the Australian High Commission in Port Moresby for encouraging participation at both the Nadi workshop and the national seminar, and helping to secure OPCW funding to attend.

Figure 31: Dr Meyer speaking to industry and government representatives at a national CWC seminar in Suva, Fiji, June 2004. *Photo courtesy of the Government of Fiji.*

As a result of bilateral consultations, the CWC workshop and National Seminar, Fiji has advised it is now well placed to finalise its national implementing legislation with likely enactment at the end of 2004. This will allow Fiji to meet its reporting obligations under the Convention.

CBR COUNTER-TERRORISM ACTIVITIES IN AUSTRALIA

Arising from the high priority the Australian Government attaches to strengthening Australia's defences against the possibility of a terrorist attack, including those involving chemical, biological or radiological (CBR) agents, ASNO has been proactive in a range of associated activities, and has introduced a number of preventative measures within its own areas of responsibility.

Early in the reporting period, ASNO was involved in a series of expert meetings both in Australia and overseas. In August 2003, ASNO made a substantial contribution to a CBR Defence Conference in Sydney. The CBR Conference was attended by Commonwealth and State/Territory authorities, which had a primary focus on incident preparation and response, with some coverage of the threat and of preventive measures.

Shortly afterwards, ASNO attended a two week technical meeting in Geneva on the Biological Weapons Convention (BWC). This was the first of three annual Experts' Meetings discussing national controls on harmful biological materials in the lead up to the 2006 BWC Review Conference. This year's issues were legislation and bio-security. It was attended by 83 States Parties, as well as other countries and NGOs. Australia was represented by Andrew Leask (ASNO), the Office of Gene Technology and the Geneva Embassy. Information and ideas generated at this meeting influenced the Council of Australian Governments (COAG) Review of Hazardous Materials (biologicals)—see below—and enhanced Australia's understanding of how to strengthen BWC compliance regionally, in turn advancing Australia's WMD outreach work.

Another dimension to CBR counter-terrorism was evident when the Australian Crime Commission held a Chemical Diversion Conference in Canberra. Although focussed primarily on illicit drug trade and manufacture, the meeting also explored in some detail the nature of chemical regulation in Australia and a possible enforcement agency role, including on security awareness raising and incident reporting. ASNO presented a paper on the CWC and chemical terrorism prevention in Australia, and the U.S. Federal Bureau of Investigation spoke about its sophisticated chemical and biological outreach program. As a consequence, the FBI's chemical and biological agent watch lists have been utilised in the development of similar control lists in Australia.

The potentially most far reaching work on CBR terrorism prevention has been the review of hazardous materials legislation, instituted by COAG. A report on the controls on ammonium nitrate in Australia is at an advanced stage and reports on each of the CBR disciplines are well on the way to completion. ASNO has provided extensive technical and operational input to each of the CBR reports.

To prevent the possibility of CBR-related materials being covertly transferred across Australia's borders, the Australian Customs Service has been involved in the development of new investigative and monitoring tools. ASNO continues to assist Australian Customs develop this process with technical and regulatory advice, including through presentations at courses, such as sensitive commodity identification training held in Sydney in April 2004.

Figure 32: U.S., Australian Customs, ASNO and other Australian regulatory officials at Sensitive Commodity Identification Training Course, Sydney.

In addition, ASNO has sought to reduce the risk of chemical terrorism by introducing additional permit conditions for chemical facilities and traders, including requirements for security statements and incident reporting. Most recently, ASNO included a list of recommended chemical counter-terrorism measures in its June 2004 chemical industry brochure, which will be distributed widely.

CONCLUSION OF BILATERAL FACILITY ARRANGEMENT WITH OPCW

Representing the culmination of lengthy negotiations, on 20 July 2004 Australia concluded a bilateral Facility Arrangement with the Organisation for the Prohibition of Chemical Weapons (OPCW) for the international inspection of Australia's new chemical weapons protective purposes facility at Fishermans Bend, Melbourne. Although this occurred outside the period covered by this Report, it is included here on the basis of the work carried out during 2003-04.

The CWC prohibits the development, production, stockpiling and transfer of chemical weapons, but permits States Parties to maintain a small scale research facility to produce limited amounts of chemical warfare agents for protective purposes. The Australian Defence Science and Technology Organisation (DSTO) operates such a facility to assist the Australian Defence Forces to develop protective equipment and procedures to defend against possible attack by chemical weapons, and also for dealing with terrorist incidents. This facility has operated successfully for many years in Maribynong in Melbourne, and has received four OPCW inspections since 1997, but will move shortly to the new site in Fishermans Bend.

ASNO started negotiations on a draft Facility Arrangement with the OPCW Technical Secretariat in late 2003, a process that included an OPCW inspection of the proposed new facility in March 2004. The Arrangement was approved by the OPCW Executive Council on 2 July 2004, following its evaluation by and consultations with individual CWC States Parties.

Figure 33: Australian Ambassador and Permanent Representative to the OPCW, Mr Stephen Brady, exchanges the signed Facility Arrangement with the OPCW Director General, Mr Rogelio Pfirter, at OPCW headquarters in The Hague.

CTBT - ON-SITE INSPECTION

The conclusion in 1996 of negotiations leading to the Comprehensive Nuclear-Test-Ban Treaty was a significant political achievement. It also marked the beginning of a new process: that of preparing to implement the Treaty. Whilst the agreement reached in 1996 settled key principles of how the CTBT will work, detailed issues needed to be resolved by the newly established Preparatory Commission (PrepCom). For the On-Site Inspection (OSI) element of the Treaty's verification system the issues to be resolved were many.

In part this is because of the complexity of mounting an OSI. With just a few days notice, around 40 inspectors would need to be removed from their daily jobs and assembled somewhere in the world along with a large military aircraft-sized load of specialised equipment. The team may then spend several months combing an area of some 1,000 square kilometres gathering evidence about whether a nuclear explosion has occurred (most likely underground).

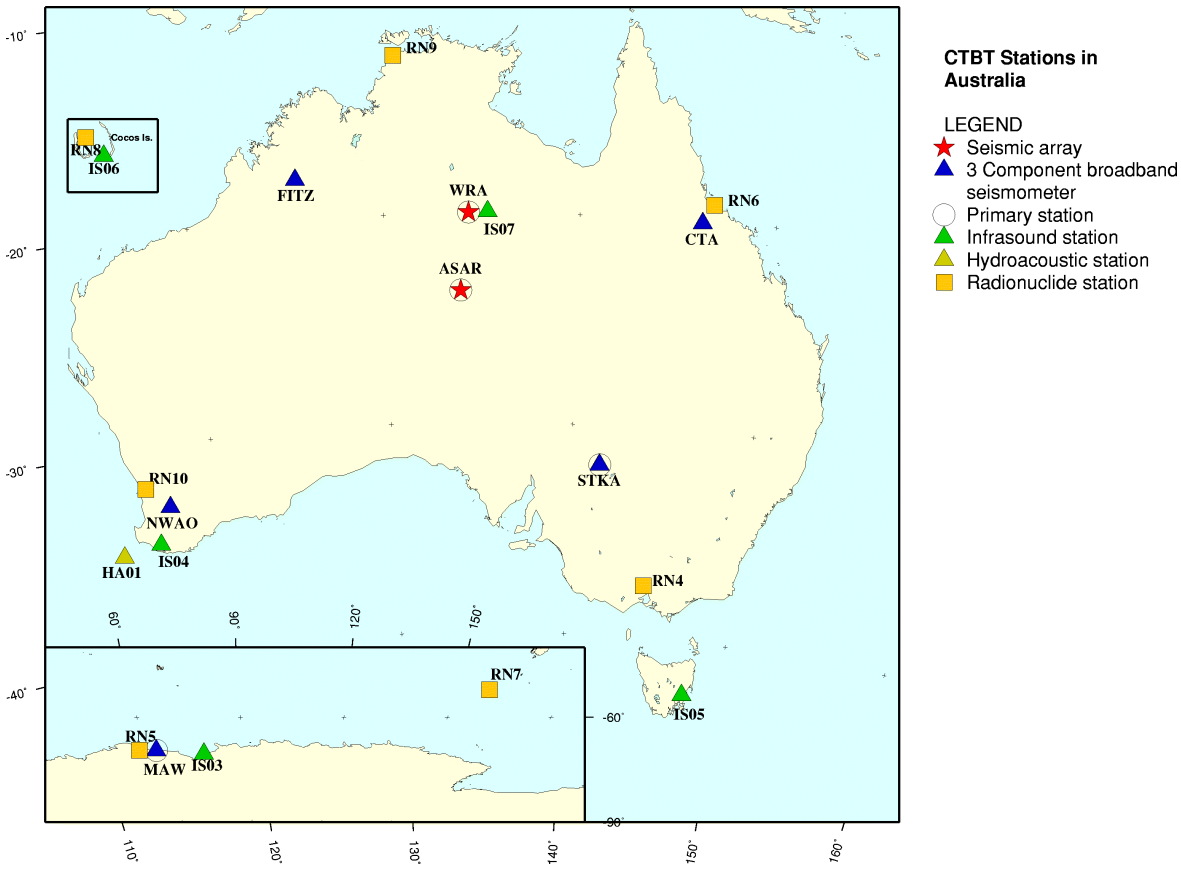


Figure 34: CTBT monitoring facilities in Australia and Australian territories. *Courtesy of Geoscience Australia.*

More importantly though, issues as yet unresolved in the development of the OSI process relate to the fact that the country being inspected would probably be less than happy to receive the inspection team, and the team might need access to areas where foreign visitors would not normally be welcomed—sites such as former nuclear test sites, or where military facilities are present.

The Treaty provides that procedures for the implementation of an OSI are detailed in an operational manual. The development of that manual has proven a challenge, largely because of the need to balance intrusiveness of inspections with concerns to protect legitimately confidential information.

The delegations of 10-15 countries have participated actively in PrepCom discussions on OSI, and between 1997 and 1999 sought to develop a 'concept of operations' for the OSI process—with the expectation that the drafting of an operational manual should not be too difficult once the basic concepts were settled. This approach produced plenty of useful input—but little in the way of agreements that could form the basis for a draft manual.

In June 2004 ASNO's Mr Malcolm Coxhead was appointed as Task Leader (chair) for the development of the operational manual.

To make progress it seemed necessary to move to discussion of the actual text for a manual, and during 2000 a first draft was prepared on the basis of written contributions made by delegations. This initial draft rolling text, of around 500 pages, has formed the basis for an elaboration (negotiation) process that has continued until today with delegations meeting for around six weeks each year. After three and a half years of discussions the rolling text has gathered hundreds more pages, and many hundreds more brackets. However, amongst this textual jumble, gems of solutions have begun to emerge. The task now for the negotiators is to mine those gems and produce a good and workable operational manual.

The work on the OSI operational manual has not taken place in a vacuum. Discussions have also been underway on matters such as defining specifications of equipment for use in OSI. The PrepCom's Provisional Technical Secretariat has also run training courses, field activities and tabletop exercises to bring many practical lessons to the negotiating table.

Even taking into account the complexity of issues affecting OSI, the development of the Operational Manual is a long time coming. With entry-into-force (EIF) of the CTBT still not firmly in view, the readiness of countries to compromise during the elaboration process has not been tested. EIF may help here. But it is also likely to bring to the table new countries—who will of course have their own views on the details of how an OSI should work.

BACKGROUND

Figure 35: Beverley uranium mine in South Australia. *Photo courtesy of Heathgate Resources.*

BRIEF OUTLINE OF THE NUCLEAR FUEL CYCLE

Currently there are 439 nuclear power reactors in operation in over 30 countries worldwide. In many cases these reactors supply a substantial proportion of national electricity requirements (see Table 9 on page 108). Overall nuclear power produces around one sixth of the world's electricity.

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.

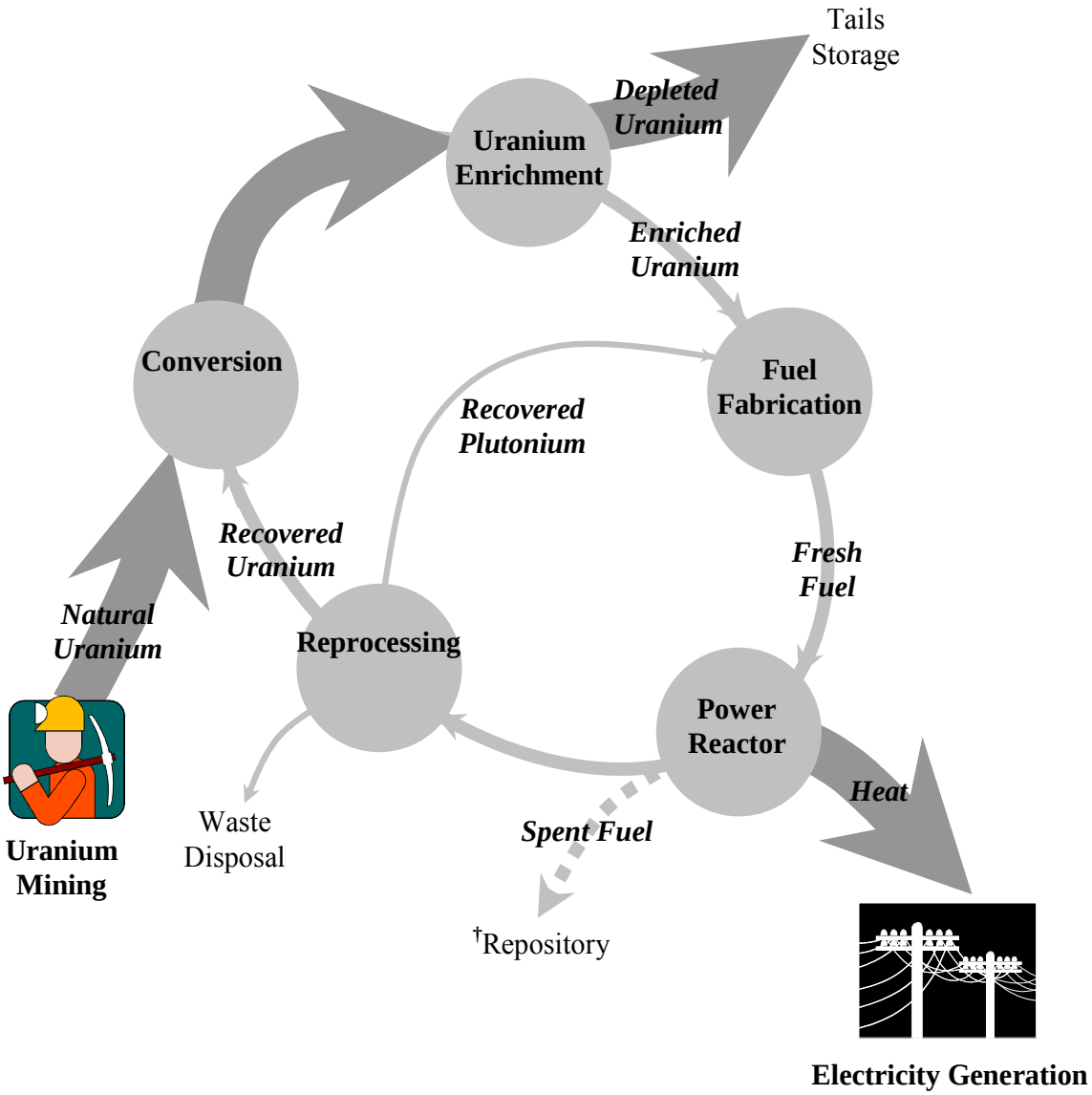
Because ordinary water is an inefficient moderator, LWRs must be operated on enriched uranium, that is, uranium in which the proportion of the fissile isotope U-235 has been increased from the level in natural uranium, 0.71%, usually to between 3% and 5%. Some reactor types can be operated on natural uranium, by using more efficient moderators, such as heavy water, which has a proportion of the heavier hydrogen isotope deuterium, or 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 U.K. 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 36):

- Conversion: natural uranium is formed into a gaseous compound, uranium hexafluoride (UF_6), 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 the fuel rods assembled into 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 have decided to dispose of their spent fuel in repositories instead of recycling it.

Figure 36: Civil nuclear fuel cycle outline.

Military fuel cycle

There are five acknowledged nuclear-weapon states (the U.S., Russia, the U.K., 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 addition the DPRK has said it has nuclear weapons. In all these 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, usually 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 8: 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 U.S., Russia, the U.K. 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 of relevant facilities and material.

Table 9: World nuclear electricity generation at 31 December 2003.

Country	*Operating Reactors*	*Capacity (GWe)*	*% of Total Electricity in 2003*	*Reactors under Construction*	
				Number	*(GWe)*
USA	104	98.3	19.9		
France	59	63.4	77.7		
Japan	53	44.1	25.0	3	3.7
Russia	30	20.8	16.5	3	2.8
Germany	18	20.6	28.1		
ROK	19	15.9	40.0	1	1.0
U.K.	27	12.1	23.7		
Canada	16	11.3	12.5		
Ukraine	13	11.2	45.9	4	3.8
Sweden	11	9.5	49.6		
Spain	9	7.6	23.6		
China	8	6.0	2.2	3	2.6
Belgium	7	5.8	55.5		
Taiwan, China	6	4.9	21.5	2	2.2
Czech Republic	6	3.6	31.1		
Switzerland	5	3.2	39.7		
Bulgaria	4	2.7	37.7		
Finland	4	2.7	27.3		
India	14	2.6	3.3	8	3.6
Lithuania	2	2.4	79.9		
Slovak Republic	6	2.4	57.4	2	0.8
Brazil	2	1.9	3.6		
South Africa	2	1.8	6.0		
Hungary	4	1.8	32.7		
Mexico	2	1.3	5.2		
Argentina	2	0.9	8.6	1	0.7
Romania	1	0.7	9.3	1	0.7
Slovenia	1	0.7	40.4		
Netherlands	1	0.5	4.5		
Armenia	1	0.4	35.5		
Pakistan	2	0.4	2.4		
Iran	-	-	-	2	2.1
DPRK	-	-	-	1	1.0
World total	439	361.1	(est) 17.0	31	25.0

In bold – bilateral agreement with Australia for the use of AONM (Taiwan is covered by an agreement between Australia and the U.S.). These countries operate 360 power reactors, accounting for 86% of world nuclear generating capacity.

Source: IAEA PRIS Database.

IAEA SAFEGUARDS STATEMENT FOR 2003

The safeguards statement is published annually by the IAEA—the following text is taken from www.iaea.org/OurWork/SV/Safeguards/es2003.html .

The Secretariat's findings and conclusions for 2003 are based upon an evaluation of all the information available to the Agency in exercising its rights and fulfilling its safeguards obligations for that year.

1. Safeguards activities were implemented for 40 States[15] with both comprehensive safeguards agreements in force and additional protocols in force or being otherwise applied. Only for such States are Agency safeguards able to provide credible assurance not only regarding the non-diversion of nuclear material but also regarding the absence of undeclared nuclear material and activities.

(a) For 19 of those States, the Secretariat completed sufficient activities and evaluation and found no indication of the diversion of nuclear material placed under safeguards and no indication of undeclared nuclear material or activities for the State as a whole. On this basis, the Secretariat concluded that all nuclear material within the territories of those States, under their jurisdiction or under their control anywhere had been placed under safeguards and remained in peaceful nuclear activities or was otherwise adequately accounted for.

(b) For 19 States (and for Taiwan, China), the Secretariat found no indication of the diversion of nuclear material placed under safeguards. Evaluations aimed at drawing a conclusion regarding the absence of undeclared nuclear material and activities for each of these States (and for Taiwan, China) as a whole remain in progress. On this basis, the Secretariat concluded for these States (and for Taiwan, China) that the nuclear material placed under safeguards remained in peaceful nuclear activities or was otherwise adequately accounted for.

(c) The Islamic Republic of Iran and the Libyan Arab Jamahiriya, having been engaged in undeclared nuclear activities, were in breach of their obligations to comply with their respective safeguards agreements.

2. Safeguards activities were implemented for 98 States with comprehensive safeguards agreements in force but without additional protocols in force or being otherwise applied. For those States, the Secretariat found no indication of the diversion of nuclear material placed under safeguards. On this basis, the Secretariat concluded that for these States, the nuclear material placed under safeguards remained in peaceful nuclear activities or was otherwise adequately accounted for. As a result of the unilateral actions of the Democratic People's Republic of Korea (DPRK) to terminate the Agency's safeguards activities in late 2002, the Secretariat was not able to implement safeguards inspections in the DPRK in

15. In addition, the Agency applies safeguards, including the measures foreseen in the Model Additional Protocol (INFCIRC/540(Corr.)), in Taiwan, China.

2003 and could not, therefore, draw any safeguards conclusions in respect of nuclear material in that State.

3. Safeguards activities were implemented in four States with INFCIRC/66/Rev.2-type safeguards agreements in force. For those States, the Secretariat found no indication of the diversion of nuclear material or of the misuse of facilities, equipment or non-nuclear material placed under safeguards. On this basis, the Secretariat concluded that the nuclear material and other items placed under safeguards remained in peaceful nuclear activities or were otherwise adequately accounted for.

4. Safeguards activities were implemented in selected facilities in four of the five nuclear-weapon States with voluntary offer safeguards agreements in force. For those States, the Secretariat found no indication of the diversion of nuclear material under safeguards. On this basis, the Secretariat concluded that the nuclear material under safeguards remained in peaceful nuclear activities or was otherwise adequately accounted for.

5. As of the end of 2003, 45 non-nuclear-weapon States party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) had not yet brought into force comprehensive safeguards agreements with the Agency as required by Article III of that Treaty. For 44 of those States[16], the Secretariat could not implement safeguards and could not, therefore, draw any safeguards conclusions.

6. In Iraq, the Agency was able to implement its United Nations Security Council resolution-related mandate in 2003 until 17 March and, as of that time, had not found any evidence or plausible indication of the revival of a nuclear programme. Under its comprehensive safeguards agreement with Iraq, the Agency verified in June 2003 that, in spite of the looting that took place in April 2003, the amount of uranium that may have been dispersed was not of proliferation concern.

16. Cuba acceded to the NPT on 4 November 2002. However, in 2003 safeguards were still being applied under INFCIRC/66/Rev.2-type safeguards agreements.

AUSTRALIAN URANIUM EXPORTS

In 2003-04 Australia exported 9,099 [17] tonnes of uranium ore concentrates (U_3O_8 or U_3O_8 equivalent), amounting to 7,716 tonnes contained uranium. This quantity of uranium is sufficient for the annual fuel requirements of some 39 reactors (each of 1000 MWe), producing around 310 terawatt hours (TWh) of electricity in total—well in excess of Australia's own electricity production, which in 2001-02 totalled about 200 TWh[18].

As of 1st January 2003 Australia held about 40% of the world's reasonably assured uranium resources recoverable at less than US$40/kg, or 29% of such resources recoverable at less than US$80/kg[19]. In 2003, 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 35 countries[20], and Taiwan, China. These agreements are listed in Table 11 on page 114. Those bilateral partners which imported Australian uranium in the 2003 calendar year are listed in Table 10 below.

Table 10: Countries to which Australian Uranium was supplied in 2003

Country	*Tonnes UOC (U_3O_8)*	*% of total (rounded)*
Belgium	88.45	0.9
Finland	112.04	1.2
France	881.72	9.3
Germany	158.76	1.7
Japan	2337.15	24.7
ROK	930.00	9.8
Sweden	518.88	5.5
U.K.	870.61	9.2
U.S.	3569.42	37.7
Total	9467.03	100.0

These figures are for Australian origin uranium that was sold and delivered from available converter stocks by book transfer to an approved end-user in a given end-user country. The figures are based on existing contracts. The destinations are based on the contracted end

17. This figure is tonnes of UOC shipped from Australia between 1 July 2003 and 30 June 2004, and is not the same as the quantity received by end users in calendar year 2003 as shown in Table 10 above.
18. Based on data from the Energy Supply Association of Australia (http://www.esaa.com.au).
19. From Uranium 2003: Resources, Production and Demand. A joint report by the OECD NEA and the IAEA.
20. 25 of the countries making up this total are EU member states.

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 2003 there were 439 power reactors in operation in over 30 countries, with a total electrical generating capacity of just over 360 GWe, and an electrical output of around 2,524 TWh. These reactors produced approximately 17% of the world's electricity (see Table 9 on page 108). Of these, 360 reactors were operated by countries eligible to use AONM under bilateral agreements with Australia. The reactors in these latter countries produced approximately 14.5% of total world electricity. Nuclear energy's contribution to electricity production in countries eligible to use Australian uranium ranged from 4% in the Netherlands to 78% in France.

In 2003, exports of Australian uranium corresponded to around 12% of global nuclear electricity production. Through generating electricity by nuclear energy rather than fossil fuels, countries using Australian uranium thereby avoided carbon dioxide emissions of around 330 million tonnes—equivalent to some 85-90%[21] of Australia's total net carbon dioxide emissions from all sources (based on data for 2002[22]).

21. This figure ranges from 85% to 90%, reflecting differences in calendar year and fiscal year estimates.
22. Taken from the National Greenhouse Gas Inventory 2002, http://www.greenhouse.gov.au/inventory/

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 appropriately 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 be used only 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[23];
- 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.

Table 11: Australia's Bilateral Safeguards Agreements and their dates of entry-into-force.

Country[24]	*Date of EIF*
Republic of Korea (ROK)	2 May 1979
U.K.[25]	24 July 1979
Finland[25]	9 February 1980
USA	16 January 1981
Canada	9 March 1981
Sweden[25]	22 May 1981
France[25]	12 September 1981
Euratom[26]	15 January 1982
Philippines[27]	11 May 1982
Japan	17 August 1982
Switzerland	27 July 1988
Egypt[27]	2 June 1989
Russian Federation[28]	24 December 1990
Mexico	17 July 1992
New Zealand[29]	1 May 2000
Czech Republic[25]	17 May 2002
USA covering supply to Taiwan, China	17 May 2002
Hungary[25]	15 June 2002

23. Consent has been given in advance to reprocessing on a programmatic basis in the case of five Agreements: Euratom, France, Japan, Sweden and Switzerland.
24. 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 (see references on page 118)
25. Czech Republic, Finland, France, Hungary, Sweden and the U.K. are members of Euratom and AONM in these countries is covered by the Australia/Euratom Agreement.
26. Euratom is the atomic energy agency of the European Union. For further details see Glossary.
27. In the case of Egypt and the Philippines, Administrative Arrangements pursuant to the Agreements have not been concluded, so in practice the Agreements have not yet entered into operation.
28. 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.
29. The Australia/New Zealand agreement covers the supply of uranium for non-nuclear use.

Australian Obligated Nuclear Material (AONM)

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 U.K. 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 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 U.S. 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 U.S. will also become U.S. obligated nuclear material (USONM), and its subsequent use will have to meet the requirements of both Australian and U.S. 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 U.S. counterpart (DOE).

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 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 general 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.

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 2003-04 within the Foreign Affairs and Trade portfolio.

Documents are listed under three main headings: agreements; legislation and related documents; and other. All agreements and treaties are available from the Australian Treaty Series available on line at http://www.austlii.edu.au/au/other/dfat. Treaty documents are available also from the ASNO website http://www.asno.dfat.gov.au and the DFAT Treaties Database at http://www.info.dfat.gov.au/treaties/.

Acts and Regulations, as well as treaties and agreements, are available from Commonwealth Library Deposit and Free Issue Schemes (LDS) libraries, a complete list of which can be found at http://www.agimo.gov.au/information/publishing/deposit. LDS libraries include State and Territory libraries, the National Library of Australia, and many university libraries. General resources for information on Acts, treaties/agreements, Legislation and Regulations are:

http://www.publications.gov.au

http://www.austlii.edu.au/databases.html

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.*
- *Non-Proliferation Legislation Amendment Act 2003.*

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 U.S. 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

Figure 37: A CTBT hydrophone array is located off Cape Leeuwin, Australia's most south-west point.

ANNEX A: NUCLEAR MATERIAL WITHIN AUSTRALIA

Table 12: Nuclear Material within Australia at 30 June 2004

Category	*Quantity*[30]	*Intended End-use*
Source Material:		
Uranium ore concentrates (UOC) at mines	1,170 tonnes U	Exports for energy use pursuant to bilateral agreements
Other UOC	3 tonnes U	Research
Natural Uranium (other than UOC)	10,819 kg	Research and shielding
Depleted Uranium	12,912 kg	Research and shielding
Thorium (Th) in ore residues	59 tonnes	Storage/disposal
Thorium (other than ore residues)	1,959 kg	Research, industry
Special Fissionable Material:		
Uranium-235	152,300 g [31]	Research, radioisotope production
Uranium-233	4 g	Research
Plutonium (except Pu-238)[32]	2,017 g [33]	Research, neutron sources

30. These figures are based on reports received pursuant to Permit requirements and were correct at the time of preparing this Annual Report.
31. 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.
32. Plutonium with an isotopic concentration of plutonium-238 exceeding 80% is exempt from safeguards.
33. 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.

ANNEX B: ASSOCIATED ITEMS WITHIN AUSTRALIA

Table 13: Associated Items within Australia at 30 June 2004.

Category[34]	*Quantity*	*Intended End-use*
Associated Material:		
Deuterium and Heavy Water	17.4 tonnes	Research, including reactor operation
Nuclear grade graphite	114 tonnes	Incorporated in HIFAR and Moata reactors, and in storage
Associated Equipment:		
HIFAR research reactor		
Moata research reactor[35]		
Fuel charging and discharging machines	2	
HIFAR control rods (not in reactors)	5	
HIFAR safety rods (not in reactors)	2	
Gas centrifuge components	-	Dismantled
SILEX equipment	-	Enrichment R&D

34. In addition to the associated items listed, associated technology is held by ANSTO, Silex Systems Ltd., patent attorneys, and IP Australia.
35. The reactor fuel has been discharged and the control room dismantled pending final decommissioning.

ANNEX C: AONM OVERSEAS

Australian Obligated Nuclear Material Overseas[36]

Table 14: Locations and quantities of AONM as at 31 December 2003

Category	*Location*	*Quantity (tonnes)*
Natural Uranium	Canada, Euratom, Japan, ROK, USA	20,262
Uranium in Enrichment Plants	Euratom, Japan, USA	8,025
Depleted Uranium	Euratom, Japan, USA	67,823
Low Enriched Uranium	Canada, Euratom, Japan, ROK, Switzerland, USA, Mexico	9,056 [37]
Irradiated Plutonium	Canada, Euratom, Japan, ROK, Switzerland, USA	78
Separated Plutonium	Euratom, Japan	0.6
Total (tonnes)		105,245

36. 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 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, 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.

37. An estimated 80-90% of Australian obligated low enriched uranium is in the form of spent reactor fuel.

Table 15: Transfers of AONM during 2003

Process[38]	*Quantity Uranium (tonnes)*	*Transfer Destination*
Conversion	1024	Canada
	3452	Euratom
	3500	USA
Total transfers between jurisdictions to conversion plants	**7976**	
Enrichment	207	USA
	2275	Euratom
	20	Japan
Total transfers between jurisdictions to enrichment plants	**2502**	
Fuel Fabrication		
	92	Japan
	182	USA
	256	ROK
Total transfers between jurisdictions to fuel fabrication plants	**530**	
Reactor Irradiation	0 [39]	Australia
	17	USA
Total transfers between jurisdictions for fuel irradiation.	**17**	
Reprocessing	<100 kg	Euratom

38. The above figures are for transfers completed between jurisdictions during 2003 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), nor return of heels or damaged product.
39. Approx 12 kg.

ANNEX D: ACCOUNTING REPORTS TO THE IAEA

Australian Accounting Reports generated for the IAEA for the period 2003-04 under Australia's NPT Safeguards Agreement with the IAEA.

Table 16: Numbers of Accounting Reports generated for the IAEA

Number of Reports Sent	*MBA*	*ICR*	*PIL*	*MBR*	*Total*
HIFAR, ANSTO	AS-A	4	1	1	6
Moata, ANSTO	AS-B	0	0	0	0
R&D Laboratories, ANSTO	AS-C	12	3	1	16
Vault Storage, ANSTO	AS-D	3	1	1	5
Miscellaneous Locations	AS-E	13	7	1	21
Replacement Research Reactor	AS-F	0	0	0	0
Silex Laboratories	AS-G	4	1	1	6
Total		36	13	5	54

Table 17: 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	56	34	13	103
Moata, ANSTO	AS-B	0	0	0	0
R&D Laboratories, ANSTO	AS-C	151	240	45	436
Vault Storage, ANSTO	AS-D	3	11	9	23
Miscellaneous Locations	AS-E	583	646	44	1273
Replacement Research Reactor	AS-F	0	0	0	0
Silex Laboratories	AS-G	20	20	7	47
Total		813	951	118	1882

Table 18: Routine Safeguards Inspections and Complementary Access performed by the IAEA during 2003-04

Date	*MBA*	*Type*
23-24 Jul 2003	AS-D	RI
	AS-C	CA
8-10 Dec 2003	AS-A (LHSTC)	SN
	AS-C AS-G	CA
12 Dec 2003	AS-E (Honeymoon mine)	CA

Date	*MBA*	*Type*
15-16 Dec 2003	AS-E	RI
29 Mar – 5 Apr 2004	AS-A, AS-C, AS-D, AS-F, AS-G	RI, DI, CA

RI	Routine Inventory Verification Inspection
CA	Complementary Access
SN	Short Notice Inventory Verification Inspection
DI	Design Information 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

During 2003-04 the IAEA carried out inventory verification inspections in five of Australia's seven Material Balance Areas (MBAs): AS-A, AS-C, AS-D, AS-E and AS-G (see Table 5). 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 access, design verification exercises and data collection and analysis.

The IAEA provides statements of conclusions of inspections under Article 91(b) of Australia's NPT Safeguards Agreement. These are usually received in the financial year following the inspection—which is why the following Table summarises available Article 91(b) statements arising from physical inventory inspections conducted in 2002-03.

Table 19: IAEA Conclusions of Inspections in Australia during 2002-03

	Applicable MBAs	*Verification Activity*	*Conclusion* [40]
(1)	AS-A AS-B AS-C AS-E	Examination of records	'The records satisfied the Agency requirements.'
(2)	AS-A AS-B AS-C AS-E	Examination of Reports to the Agency	AS-A ICR 157, AS-C ICR 425, AS-E ICR 83&92 'not dispatched to the Agency within the timing specified by the Facility Attachment.' AS-E PILs and MBRs not reported during 1997-2002. All other reports satisfied Agency requirements.
(3)	AS-A AS-C	Application of Containment Measures	'The application of containment measures adequately complemented the nuclear material accountancy measures.'
(4)	AS-A AS-B AS-C AS-E	Verification of Physical Inventory	'The physical inventory declared by the operator was verified and the results satisfied the Agency requirements.'
(5)	AS-A AS-C	Verification Activities for Timely Detection	'The Verification activities for timely detection during the material balance period satisfied the Agency requirements'

The late reports identified for AS-A and AS-C were submitted outside the specified timeframe due to transitional problems arising from moving to electronic submission.

In December 2003 the IAEA carried out an initial inventory verification for MBA AS-E (miscellaneous locations). The IAEA verified this by inspecting one location in detail, and then reviewing the accounts held by ASNO for the other locations. Further explanation of IAEA activities and findings for AS-E is given on page 39.

MBA AS-F is the Replacement Research Reactor currently under construction at Lucas Heights. There is not yet any inventory of nuclear material in this MBA so the IAEA has not carried out any inventory verification activities there, however the IAEA visited the site in March 2004 to verify design information.

40. The AS-G MBA, Silex Labs, was created in 2003 and a Facility Attachment has not yet been finalised with the IAEA. The IAEA generally only issues Article 91(b) statements where a Facility Attachment has been agreed.

Conclusions from Complementary Access

The IAEA provides statements of conclusions for each State in which strengthened safeguards are in force. These are provided under Article 10.c. of the Additional Protocol to Australia's NPT Safeguards Agreement. The Statement for calendar year 2003 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 Centre
> Honeymoon Project, Uranium Mine.
>
> Access pursuant to Article 4.a.(ii) in addition to subsequent clarification and agreement to add to the Article 2 declaration resolved a question and/or inconsistency referred to in Article 4.d at:
>
> Lucas Heights and Technology Centre
> Little Forest Burial Ground.
>
> These conclusions are pending the results of environmental samples.'

ANNEX F: IAEA SAFEGUARDS STATISTICS [41]

Table 20: IAEA Safeguards Expenditure (US$ million)

	2001	*2002*	*2003*[42]
Regular Budget expenditure	69.971	78.500	91.500
Extra budgetary funds expenditure	15.172	19.700	21.300

Table 21: IAEA Verification Activities

	2001	*2002*	*2003*
Number of inspectors	231	243	247
Inspections performed	2,487	2,430	2,363
Person-days of inspection	10,314	10,084	9,260
Number of seals applied to nuclear material or safeguards equipment, detached and subsequently verified	26,195	26,071	25,209
Films, video tapes and digital storage media items reviewed	5,402	4,803	3,689

Table 22: Approximate quantities of material subject to IAEA Safeguards on 31 December 2001, 2002 and 2003

Tonnes	*2001*	*2002*	*2003*
Plutonium contained in irradiated fuel	678.9	732	770
Separated plutonium outside reactor cores	77.5	82	85.5
Highly enriched uranium	20.9	31.8	31.8
Low enriched uranium	50,079	52,225	52,972
Source material (natural uranium or thorium)	94,940	96,412	102,252

Table 23: Number of installations under IAEA Safeguards or containing safeguarded material on 31 December 2001, 2002 and 2003

	Number of Installations		
Facility Type	*2001*	*2002*	*2003*
Power reactors	238	239	236
Research reactors and critical assemblies	160	158	160
Conversion plants	14	14	14
Fuel fabrication plants	41	41	40
Reprocessing plants	6	6	6
Enrichment plants	12	10	11
Separate storage facilities	79	80	85
Other facilities	94	86	85
Subtotals	645	634	637
Other locations and non-nuclear installations	454	325	328
Totals	1,099	959	965

41. Source of information: IAEA Annual Reports and Safeguards Implementation Reports for 2001-2003. All figures given are for calendar years.
42. The apparent increase in actual expenditures in 2003 ($91.5 million) compared to 2002 ($78.5 million) partly reflects the strengthening of the Euro in comparison to the U.S. Dollar in 2003.

ANNEX G: EXPENDITURE BY OPCW AND CTBTO PREPCOM

Table 24: Expenditure by the OPCW (Organisation for the Prohibition of Chemical Weapons) and CTBTO (Comprehensive Nuclear-Test-Ban Treaty Organization) Preparatory Commission (US$ million)

	2000	2001	2002	2003 [43]
OPCW	56.2	49.8	71.9	85.5
CTBTO[44]	79.9	93.3	71.7	86.7

The OPCW budget was in Netherlands Guilders and now Euros—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 2000, 2001, 2002 and 2003.

43. Conversion factor 1.2543.
44. Sources—CTBTO PrepCom Annual Reports, Programme and Budget documents.

ANNEX H: AUSTRALIAN SAFEGUARDS SUPPORT PROGRAM

ASSP comprises projects undertaken to assist the IAEA.

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. The AMS facility at ANSTO is now a certified member of the IAEA's Network of Analytical Laboratories for measurements of U-236 and I-129.

As reported in last year's annual report, ANSTO is investigating the applicability of the methodology for measurements of isotopes of plutonium—significant progress on these investigations have been made.

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.

All current tasks have been completed and ASNO is awaiting further tasking under this activity from the IAEA.

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.

Supporting the IAEA's information analysis capability ASNO is providing support to the IAEA's Division of Safeguards Information Technology in evaluating the best means of collecting and analysing information on a state's nuclear programs from non-state sources—sources such as open source, information collected during IAEA activities, and information provide by third parties. This Australian Safeguards Support Program project covered two tasks: (1) database software evaluation for storage and retrieval of open source information; and (2) investigation, from open source information, of details of the recently revealed nuclear black market in centrifuge and other proliferation-sensitive technologies. A third task under this project, information analysis in support of safeguards state evaluations, is being undertaken outside the period covered by this Report.

Tasks Completed During 2003-04

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.

ANNEX I: MEDIA RELEASES 2003-2004

ASNO contributed to the following media releases during 2003-04 (see http://www.dfat.gov.au/media/):

FA13 – 30 January 2004: Australian Delegation to Visit North Korea.

FA52 – 19 April 2004: Australia Continues to Lead the Way on Nuclear Test Ban.

FA84 – 16 June 2004: Australia Group Expands to Combat Chemical and Biological Weapons Proliferation.

ANNEX J: STATUS OF AUSTRALIAN IMS STATIONS

CTBT International Monitoring System.

Table 25: Australian IMS Stations—Status as at 30 June 2004

	Status[1]	*Operator*[2]
Primary Seismic Stations		
Warramunga, NT	C	ANU
Alice Springs, NT	X	GA/USA
Stephens Creek, NSW	C	GA
Mawson, Antarctica	C	GA
Auxiliary Seismic Stations		
Charters Towers, QLD	T	GA
Fitzroy Crossing, WA	T	GA
Narrogin, WA	T	GA
Infrasound Stations		
Warramunga, NT	C	ANU
Hobart, TAS	C	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	C	ARPANSA
Cocos Islands	C	ARPANSA
Macquarie Island, TAS	S	*ARPANSA*
Mawson, Antarctica	S	*ARPANSA*
Radionuclide Laboratory		
Melbourne, VIC	T	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 in italics.)

ANNEX K: STATUS OF ADDITIONAL PROTOCOLS

(AS AT 30 JUNE 2004)

Prepared by ASNO on basis of IAEA information

SUMMARY:

States with significant nuclear activities [45]:

Total 71 + Taiwan, China
63 NNWS NPT Parties (see footnote on DPRK, Table 26C)
5 NWS
3 INFCIRC/66 (India, Israel, Pakistan)

Number of APs in force:	61 + Taiwan, China
APs signed or approved:	29
Overall total of APs:	90

Of the 63 NNWS NPT Parties with significant nuclear activities:

42 have an AP in force
7 have signed an AP (or had an AP approved by the IAEA Board of Governors)
14 have not signed an AP

45. 'Significant nuclear activities' encompasses any amount of nuclear material in a facility or location outside facilities (LOF), or nuclear material in excess of the exemption limits in INFCIRC/153 paragraph 37.

Table 26A: States with Additional Protocols in force. *States with significant nuclear activities shown in bold.*

State	In Force
Armenia	28 Jun 04
Australia	12 Dec 97
Austria	30 Apr 04
Azerbaijan	29 Nov 00
Bangladesh	30 Mar 01
Belgium	30 Apr 04
Bulgaria	10 Oct 00
Burkina Faso	17 Apr 03
Canada	8 Sep 00
Chile	3 Nov 03
China	28 Mar 02
Croatia	6 Jul 00
Cuba	3 Jun 04
Cyprus	19 Feb 03
Czech Republic	1 Jul 02
Denmark	30 Apr 04
DR Congo	9 Apr 03
Ecuador	24 Oct 01
El Salvador	24 May 04
Finland	30 Apr 04
France	30 Apr 04
Georgia	3 Jun 03
Germany	30 Apr 04
Ghana	11 Jun 04
Greece	30 Apr 04
Holy See	24 Sep 98
Hungary	4 Apr 00
Iceland	12 Sep 03
Indonesia	29 Sep 99
Iran	signed 18 Dec 03 [∗]
Ireland	30 Apr 04

State	In Force
Italy	30 Apr 04
Jamaica	19 Mar 03
Japan	16 Dec 99
Jordan	28 Jul 98
Kuwait	2 Jun 03
Latvia	12 Jul 01
Libya	signed 10 Mar 04 [∗]
Lithuania	5 Jul 00
Luxembourg	30 Apr 04
Madagascar	18 Sep 03
Mali	12 Sep 02
Monaco	30 Sep 99
Mongolia	12 May 03
Netherlands	30 Apr 04
New Zealand	24 Sep 98
Norway	16 May 00
Panama	11 Dec 01
Peru	23 Jul 01
Poland	5 May 00
Portugal	30 Apr 04
ROK	19 Feb 04
Romania	7 Jul 00
Slovenia	22 Aug 00
South Africa	13 Sep 02
Spain	30 Apr 04
Sweden	30 Apr 04
Turkey	17 Jul 01
U.K.	30 Apr 04
Uruguay	30 Apr 04
Uzbekistan	21 Dec 98

Notes: Total 61 states—in addition the IAEA applies Protocol measures in Taiwan, China.
[42 NNWS with significant nuclear activities, + Taiwan, China]

[∗] In force provisionally.

Table 26B: States with Additional Protocols signed or approved by the IAEA Board of Governors, but not yet in force. *States with significant nuclear activities shown in bold.*

State	Signed/*approved*
Andorra	9 Jan 01
Albania	*16 Jun 04*
Cameroon	*16 Jun 04*
Costa Rica	12 Dec 01
Estonia	13 Apr 00
Gabon	*18 Mar 03*
Guatemala	14 Dec 01
Haiti	10 Jul 02
Kazakhstan	6 Feb 04
Kiribati	*10 Sep 02*
Malta	24 Apr 03
Mauritania	2 Jun 03
Mexico	29 Mar 04
Morocco	*16 Jun 04*

State	Signed/*approved*
Namibia	22 Mar 00
Nicaragua	18 Jul 02
Niger	11 Jun 04
Nigeria	20 Sep 01
Paraguay	24 Mar 03
Philippines	30 Sep 97
Russia	22 Mar 00
Seychelles	7 Apr 04
Slovakia	27 Sep 99
Switzerland	16 Jun 00
Tajikistan	7 Jul 03
Tanzania	*16 Jun 04*
Togo	26 Sep 03
Ukraine	15 Aug 00
USA	12 Jun 98

Note: Total 29 states [7 NNWS NPT Parties with significant nuclear activities]

Table 26C: States with significant nuclear activities, which have not yet signed Additional Protocols.

State
Algeria
Argentina
Belarus
Brazil
Colombia
DPRK [46]
Egypt
India
Israel

State
Iraq
Malaysia
Pakistan
Syria
Thailand
Venezuela
Viet Nam
Yugoslavia

Note: Total 17 states [14 NPT—India, Israel and Pakistan are not NPT Parties]

It is understood Argentina and Brazil intend to conclude protocols in conjunction with the regional safeguards authority ABACC.

46. On 10 January 2003 the DPRK gave notice of withdrawal from the NPT—pending clarification of its status, the DPRK is counted here as an NPT Party.

ANNEX L: ASNO PUBLICATIONS AND PRESENTATIONS

Publications and presentations by ASNO staff (in some cases in collaboration with others) during 2003-2004 which are available to the public:

Nuclear

John Carlson, Russell Leslie, Peter Riggs and Annette Berriman, *Back to Basics—Re-Thinking Safeguards Principles*, Annual Meeting of the Institute of Nuclear Materials Management (INMM), Phoenix, Arizona, 13-17 July 2003.

John Carlson, *Non-Proliferation—The DPRK Challenge*, 2003 INMM Annual Meeting.

John Carlson, *Strengthening the Non-Proliferation Regime*, 2003 INMM Annual Meeting.

John Carlson, *Nuclear Safeguards—A Holistic View*, ESARDA/INMM Workshop on Safeguards Perspectives for a Future Nuclear Environment, Como, Italy, 14-16 October 2003.

John Carlson, *Nuclear Safeguards—Challenges and Responses*, International Seminar on 'A fresh look at nuclear safeguards', ISTC/ENCI/ESARDA, Como, Italy, 17-18 October 2003.

John Carlson, *Strengthening the Nuclear Non-Proliferation Regime*, Fifth Conference on Nuclear Science and Engineering in Australia, Canberra, 5-6 November 2003.

Stephan Bayer, *Risk Assessment Methodology for Security of Nuclear Facilities as part of National Critical Infrastructure Protection*, INMM Global Best Practices in Nuclear Materials Accountancy, Control, and Physical Protection, Prague, Czech Republic, June 2004.

Chemical/Biological

Andrew Leask, *Australia's Experience in Educating Industry and Research Institutes about Export Obligations—A Framework for the Biological Sector*. Meeting of the States Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, Geneva, 18–29 August 2003.

Andrew Leask, *Nuclear, Biological, Chemical and Radiological: Regulation in Australia of Activities and Materials,* Australian Defence Force Medical Officer Nuclear Biological Chemical Defence Course, Wodonga, 24 May-4 June 2004.

John Howell, *Chemical Terrorism Prevention in Australia*, CBR Defence 2003-Collaboration, Coordination and Control Conference, Sydney, 27-29 August 2003.

Gordon Eckersley and John Howell, *Update on Australia's Experience in Tracking Systems for International Trade in CWC Scheduled Chemicals*, Second Meeting of CWC National Authorities on Practical Aspects of Controlling Trade in CWC Scheduled Chemicals, Barcelona, 15-18 September 2003.

John Howell, *Australian Obligations under the Chemical Weapons Convention*, Australian Crime Commission Seventh National Chemical Diversion Conference, Canberra, 15-17 September 2003.

Josy Meyer, *Australian Experiences with CWC Implementation*, First Regional Meeting of National Authorities of States Parties in Asia, Singapore, 29-31 October 2003.

John Howell, *Chemical and Biological Terrorism Prevention in Australia*, DFATNEWS Vol 10 No 9, October 2003.

John Howell, *Preventing Proliferation Through Education*, Quadripartite Export Control Conference, Canberra, 17-20 November 2003.

John Howell, *Update on CWC Implementation in Australia*, PACIA Regulatory Affairs Network Meeting, Brisbane, 25 November 2003.

John Howell, *Chemical Risk Management and the CWC,* Industry Training, Melbourne, 17 December 2003.

John Howell, *Australia's Experience in Tracking Systems for International Trade in CWC and Other Controlled Chemicals,* Australia-China Trade Control Dialogue, Beijing, 23-24 March 2004.

John Howell, *Australia's Obligations under the CWC*, U.S. Export Control Workshop: Commodity Identification Training, U.S. Department of Energy, Sydney, 19-21 April 2004.

John Howell, *Customs Classifications and Controlling Chemical Trade*, U.S. Export Control Workshop: Commodity Identification Training, U.S. Department of Energy, Sydney, 19-21 April 2004.

John Howell, *Making the Chemical Weapons Convention Work Well*, DFATNEWS, Vol 11 No 4, April 2004.

Josy Meyer, *Australia's Experiences with CWC Implementation*, Workshop on the Practical Implementation and Universality of the Chemical Weapons Convention, Nadi, 14-15 June 2004.

Josy Meyer, *Role of the National Authority in Implementing the CWC*, National Seminar on the Implementation of the Chemical Weapons Convention, Suva, 16 June 2004.

John Howell and Josy Meyer, *The Chemical Weapons Convention—A Guide for Australian Industry Producing, Using or Trading Chemicals*, Canberra, June 2004.

Gordon Eckersley and John Howell, *Australian Preparedness for Challenge Inspections under the CWC*, EU Vienna Seminar on Challenge Inspections in the Framework of the CWC, Vienna, 24-25 June 2004.

CTBT

Malcolm Coxhead, *Nuclear-test-ban workshop in Hiroshima,* DFATNEWS, Vol. 10 No. 6, July 2003.

GLOSSARY OF ABBREVIATIONS, ACRONYMS AND DEFINITIONS

ABACC	Brazilian-Argentine Safeguards Agency.
ACTBO	Australian Comprehensive Test Ban Office, the Australian national authority responsible for implementing Australia's obligations in relation to the CTBT. ACTBO is part of ASNO.
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.
AG	Australia Group—the Australian-chaired export control group for chemical and biological weapons-related materials and equipment.
ANSTO	Australian Nuclear Science and Technology Organisation.
AONM	Australian Obligated Nuclear Material is nuclear material 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).
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency.
ASO	Australian Safeguards Office—the Australian national authority responsible for implementing Australia's nuclear safeguards obligations. ASO was the predecessor to ASNO and now forms part of ASNO along with CWCO and ACTBO.
ASSP	Australian Safeguards Support Program.
BAPETEN	Nuclear Energy Control Board (Indonesia).
BATAN	National Nuclear Energy Agency (Indonesia).
BWC	Biological Weapons Convention—full title: Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction.
CANDU	Canadian Deuterium Uranium type reactor. A reactor design that is moderated and cooled by heavy water and fuelled with natural uranium.
CD	Conference on Disarmament.
Challenge inspection	Under the CWC, the inspection of any facility or location in the territory or in any other place under the jurisdiction or control of a State Party requested by another State Party.
COAG	Council of Australian Governments.
Complementary access	The right of the IAEA pursuant the Additional Protocol to access a site or 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 Organization—Vienna-based international organisation established to give effect to the CTBT.
CTBT PrepCom	Comprehensive Nuclear-Test-Ban Treaty Preparatory Commission.
CWC	Chemical Weapons Convention—full title: Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction.
CWCO	Chemical Weapons Convention Office—the Australian national authority responsible for implementing Australia's obligations under the CWC. CWCO is part of ASNO.
Depleted uranium	Uranium having a U-235 content less than that found in nature (e.g. 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	Atomic Energy Agency of the European Union. Euratom's Safeguards Office is responsible for the application of safeguards to all nuclear material in Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, and Sweden; and to all nuclear material in civil facilities in France and the U.K.

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 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 Australian Geological and Seismic Organisation, AGSO).
G-8	Group of Eight—comprising Canada, France, Germany, Italy, Japan, Russia, U.K. and U.S.
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.
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 optimum combination of all safeguards measures under comprehensive safeguards agreements and the additional protocol to achieve maximum effectiveness and 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 undergoing 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, U.S., Russia, U.K., France and China.

OPCW	Organisation 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.
PACIA	Plastics and Chemicals Industries Association, Australia.
P-5	The five permanent members of the Security Council—U.S., Russia, U.K., France and China.
PIL	Physical Inventory Listing. A term used in nuclear materials accountancy.
PrepCom	Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty.
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).
PTS	Provisional Technical Secretariat for the Comprehensive Nuclear-Test-Ban Treaty.
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 appointed by and advising the IAEA Director General.
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 micro-organisms, animals or plants, irrespective of the method of production, whether natural or modified, that can cause death, disease or ill health to humans, animals or plants.
Traditional safeguards	The system of safeguards based on the IAEA's document INFCIRC/153.
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_4	Uranium tetrafluoride, a compound of uranium and fluorine that is a mid-stage product in the conversion of uranium dioxide (UO_2) to uranium hexafluoride (UF_6).
UF_6	Uranium hexafluoride, a gaseous compound of uranium and fluorine used as the feedstock for most enrichment processes.
UNMOVIC	United Nations Monitoring, Verification and Inspection Commission, mandated to disarm Iraq of its weapons of mass destruction.
UOC	Uranium Ore Concentrates (e.g. yellowcake).
UO_2	Uranium dioxide, a chemical form of uranium commonly used in power reactors.
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). Sometimes radiological weapons are also encompassed by this term.

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