Australian Government

Australian Safeguards and Non-Proliferation Office

ASNO

ANNUAL REPORT

2017–18

PRODUCED BY

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IMAGES

Photo 1: An unmanned surface vehicle robot competing in the IAEA Robotics challenge at CSIRO in Brisbane, 2017.

Photo 2: OPCW inspectors collecting samples during a mock inspection exercise.

Photo 3: The Ranger mine packing facility with drums of uranium oxide (U_3O_8) ready for export.

Photo 4: Spinning globe on the background of night sky, Shutterstock.

Photo 5: First results from Davis Infrasound Array — Australia's final CTBT International Monitoring station to be established.

Photo 6: Image from ANSTO's "Shrink to the Size of an Atom. Tour Opal in Virtual Reality."

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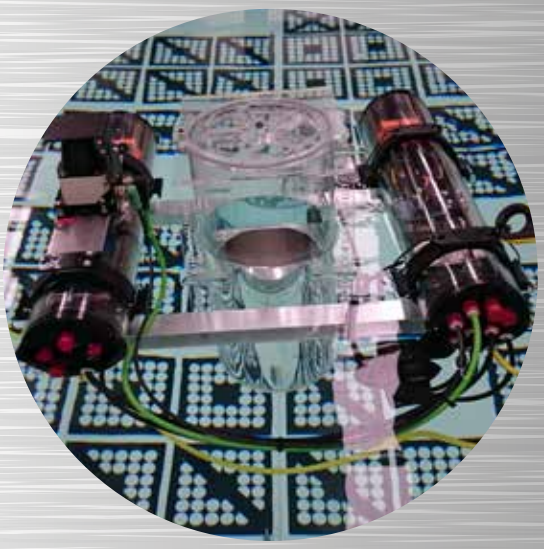

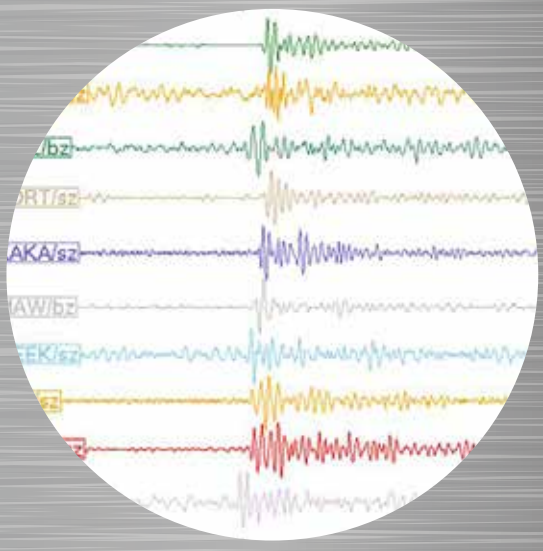
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ANNUAL
REPORT
2017–18

Guide to the Report

This report complies with the formal reporting obligations of the Director General ASNO. It provides an overview of ASNO's role and performance in supporting nuclear safeguards and the non-proliferation of weapons of mass destruction.

The report has five parts:

- report by the Director General ASNO on key non-proliferation developments in 2017–18
  and a preview of the year ahead
- summary of current major issues
- functional overview of ASNO, including its operating environment and outcomes
  - outputs structure – the first outcome demonstrates accountability to Government; the second outlines public outreach and education
- report on ASNO's performance during 2017–18
- key features of ASNO's corporate governance and the processes by which ASNO is directed, administered and held accountable.

Because ASNO is funded as a division of the Department of Foreign Affairs and Trade (DFAT), some mandatory annual report information for ASNO is incorporated in the DFAT Annual Report. This includes:

- financial statements
- corporate governance and accountability framework
- external scrutiny
- human resource management, including work health and safety
- asset management
- purchasing
- agency-specific social inclusion strategies
- advertising and market research
- ecologically sustainable development and environmental performance.

A checklist of information included against annual report requirements is set out in the List of Requirements (page 106).

Australian Government

Australian Safeguards and Non-Proliferation Office

8 October 2018

The Hon Marise Payne
Minister for Foreign Affairs
Parliament House
CANBERRA ACT 2600

Dear Minister

I submit the Annual Report on the operations of the Australian Safeguards and Non-Proliferation Office (ASNO) for the financial year ended 30 June 2018. This report is made in accordance with 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*.

During the reporting period all relevant statutory and treaty requirements were met, and ASNO found no unauthorised access to, or use of, nuclear materials or nuclear items of safeguards or security significance in Australia. All requirements were met under Australia's safeguards agreement with the International Atomic Energy Agency and under the Chemical Weapons Convention, and further progress was made with activities in anticipation of the entry into force of the Comprehensive Nuclear-Test-Ban Treaty. All Australian Obligated Nuclear Material was satisfactorily accounted for.

As outlined in this Report, ASNO continued its major contribution to advancing Australia's interests in effective measures against the proliferation of weapons of mass destruction through our activities at the domestic, regional and international levels, and through working closely with colleagues in the Department of Foreign Affairs and Trade in Canberra and Australia's diplomatic missions, and in other departments and agencies.

Yours sincerely

Dr Robert Floyd
Director General

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SECTION 1

Director General's Report

The Year in Review

Dr Robert Floyd,
Director General
ASNO.

Nuclear Non-Proliferation and Safeguards Developments

The International Non-Proliferation Environment

The principal challenges for the non-proliferation regime during the 2017–18 reporting period included those related to nuclear programs in Iran and DPRK, the continued use of chemical weapons in Syria in the absence of a formal attribution mechanism, and the poisoning of individuals in the United Kingdom (UK) with the military-grade "Novichok" nerve agent. The responses to these challenges demonstrated the vital importance of the organisations responsible for verifying compliance with non-proliferation treaties, namely the International Atomic Energy Agency (IAEA), the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and the Organisation for the Prohibition of Chemical Weapons (OPCW).

Since the Joint Comprehensive Plan of Action (JCPOA) entered into force, the IAEA has confirmed in its quarterly reports that Iran is implementing all nuclear related commitments under the JCPOA, including with regard to caps on enriched uranium and heavy water. On 8 May 2018, President Trump announced USA's withdrawal from the agreement, citing various weaknesses in the JCPOA. Notwithstanding USA's withdrawal, Australia considers that the JCPOA remains the best available option to address Iran's nuclear program, and with no credible alternative, continues to urge all parties to the agreement to keep the deal in place and implement it in full. Australia's ongoing support for the JCPOA is based on reporting from the IAEA that the deal is working and providing verifiable assurances on Iran's nuclear program.

The latter half of 2017 saw significant and concerning escalation in DPRK's nuclear and missile program, which included a spate of missile launches and a sixth nuclear test. On 3 September 2017, the International Monitoring System of the CTBTO detected a nuclear test in DPRK with an estimated explosive yield of 150 to 240 kT which was significantly larger than previous tests suggesting that a different and more powerful weapon design had been tested. The ballistic missile tests in 2017 included for the first time the launching of inter-continental ballistic missiles (ICBMs), indicating a range as far as 10,400 km.

In January 2018 in his annual New Year address, DPRK President Kim Jong-un declared the country's nuclear force as completed, but then in March, in a significant turnaround, invited President Trump to a meeting to discuss denuclearisation. The meeting ultimately took place on 12 June in Singapore which produced a joint-declaration. While the Singapore declaration formally reaffirmed DPRK's commitment to work towards complete denuclearisation of the Korean Peninsula, there have been thus far no verified actions backing that commitment. Shortly before the Summit, the DPRK gave access to international

media to the Punggye-ri site to observe the purported destruction of nuclear test facilities. Chemical explosives were used to collapse several tunnel entrances and destroy some buildings. This action could indicate that the DPRK does not see a need to conduct further explosive nuclear tests; however the extent of destruction is not clear and not subject to independent verification by the CTBTO or the IAEA. It is possible that usable underground facilities remain and could be accessed by reopening tunnel entrances or creating new access tunnels. The commitment of the DPRK to work toward complete denuclearisation is welcome, however how this relates to international calls for a process that is complete, verifiable and irreversible remains unclear.

The OPCW continued to be challenged by on-going chemical weapons attacks in Syria in violation of the Chemical Weapons Convention (CWC) and United Nations Security Council Resolution 2118 (2013), as well as the poisonings of individuals in the UK in Salisbury and Amesbury with military-grade nerve agent "Novichok", resulting in one death. The UK incidents are the first use of nerve agents in Europe since the Second World War.

The OPCW's Fact-Finding Mission (FFM) continued to be deployed during the reporting period and confirmed that toxic chemicals were used as weapons on a number of occasions in Syria, including in Khan Shaykhun on 4 April 2017, an attack that reportedly killed around 74 people and injured about 500. The OPCW-UN Joint Investigative Mechanism's (JIM) 7th Report of 26 October 2017 concluded that the Syrian Arab Armed Forces were responsible for the use of the chemical warfare agent sarin in Khan Shaykhun. The attack was the deadliest use of chemical weapons in the Syrian civil war since the Ghouta sarin attack in 2013. Holding perpetrators accountable for chemical weapons use became more difficult when the JIM's mandate was not renewed in November 2017, and the UN Security Council failed to re-establish an attribution mechanism. A further chemical weapons attack, likely involving chlorine and widely contributed to the Syrian regime, occurred on 7 April 2018 in the Syrian city of Douma reportedly killing up to 70 people including women and children.

In January 2018, France established the International Partnership Against Impunity for the Use of Chemical Weapons, of which Australia is a founding member, to collect and preserve information to help hold publicly accountable those responsible for the proliferation or use of chemical weapons. At its May 2018 meeting, Partners supported calls for a Special Session of the Conference of the States Parties to the Chemical Weapons Convention, and to explore options for extending the role of the OPCW to potentially include attributing responsibility for use. On 27 June 2018, the 4th Special Session of the Conference of the States Parties to the CWC empowered the OPCW to attribute responsibility for the use of chemical weapons in Syria, and agreed to consider options for universal attribution of all uses of chemical weapons in the territory of any State Party.

Despite the challenges mentioned above the overwhelming majority of States are compliant with their NPT and CWC obligations and the critically important roles of the IAEA and OPCW continue to be demonstrated. In September 2017, the IAEA recognised 20 years of the operation of the Additional Protocol on Strengthened Safeguards. Although the CTBT has not entered into force, the International Monitoring System (IMS) continues to play a vital role in monitoring for nuclear tests, and 2018 saw the completion of establishment of all IMS stations in Australia. This shows that continued investment in non-proliferation regimes continues to enhance the regimes and bear fruit.

International Atomic Energy Agency Safeguards

ASNO assesses that the IAEA continues to effectively fulfil its objective of verifying that states uphold their respective non-proliferation commitments, using the tools available to the IAEA under safeguards agreements, and when in place, under Additional Protocols. The IAEA uses a combination of in-field inspections of nuclear material, facilities, and R&D activities; as well as its analysis of information in its headquarters in Vienna. The overarching framework the IAEA uses to prioritise and optimise verification activities is the use of State-level approaches. These are customised approaches to how the IAEA applies safeguards in each State, based on a standardised methodology using acquisition path analysis of technically plausible pathways nuclear material suitable for a weapons program could in principle be acquired.

The environment the IAEA operates in is one of steadily increasing quantities of nuclear material and facilities under safeguards, as well as an evolving risk profile for the international nuclear fuel cycle. The IAEA therefore needs to be adaptive and innovative to improve the efficiency and effectiveness of safeguards implementation over time to stay ahead of the curve. In this regard, a significant development in recent years has been the IAEA's innovation with methodology through State-level approaches. By the end of June 2018 the IAEA had completed State-level approaches for 131 States. For 53 States these were updates to their existing State-level approaches, and for 78 States, State-level approaches were developed for the first time. State-level approaches for the remaining States are under development. By the end of 2017 the IAEA had about one year of implementation experience of State-level approaches, from which it could undertake analysis of its experiences and lessons learnt, to report to Member States on progress.[1]

Innovation with technology and analytical tools also plays a very important role in equipping the IAEA to manage the evolving challenges in safeguards implementation. Australia is contributing to technology innovation through projects under the Australian Safeguards Support Programme (see Output 1.4). A highlight in the reporting period was the IAEA International Robotics Challenge, hosted by CSIRO's Data61 Innovation Network in Brisbane in November 2017.[2] The Challenge brought together twelve robotics teams from nine countries to test their devices in water-based and land-based scenarios simulating how nuclear fuel in dry storage and in fuel ponds is verified by IAEA inspectors. Using robotics has the potential to make repetitive inspection tasks more efficient, freeing up inspector time to put more efforts into scrutinising how facilities are being used (more details on how Australia is assisting the IAEA with technology and analytical innovation for safeguards is reported in Section 2 – Current Topics).

While innovation by the IAEA is necessary, it is also important not to lose sight of the responsibility of each Member State to ensure effective domestic systems are maintained for managing and reporting on safeguards obligations. The effort the IAEA expends in implementing safeguards depends in part on the timeliness and accuracy of inventory, facility and activity reports submitted by Member States, and most importantly, responsiveness in addressing issues. Given safeguards are fundamentally about maintaining international confidence of the compliance of States with non-proliferation commitments, there is an important role for States to assist each other in raising awareness and promoting better practice. The IAEA continues to work directly with individual States to address specific issues and conducts outreach and awareness-raising activities through workshops and meetings. Australia plays a role through participating in

1 The analysis was contained in the Director General's report to the Board of Governors issued on 31 July 2018: *Implementation of State-level Safeguards Approaches for States under Integrated Safeguards – Experience Gained and Lessons Learned* (GOV/2018/20).

2 https://www.csiro.au/en/News/News-releases/2017/International-Robotics-Challenge

The IAEA Robotics Challenge, Pullenvale, Brisbane.

reviews of safeguards approaches and training courses, such as through DG ASNO's chairing of the Standing Advisory Group on Safeguards Implementation (SAGSI), and through ASNO's membership of the Asia-Pacific Safeguards Network (APSN). More details on ASNO's work in these areas are in Output 1.4.

Domestic Developments

In 2017, the IAEA continued to report that it found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities in Australia. The IAEA has drawn this "broader conclusion" that all nuclear material remained in peaceful use activities for Australia every year since 2000.

During the reporting period, the IAEA conducted various verification activities (under different names but all essentially inspections) in Australia under the Comprehensive Safeguards Agreement and under the Additional Protocol. In total, twelve separate inspections, plus one technical visit were carried out at ANSTO, Monash University and a CSIRO site. The IAEA generally combines several inspections together, so these twelve inspections were all conducted over three separate visits to Australia. There were no issues of any significance identified by the IAEA in these inspections. Details of these inspections and the IAEA's findings (where available at the time of publication of this Annual Report) are in Output 1.1 and Appendix B.

Along with completing routine reports to the IAEA and overseeing IAEA inspections, ASNO also works to ensure that IAEA safeguards can be effectively implemented. One focus of this work is in relation to the ANSTO Nuclear Medicine (ANM) radio-pharmaceutical production plant. When operational the plant is designed to ensure security of supply of nuclear medicines to Australian patients and to supply a significant proportion (up to 25 per cent) of the world's requirements. Construction of this plant was completed in November, and in April 2018 DG ASNO endorsed ANSTO's safeguards and security commissioning report under a permit to possess nuclear material, allowing for the introduction of nuclear material[3] (see Output 1.1). There are technical challenges with verification of the uranium content in the solid waste stream end of the plant so the IAEA has developed a customised detector to do this measurement in a hot cell.

3 The CEO for the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) also issued an operating licence for the plant in April 2018.

In January 2018, the IAEA conducted a dimensional test of this detector in a hot cell at ANSTO, with a hot test anticipated for the end of 2018. Over time the uranium content in solid waste will accumulate significantly. It is important therefore that the IAEA is able to verify the uranium content so that Australia can demonstrate to the international community that all nuclear material is accounted for. Another focus of ASNO's work was contributing to the Department of Industry, Innovation and Science's National Radioactive Waste Management Facility project. ASNO is working with ANSTO to ensure that the engineering designs of the facility can meet requirements to facilitate IAEA verification of any nuclear material held, while seeking to minimise costs associated with verification.

Nuclear Security Developments

As part of its regular inspection program, ASNO conducted six security inspections including at ANSTO, CSIRO, Silex Systems Limited and UOC transporters. These are further described in Section 4 – Output 1.2. ASNO completed a review of safeguards and security requirements at Australian uranium mines. New five-year permits were issued after consultation with state/territory regulators and industry stakeholders.

Following on from the successful International Physical Protection Advisor Service (IPPAS) mission to ANSTO in November 2013, ASNO hosted a follow-up mission from 30 October to 10 November 2017. The mission reviewed the recommendations and suggestions made in the 2013 IPPAS mission and made new recommendations based on visits to ANSTO's OPAL reactor and new nuclear medicine facility as well as on cyber security arrangements. A full report of the mission can be found in Section 2 – Current Topics.

Through the post-summit Nuclear Security Contact Group and the annual CPPNM Points-of-Contact meeting, ASNO engaged with CPPNM States Parties to prepare for a successful review conference to take place in 2021. Australia also took up the chair of the Nuclear Security Guidance Committee for its third three-year term.

A summary of international nuclear security development can be found in the IAEA's 2018 nuclear security report, released during its annual general conference.

Bilateral Safeguards Developments

During 2017–18, all Australian Obligated Nuclear Material (AONM) was accounted for in accordance with the procedures and standards prescribed under relevant bilateral Nuclear Cooperation Agreements (NCAs).

Over the past decade, Australia has successfully negotiated bilateral NCAs with a range of countries including China, Russia, United Arab Emirates, India and Ukraine. Australia's network of 25 NCAs covers 43 countries. These countries operate about 98 per cent of the world's nuclear power generation capacity.

ASNO and its Ukrainian counterparts are close to finalising the Administrative Arrangement (AA) and Facilities List pursuant to the Australia-Ukraine NCA, which entered into force in June 2017. The finalisation of the AA is required before commercial transfers of AONM to Ukraine can commence under the Australia-Ukraine NCA.

To ensure continued peaceful nuclear cooperation with the UK after its planned withdrawal from the EU and Euratom in March 2019, ASNO and its UK counterparts have finalised the text of an updated Australia-UK NCA. The updated NCA will allow future AONM exports to the UK for enrichment and use after Brexit and will continue to require Australian uranium to be used exclusively for peaceful purposes, be subject to IAEA safeguards, and be protected by internationally agreed standards of physical protection.

Chemical Weapons Convention Developments

Domestic Developments

During the reporting period ASNO submitted comprehensive and timely annual declarations in accordance with the requirements of the Chemical Weapons Convention (CWC) to the Organisation for the Prohibition of Chemical Weapons (OPCW). These included reports of Australia's CWC-related chemical trade and other relevant chemical activities within industry and Defence laboratories, as well as Australia's national programs for assistance and protection against chemical weapons.

ASNO facilitated routine OPCW inspections at Australia's only declared Schedule 1 Facility for protective purposes and at two 'Other Chemical Production Facilities' in NSW and Victoria bringing the total number of inspections in Australia to 56 since entry-into-force of the CWC in 1997. All inspection reports have confirmed Australia's declared information, including the absence of any undeclared CWC-Schedule 1 chemicals and/or their production.

ASNO continued to inform Australia's policy positions through provision of technical advice on CWC and verification-related issues.

International Developments

According to the OPCW there are now 193 States Parties to the CWC covering 98 per cent of the global population. This leaves only four countries that have yet to join – DPRK, Egypt, Israel (signed but not ratified) and South Sudan. South Sudan announced its intention to join the CWC at the 22nd Conference of the States Parties (CSP22) in 2017, which will bring the CWC one step closer to universality. That said, there remains 70 States Parties yet to enact comprehensive implementing legislation which is needed in order to reduce the threat of the use of chemical weapons by non-State actors, including terrorists.

Since entry into force of the CWC, the OPCW inspectorate has conducted 6,861 routine inspections at 3,180 chemical weapon-related and 3,681 industrial sites in about 80 States Parties. Aside from routine verification work, OPCW resources were stretched by a rise in non-routine and fact-finding missions to investigate allegations of chemical weapons use.

The OPCW continued its efforts to clarify outstanding issues relating to Syria's initial declaration of its chemical weapons programme. Concerns remain, given on-going use of chemical weapons in Syria, including the sarin nerve agent attack in the Syrian city of Khan Shaykhun (4 April 2017) for which the OPCW-United Nations Joint Investigative Mechanism (JIM), in its seventh report (S/2017/904), held the Syrian Arab Republic responsible. The report also held "ISIL" responsible for the use of sulphur mustard in attacks at Umm Hawsh on 15 and 16 September 2016. The mandate of the JIM was not renewed by the UN Security Council beyond 17 November 2017 (see Section 2 – Current Topics).

Despite the OPCW's Declaration Assessment Team having conducted 19 rounds of consultations to resolve gaps, inconsistencies and discrepancies in Syria's declarations, the information made available so far has not been sufficient for the OPCW Technical Secretariat to confirm that Syria submitted an accurate and complete declaration. However, by the end of July 2018, the OPCW had verified the destruction of the remaining two (out of 27 declared) chemical weapons production facilities in Syria.

The OPCW's Fact-Finding Mission (FFM) issued a number of reports in the last year addressing allegations of chemical weapons use in Syria. An interim report released just outside the reporting period on 6 July 2018 identified that chlorinated organic chemicals had been found at two sites in Douma (from an attack on 7 April 2018), but the FFM is continuing to work to draw final conclusions. Other reports identified chlorine use in the town of Sarraqib on 4 February 2018, and both chlorine and sarin

use in the town of Ltamenah in March 2017. The FFM also reported on alleged incidents in Al-Hamadaniya and Karm al-Tarrab, but could not confirm whether a specific chemical was used as a weapon.

At the United Kingdom's request, the OPCW conducted a Technical Assistance Visit, confirming the UK's findings relating to the identity of the toxic chemical that was used in Salisbury and severely injured Sergei Skripal, Yulia Skripal and a police officer on 4 March 2018. The same type of deadly nerve agent, subsequently lead to the death of a British citizen through exposure on 30 June 2018.

The Scientific Advisory Board's (SAB) Temporary Working Group (TWG) on Investigative Science and Technology held its first meeting from 12-14 February 2018 (SAB-27/WP.1), chaired by Australian expert Dr Veronica Borrett. The TWG's work is increasingly important as it conducts an in-depth review of methods and technologies that could be used by OPCW inspectors for investigative work on alleged use of chemical weapons under Articles IX and X of the CWC. ASNO's voluntary contribution of $20,000 to the OPCW's Trust Fund will help this work continue, as it is solely reliant on extra budgetary funding.

Given the need for the OPCW to keep pace with current threats and advances in science and technology, the Director General Ahmet Üzümcü strongly advocated for the need to upgrade the existing OPCW laboratory into a Centre for Chemistry and Technology. This will augment in-house analytical capabilities and will contribute to the development and maintenance of capabilities in States Parties through the network of designated laboratories and in-house training opportunities.

Dr Veronica Borrett (pictured on the far right) briefing the 27th Session of the OPCW's Scientific Advisory Board (19-23 March 2018) on the outcomes of the first meeting of the Temporary Working Group on Investigative Science and Technology.

HE Brett Mason, Australia's Permanent Representative to the OPCW in The Hague, delivering opening remarks at the joint Australia/Swiss side event entitled "Central Nervous System-Acting Chemicals: A future priority" held on 28 November 2017 in the margins of the 22nd Conference of the States Parties to the CWC.

In preparation for the 4th Review Conference (4th Revcon) in November 2018, ASNO led Australia's joint contributions with Canada and New Zealand to the Open-Ended Working Group Thematic Discussions reviewing the implementation of the CWC which took place over the first half of 2018. Efforts by Australia and Switzerland continued through the reporting year to raise awareness among delegations, including at the Open-Ended Working Group on Future Priorities of the OPCW, about the dangers of the use of Central Nervous System-Acting Chemicals (CNSACs), such as fentanyl and analogues, in aerosolised form for law enforcement purposes. Such advocacy continues to gather momentum and support for the commencement of discussions within the OPCW, if possible, through a recommendation by the 4th Revcon.

In the margins of CSP22 (held 27 November – 1 December 2017), Australia and Switzerland co-hosted their third successful joint side-event on CNSACs with the purpose of impressing on the audience a need for them to join the growing number of voices calling for open, inclusive discussions on this important subject. The Chair of the SAB presented its work on CNSACs over the past 15 years to about 100 delegates from States Parties, non-government organisations and the OPCW Technical Secretariat. The US Drug Enforcement Administration's presentation explained the rise in illicit use of fentanyls, which continues to pose a health risk to first responders being exposed.

The OPCW continued its contribution to global counter-terrorism efforts, including through its Open-Ended Workshop Group on Terrorism and it sub-working group on non-State actors, with active support by Australia for the OPCW draft decision (S/1652/2018) on the legal accountability by non-State actors. This work was augmented by the OPCW's Conference on Countering Chemical Terrorism which was convened from 7 – 8 June 2018 in The Hague, in which a range of Federal and State agencies participated from Australia.

The Conference was attended by over 250 participants representing 67 States Parties including relevant international organisations (e.g.Europol), non-government organisations and academia to discuss, inter alia, countering the threat of chemical terrorism, prevention, response, legal accountability and the sharing of national experiences.

The past twelve months has seen significant milestones achieved in the area of chemical demilitarisation: with Russia and Libya having completed destruction of their remaining declared stockpiles of chemical weapons by 27 September and 23 November 2017, respectively. Consequently 96 per cent of the world's declared stockpile of 72,304 mT of chemical agent have now been destroyed. These achievements were made possible due to independent verification by the OPCW and the financial and technical support of many donor countries. In the case of Libya, following international approval, the last remaining chemical weapons precursors (500 mT of Category 2 agent) were removed from Libya and destroyed at the GEKA mbH facility in Munster, Germany.

By the end of 2017, Iraq had completed destruction of its chemical weapons remnants stored in two bunkers at the Al Muthana site. In February 2018, the OPCW confirmed that four former chemical weapons production facilities (CWPFs) in Iraq were completely destroyed with only one former CWPF remaining that has been approved by States Parties for conversion for peaceful purposes.

Progress on the US chemical weapons destruction program continues and is on track to be completed in advance of the United States' planned completion date of September 2023.

Australia remained actively engaged at the OPCW during 2017–18, including as a member of the OPCW's Executive Council (to May 2018). This year also marked the final year of Ahmet Üzümcü's second term as Director-General of the OPCW since taking up this appointment on 25 July 2010.

Australia's former Foreign Minister, Julie Bishop, stressing the importance of the International Monitoring Stations at the 2017 Conference on Facilitating the Entry into Force of the CTBT at the United Nations Headquarters, New York. Photo by The Official CTBTO Photostream.

Comprehensive Nuclear-Test-Ban Treaty

Although the entry into force of Comprehensive Nuclear-Test-Ban Treaty (CTBT) remains elusive, the normative value of the treaty is significant. Only the DPRK has conducted nuclear test explosions in the 21st century, and the international community has condemned each test. The provisional operation of the CTBT's International Monitoring System (IMS) has been critical for providing states with prompt and scientifically sound information about each of the nuclear tests.

The support of the great majority of states for the aims of the CTBT remains strong. Most continue to provide active support to development of all aspects of the verification regime, including the provisional operation of the IMS. Around 90 per cent of IMS facilities have been established. With the completion during this year of works to install an infrasound monitoring station at Davis station in Australian Antarctic Territory, all of Australia's 21 IMS facilities are in place. Testing of the final station is underway to enable its full incorporation into the IMS network.

ASNO continues to provide support for outreach to promote the CTBT as well as support for development of the verification regime. Details are set out in Section 4 — Output 1.6.

The Australian Government's decision in October 2016 to upgrade Australia's sub-Antarctic research station at Macquarie Island will require relocation of a number of buildings away from locations that are increasingly at risk from ocean inundation. This includes buildings supporting the CTBT radionuclide monitoring station on the island. Together with ARPANSA, which operates the radionuclide station, ASNO is participating in discussions with the Australian Antarctic Division on the design of new facilities so that Australia continues to fulfil its CTBT commitments.

Other Non-Proliferation and Disarmament Activities

International Partnership for Nuclear Disarmament Verification (IPNDV)

Practical steps toward nuclear disarmament will need to be underpinned by effective verification. The International Partnership for Nuclear Disarmament Verification (IPNDV) brings together both nuclear and non-nuclear weapon states under a cooperative framework to further understand and find solutions to the complex challenges involved in the verification of nuclear disarmament.

During the year, IPNDV completed its first two-year phase of work focusing on how to verify nuclear weapon dismantlement. The results of the work are available online at www.ipndv.org. A second two-year work phase is now underway, with a wider focus on the sorts of measures needed to verify future reductions in nuclear weapons holdings.

IPNDV engages a wide range of states in its work, including three of the five NPT Nuclear Weapons States, as well as states that support measures such as the nuclear weapons ban treaty.

Fissile Material Cut-Off Treaty (FMCT)

A verifiable ban on production of fissile material for use in nuclear weapons is widely seen as one of the practical steps that could be taken toward nuclear disarmament. However, impasse in the Conference on Disarmament (CD) has prevented negotiations on a fissile material cut-off treaty (FMCT). Australia has actively supported a number of initiatives to advance international discussions on the shape of an FMCT, both to promote the commencement of negotiations, and to develop proposals that could assist negotiators.

The 71st session of the UN General Assembly agreed to form a High Level Expert Preparatory Group (EPG) to consider and make recommendations on substantial elements of a future FMCT. The EPG met for two two-week sessions during 2017–18 and has now finalised its report. DG ASNO Robert Floyd supported by ASNO and DFAT input, represented Australia on the EPG. The EPG has produced a report outlining possible treaty elements as options for future negotiators. It is a practical toolbox and good groundwork for when negotiations may start.

UN-mandated processes such as the 2014 – 15 FMCT Group of Governmental Experts and the 2017–18 EPG have helped to maintain active international engagement on developing an FMCT, notwithstanding the failure of the CD to agree to negotiations on a treaty. These processes have also demonstrated the benefits of cooperative initiatives between Nuclear Weapons' States and Non-Nuclear Weapons' States in building trust, and finding practical, realistic ways forward with the disarmament agenda.

The Year Ahead

At the time of writing, negotiations between the United States and the DPRK have not yet brought shape to potential denuclearisation commitments, and thus of the verification measures that would apply. ASNO is examining elements of a potential Australian contribution to support the verification of DPRK denuclearisation, should progress in US-DPRK negotiations warrant it.

Testing to certify that IMS infrasound station at Davis station in Antarctica meets CTBT requirements is underway. The station should come fully into operation during 2018, and will mark the completion of all IMS facilities that Australia hosts.

In 2013-14, the CTBTO conducted several exercises to test aspects of the On-Site Inspection (OSI) element of the CTBT's verification regime. Based on the lessons learned from those exercises, the CTBTO has since refined its plans, equipment and procedures for conducting an OSI and will subject these to further testing in a further series of exercises in 2019 – 20. ASNO's Malcolm Coxhead is contributing to a group of experts developing viable and technically sound scenarios against which the CTBTO's capability will be tested.

A ban on the production of fissile material for nuclear weapons is integral to progress on nuclear disarmament. Now that 2017–18 EPG has completed its work, focus will return to how to advance discussions in the CD, taking account of the very useful work of the EPG.

IPNDV will continue its second two-year work phase, elaborating concepts, procedures and technologies for verified nuclear disarmament. During this phase, the partnership's focus is on verifying declarations that states could make of their nuclear weapons and of steps to dismantle them. DG ASNO continues to co-chair one of IPNDV's three working groups: that addressing procedures for removal of

warheads from delivery systems and their dismantlement, leading to placement of the removed nuclear material under safeguards, or to its irreversible disposal.

ASNO will continue to provide technical advice and support in the development of Australian Government policy positions, including in the lead-up to the CWC 4th Revcon.

A particular focus will be supporting the incoming OPCW Director-General Ambassador Arias and the OPCW in developing arrangements for the OPCW to identify the perpetrators of the confirmed use of chemical weapons in any States Party. Another key priority is to continue efforts to firm up support for the inclusion of language in the 4th Revcon Report on the commencement of discussions within the OPCW on the dangers of Central Nervous System-Acting Chemicals for law enforcement purposes.

On the international safeguards front, ASNO will continue to actively promote the work of the Asia-Pacific Safeguards Network (APSN) and assist with training and development in the region to build capacity for safeguards implementation. ASNO will collaborate with CSIRO, universities and others on various innovation and analytical technical safeguards challenges including through the 2018 IAEA Safeguards Symposium in Vienna.

Regarding nuclear security, ASNO will pursue an action plan to address the recommendations and suggestions made in the follow-up IPPAS mission; will work with US authorities on the operation of the SILEX agreement after Silex Systems Limited's withdrawal from acquiring General-Electric-Hitachi's share of Global Laser Enrichment. ASNO will also continue its international nuclear security engagement through the Nuclear Security Contact Group and the Nuclear Security Guidance Committee.

The United Kingdom (UK) will withdraw from the EU and Euratom in March 2019. Upon its withdrawal, the UK will likely enter into a post-Brexit transition period up to December 2020 (whereby the UK will remain a party to its current Euratom obligations). However, ASNO's Bilateral Safeguards Section is working to ensure that an updated Australia-UK Nuclear Cooperation Agreement is ready to enter into force prior to March 2019, in the event that the proposed transition period does not occur. This will guarantee there is no impact on Australian uranium continuing to be processed and used in the UK after Brexit.

The Administrative Arrangement under Australia's Nuclear Cooperation Agreement with Ukraine is close to finalisation. It is anticipated the Administrative Arrangement will be signed in the coming months, which will enable future uranium sales to support the Ukrainian nuclear power industry.

Managing Australia's network of bilateral nuclear cooperation agreements is central to the work of the Bilateral Safeguards Section, including through the detailed scrutiny of the transfer and use of AONM around the world.

A focus of ASNO's nuclear regulatory areas over the year ahead will be supporting the development of the next modules of the new nuclear database, NUMBAT along with its associated permit holder online portal as well as the redevelopment of ASNO's chemical database and online portal in a new platform. Each will be done to improve the end-user stakeholder experience and the efficiency of ASNO's regulatory functions.

ASNO will continue to work with the IAEA and ANSTO on the deployment of a customised detector to measure the nuclear material in the waste stream from the ANSTO Nuclear Medicine (ANM) molybdenum–99 production plant. Safety reviews are required prior to use with the hot test of the detector currently scheduled for the second half of 2018.

Another domestic focus will see ASNO continue to provide regulatory advice to the Department of Industry, Innovation and Science's National Radioactive Waste Management Facility project. ASNO is working with ANSTO to ensure that the engineering designs of the facility can meet requirements to facilitate IAEA verification of any nuclear material held, while seeking to minimise the operation impact associated with verification.

SECTION 2
Current Topics

Countering Impunity for the Use of Chemical Weapons

In the aftermath of the First World War, the use of chemical weapons was banned by the international community, firstly by the 1925 Geneva Protocol and subsequently by the 1993 Chemical Weapons Convention (CWC), which also prohibited their possession, transfer, acquisition and development. There are now 193 CWC States Parties, with only four countries yet to ratify or accede to the CWC (DPRK, Egypt, Israel and South Sudan). The Organisation for the Prohibition of Chemical Weapons (OPCW) in The Hague is the global watchdog, responsible for oversight of the implementation of the CWC.

Since 2012 there has been an alarming resurgence in the use of chemical weapons, primarily in the Syrian civil war. The international community has been at great pains to put an end to this troubling development. There have also been chemical weapons attacks in Iraq as well as nerve agent poisonings in the Kuala Lumpur international airport terminal involving VX (13 February 2017) and in the United Kingdom using "Novichok" in Salisbury and Amesbury, on 4 March and 30 June 2018, respectively. Using toxic chemicals as weapons violates international law, runs contrary to established global non-proliferation arrangements and challenges the rules-based international order.

Police and members of the armed forces assist in the investigation of nerve agent poisonings in Salisbury March 2018.

Launch of the International Partnership against Impunity for the Use of Chemical Weapons, Paris, 23 January 2018. Photo courtesy of French Ministry of Europe and Foreign Affairs.

The contribution of the OPCW in responding to these incidents has demonstrated the breadth of its technical capabilities and underlined the importance of the OPCW maintaining and developing its expertise. Since its establishment in April 2014, the OPCW's Fact-Finding Mission (FFM) in Syria has produced at least 13 reports (and several interim reports) confirming that sarin, sulphur mustard and chlorine, have been used as weapons. The FFM's mandate is strictly limited to gathering facts and does not extend to attribution of responsibility for identified uses of chemical weapons.

The OPCW-United Nations Joint Investigative Mechanism (JIM) established under United Nations Security Council (UNSC) Resolution 2235 (2015) was mandated to identify, to the greatest extent feasible, those involved in the use of chemicals as weapons in Syria, where the FFM had determined that a specific incident involved, or likely involved, the use of chemicals as weapons.

The JIM's seventh (and final) report, released on 26 October 2017 (S/2017/904), attributed responsibility to the Syrian Arab Republic for a sarin attack in Khan Shaykhun on 4 April 2017. Previous JIM reports concluded that the Syrian regime's military was also responsible for toxic chemical attacks in Talmenes, on 21 April 2014; Qmenas, on 16 March 2015; and Sarmin, on 16 March 2015. Although its work was not complete, the JIM's mandate was not renewed by the UNSC beyond 17 November 2017.

Outside the OPCW and UN, other collective efforts are underway to ensure accountability for chemical weapons use. Australia became a founding member of the French-led International Partnership against Impunity for the Use of Chemical Weapons and participated in its launch in Paris on 23 January 2018 and its first meeting on 17-18 May 2018. The initiative, alongside existing organisations and mechanisms, advocates for accountability and coordinates practical efforts to combat impunity, including through sanctions.

Thirty-four countries have now joined the partnership and associated themselves with the Declaration of Principles which include: strong support for the CWC and the OPCW, and reaffirming the importance of UNSC Resolutions 2314 (2016), 2235 and 2209 (2015), 2118 (2013), and 1540 (2004); UN General Assembly (UNGA) Resolution A/72/43 (2017); as well as the Human Rights Council Resolution S–17/1 (2011).

The UN is also addressing the issue of improving accountability for the use of chemical weapons through the International, Impartial and Independent Mechanism on Syria (established in December 2016 by UNGA Resolution 71/248). The Mechanism collects and analyses information and evidence of potential international crimes committed in Syria to assist criminal proceedings in national, regional or international courts or tribunals that have, or may in the future have, jurisdiction over these crimes.

On 7 April 2018, just over a year after the Khan Shaykhun nerve agent attack conducted by the Syrian Arab Armed Forces, they are thought to have been responsible for another chemical weapon attack in Douma, Syria, during an offensive against opposition forces. However the FFM has not yet released its final report on this incident.

On 4 March 2018, three people in Salisbury, United Kingdom, were poisoned by exposure to a nerve agent, popularly known as "Novichok". The OPCW responded to the United Kingdom's request for assistance by undertaking a Technical Assistance Visit (TAV) which confirmed the UK findings relating to the identity of the toxic chemical that was used.

On 30 June, the same type of nerve agent was identified as being the cause of the sudden illness of two UK citizens in Amesbury, United Kingdom, with deadly effect for one victim. An OPCW TAV responded to the United Kingdom's further request for assistance.

The poisonings in the United Kingdom, and the continued use of chemical weapons in Syria, prompted the convening of three extraordinary sessions of the OPCW Executive Council on 4, 16 and 18 April 2018. These meetings allowed States Parties the opportunity to express concern, to show solidarity in upholding the integrity and credibility of the CWC and the OPCW, and to call for the establishment of a mechanism to attribute responsibility for the use of chemical weapons. Australia, and others, expressed full confidence in the impartiality and competence of the OPCW Technical Secretariat.

These efforts culminated in the convening of a Special Session of the Conference of the States Parties to the CWC in The Hague on 26-27 June 2018, where a clear majority adopted a decision which gives the OPCW an attribution role in Syria and agrees to consider options for a universal attribution mechanism in November 2018.

This year, the OPCW also continued its efforts on accountability for the use of chemical weapons by non-State actors. The JIM, prior to its mandate expiry, found that the so-called Islamic State in Iraq and the Levant (ISIL/Da'esh) was responsible for chemical weapons attacks in Marea (S/2016/738, 3rd Report) and Umm Hawsh (S/2017/904, 7th Report) in Syria. Australia joined other members of the OPCW Executive Council in unanimously adopting the decision entitled "Addressing the Threat Posed by the Use of Chemical Weapons by Non-State Actors" (EC-86/DEC.9 dated 13 October 2017). The Decision urges States Parties to enact comprehensive penal legislation for activities that are prohibited under the CWC, including prohibiting non-State actors from using, developing, encouraging or inducing in any way anyone to engage in these activities, and provides useful guidance for future initiatives. This OPCW decision is complementary to and reinforces the requirements under UNSCR 1540 (2004).

Effective Verification and International Security

The Russian proverb "trust, but verify", made well-known by US President Ronald Reagan to highlight the value of extensive verification under US-Soviet treaties, applies in the design of almost all non-proliferation and arms-control treaties over the last seventy years. The specific commitments made by states under those treaties are of course what matters, but without effective measures to verify them, the value of the commitments is diminished.

Approaches to treaty verification have evolved, and must continue to evolve, not just to enhance their efficiency or to serve the requirements of new treaties, but also to address new practical and political developments. The second decade of the twenty-first century has seen a new set of challenges requiring verification to evolve. Arms-control verification both supports and relies on a global rules-based order that has come under increased pressure on various fronts. But there are opportunities too.

Developments over seventy years

Modern concepts around verification for arms control and non-proliferation emerged in the 1950s, initially with bilateral controls on the supply of nuclear equipment, followed by early work on safeguards by the International Atomic Energy Agency's (IAEA) and the European Atomic Energy Community to ensure that nuclear material and equipment supplied internationally under commercial deals would not be diverted from civil use. The advent of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in the late 1960's enlarged the IAEA's task considerably. New safeguards were developed to apply to all of the nuclear activities in NPT Non-Nuclear Weapon States to ensure there was no diversion or misuse of nuclear material of facilities for weapons, an approach referred to as comprehensive safeguards. By the 1990s it was evident that the IAEA safeguards system would need to adapt further to effectively support the NPT (in light of Iraq's attempt to develop nuclear weapons in a clandestine fashion in a covert nuclear weapon program). The resulting Additional Protocol on IAEA safeguards now has wide adherence. The evolution to a State-level approach for application of safeguards by the IAEA is also enabling more focused and cost-effective verification of NPT commitments.

In the 1980s and 90s, concepts and models emerged to verify new multilateral treaties. The widespread and legitimate use of many chemical weapon precursors in the vast global chemical industry has meant that much of the verification regime of the 1993 Chemical Weapons Convention (CWC) must focus on verifying that the nature of activities at declared chemical facilities is consistent with states' obligations – rather than trying to track chemicals in the same way as IAEA safeguards track nuclear material. The CWC also needed to verify the destruction of the large stockpiles of chemical weapons held by a number of states.

The central element of verification for the Comprehensive Nuclear-Test-Ban Treaty (CTBT) is different again and relies on remote monitoring for physical indicators of a nuclear explosion. Scientific study of techniques for this kind of verification went on throughout the cold war, and the sophistication and capability of International Monitoring System (IMS) for the CTBT has exceeded expectations. Unlike the other mentioned treaties, the IMS puts authenticated data from scientific instruments directly in the hands of states. The IMS functions now notwithstanding the treaty has yet to enter into force.

Bilateral and regional arms control arrangements have also been developed with their own approaches to verification. The US-Russia New Start Treaty focuses on the monitoring of deployed nuclear weapons systems. Access under on-site inspections is very specific and formalised, but is augmented by information and detailed analysis obtained using national technical means (e.g. satellite observations).

Future challenges and opportunities

By gathering evidence of the use of chemical weapons in Syria, verification applied by the Organisation for the Prohibition of Chemical Weapons (OPCW), and through mechanisms mandated by UN Security-Council, has demonstrated significant added value in circumstances where the global norm against use has been violated repeatedly. However, the subsequent response of the international community has been blunted by arguments over attribution of responsibility for use of the weapons. Central to this problem is the question of how to ensure that non-compliance with the terms of an agreement is both recognised and responded to in a way that will deter future non-compliance. If commitments under the CWC are to be enforceable, its verification needs to evolve to address these issues. At the time of writing, Member States have agreed on an approach for the case of Syria, but a new mechanism would need to be approved for use in other cases.

The basic obligations of the CWC can apply to the misuse of any toxic chemical. However, the use of Novichok agent has raised the question of whether the schedules of chemicals on which CWC verification is based should be adapted and evolve.

Political developments in 2018 has opened the possibility that North Korea could commit to concrete denuclearisation measures, as well as the removal of chemical and biological weapons programs, for which verification would be essential. At the time of writing, there is not yet clarity around how negotiations between the United States and North Korea may proceed. If North Korea agreed to fully disarm itself of nuclear weapons, a very significant new verification effort would be required. While this can, and should, incorporate measures based on IAEA safeguards to deal with fissile material and its production, a broader framework must also address the dismantlement on nuclear weapons and delivery systems, as well as North Korea's nuclear testing program. A verification framework that pulls these many elements together would be unprecedented. The international community does have experience in verifying the dismantlement of past weapons programs such as in South Africa in the early 1990s, but North Korea would be a much larger scale of complexity.

Among the multilateral treaties described above, only the CWC has sought to verify global disarmament for a category of Weapons of Mass Destruction. Although progress toward multilateral nuclear disarmament remains very slow, this is a central commitment of the NPT and verification measures need to be developed to support future agreements in this area. The International Partnership for Nuclear Disarmament Verification (IPNDV), with experts from around 25 countries (including the US, UK and France), began work in 2015 on procedures and tools that could enable nuclear weapon possessor states to verifiably reduce their arsenals as part of a future disarmament regime, while confident that others are doing the same.

A verifiable ban on the production of fissile material for use in nuclear weapons would have to be part of any comprehensive nuclear disarmament framework. The reports of UN-mandated expert groups that met in 2014-15 and 2017–18 have outlined significant elements of a future Fissile Material Cut-Off Treaty, including how it could be verified.

Conclusion

Refining technical tools for verification, whether under IAEA safeguards or any other of the verification regimes noted above, is an ongoing requirement for ensuring effectiveness and cost efficiency. However, the broader concepts for verification of various treaty instruments must continue to evolve. Changes and challenges in the international security environment are a key driver for verification to adjust to shifts in the international security environment. Thinking about verification also needs to look to potential future changes, and can sometimes help lead them by showing how objectives

such as nuclear disarmament could be advanced with confidence among states.

Innovation in Safeguards Research and Development

IAEA safeguards are fundamental to maintaining international confidence that States are complying with their non-proliferation commitments, and as such make an important contribution to international security. The continuing effectiveness of safeguards is achieved by the combined effort of the IAEA and Member States to keep pace with challenges in verification, as well as opportunities from emerging technologies and analytical techniques. This ensures that the IAEA is able to deliver credible conclusions on compliance with non-proliferation commitments as the nuclear fuel cycle evolves and as quantities of nuclear material under safeguards continue to increase.

In recent years, safeguards have benefited from conceptual innovations, like the State-level concept (see ASNO Annual Report 2013-14, page 64), and technical innovations, like new field instruments and analytical techniques. However, the IAEA has limited capacity and facilities for research and development on new safeguards tools and techniques. Instead, the IAEA relies heavily on 21 Member State Support Programmes, which have been set up by States to assist the IAEA in safeguards research and development. While most of the development work is done by Support Programmes, the IAEA also maintains a small in-house "Technology Foresight Team," with the job of tapping into cutting-edge tools and techniques for safeguards in a cost-effective way by bringing together IAEA inspection and analysis needs with work by R&D leaders.

Amongst the 21 Support Programmes, the Australian Safeguards Support Programme (ASSP) is one of the oldest, having been in place since 1980. The ASSP draws on several Australian research institutes, universities and other agencies to assist the IAEA's efforts in testing new ideas in the pursuit of a more effective and efficient safeguards system.

The traditional model for developing safeguards technology involved the IAEA defining safeguards needs and then seeking a research institution to develop a tailored solution. The drawback of this approach is that safeguards tend to be a small niche market with limited economies of scale – there are limited commercial incentives for potential providers to develop new technologies. The IAEA is now moving beyond the traditional model to make greater use of its Technology Foresight Team, in cooperation with Member States, to conduct broad searches for new technologies developed outside the traditional safeguards community that could be applied to safeguards.

There are several examples where Australia is contributing to this new way of doing innovation for IAEA safeguards. ASNO has recently brokered a partnership between the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the IAEA to develop and test new safeguards technologies.

In November 2013, ASNO invited CSIRO to participate in the IAEA Workshop "Scanning the Horizon: Novel Techniques and Methods for Safeguards" in Vienna. During the workshop, the IAEA was particularly interested in CSIRO's recent invention of the Zebedee hand-held 3D laser mapping device. CSIRO originally designed the Zebedee for a variety of non-safeguards applications, such as mapping heritage sites and crime scenes, but during the workshop it became clear that the Zebedee could be of direct benefit to safeguards inspections.

After a period of field testing, IAEA inspectors began using the Zebedee in safeguards inspections in 2016, just a few years after the device was invented. The Zebedee has proven to be particularly useful for verifying the design of nuclear facilities and calculating volumes of large objects or stockpiles of material.

The IAEA is also pursuing a new strategy of using crowdsourcing challenges to get the broader scientific community involved in highly specialised technology development for safeguards. In November 2017, CSIRO hosted the IAEA's Robotics Challenge with the aim of automating repetitive measurement tasks currently performed by IAEA inspectors on items of nuclear material. This could free up inspectors to focus on other aspects of the safeguards mission, such as critically analysing how facilities are being used.

Teams of robotics experts from all over the world designed robots for the challenge. The IAEA defined the inspection tasks for the robots by breaking them up into a series of contextual usage scenarios, making the challenge accessible to robotics experts without prior knowledge of safeguards. In total, 27 teams from 18 Member States submitted technical proposals.

Teams with satisfactory proposals (twelve teams from nine Member States) brought their robots to the site of CSIRO's Data61 innovation Network in Pullenvale, Brisbane. A large shed was set up as a simulated

Robots competing in the IAEA Robotics Challenge at CSIRO in Brisbane in November 2017: **(a)** unmanned surface vehicles for verifying spent fuel in ponds by recording images of radiation glow patterns and **(b)** unmanned ground vehicles for verifying other nuclear materials by identifying items of a specific geometry, recording ID tags, performing 3D scans, and carrying IAEA instrument payloads.

nuclear facility (i.e. no nuclear or radioactive material was used) allowing the IAEA to test the robots.

The Robotics Challenge demonstrated that robots can enhance the efficiency of otherwise labour-intensive inspection tasks. The IAEA has now selected some of the robots for proof-of-concept testing in real nuclear facilities. Further reporting on the Robotics Challenge can be found in Section 4 – Output 1.4.

The approach of scanning the horizon for new technology developments has potential to generate more safeguards technologies in the near future. For example, CSIRO is working on robots for inspecting drums of radioactive material stacked in sheds and bunkers. Although initially focussed on safety of storage and disposal, these robots may also have safeguards applications, including building maps of facilities storing nuclear material, locating nuclear material stored with other hazardous substances, characterising that nuclear material, and verifying seals in otherwise inaccessible locations.

The IAEA has also expressed an interest in the potential safeguards applications of blockchain (shared ledger) technology used by cryptocurrencies like Bitcoin. The technology is designed to ensure the consistency and immutability of electronic data held among multiple parties, which may prove useful for reporting nuclear material inventories and transactions among nuclear operators, state regulatory authorities, and the IAEA. In 2018, researchers at the School of Electrical Engineering and Telecommunications at the University of New South Wales are taking up the task of evaluating the potential utility of blockchain technology for nuclear material accounting.

Innovation is paramount if the IAEA is to continue to deliver credible safeguards conclusions. Through the ASSP, ASNO is assisting the IAEA to build partnerships with Australia's scientific community, which will generate more ideas for fulfilling the Agency's safeguards R&D needs.

Australia's IPPAS Follow-up Mission

Australia hosted a International Physical Protection Advisory Service (IPPAS) follow-up mission on 30 October to 10 November 2017 having committed to do so during the 2016 Washington Nuclear Security Summit. The IAEA established IPPAS missions in 1995 to assist States in strengthening their national nuclear security regime. IPPAS missions comprise a team of international experts who assess a State's system of physical protection (nuclear security), compare it with international best practices and make recommendations for improvements. As of 30 June 2018, the IAEA had conducted 84 IPPAS missions globally.

Australia conducted its first IPPAS mission in 2013 which was reported in ASNOs 2013-14 Annual Report. The 2017 follow-up mission (being the IAEA's 80th) comprised seven international experts of diverse experience and backgrounds from the IAEA, Canada, Germany, Slovenia, Philippines, Serbia, and the USA. The mission was held over two weeks at the Australian Nuclear Science and Technology Organisation (ANSTO). In addition to addressing the recommendations and suggestions made in the 2013 mission report, the 2017 mission visited the ANSTO's new Nuclear Medicine facility and also revisited the OPAL Reactor and primary nuclear material store. Cyber security was also reviewed.

Aside from the three core agencies hosting the inspection, ASNO, ANSTO and the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), other key Australian agencies that attended the mission were the Australian Federal Police and the Australian Signals Directorate.

IPPAS Mission team at the OPAL reactor with staff from ANSTO and ASNO.

IPPAS Mission Results

The IPPAS team was satisfied that all the nine recommendations made in the 2013 report had been addressed and reported them as closed. Of the twenty-four suggestions, fourteen were similarly closed while seven were not fully addressed. The final report also included four new recommendations, fifteen new suggestions and identified five good practices. Overall, the IPPAS team concluded that Australia has a mature and well-established nuclear security regime, which has been enhanced significantly in the recent decade and further on the basis of the 2013 IPPAS mission report.

A redacted version of the report (to exclude security sensitive information) is available on ASNO's website.[4] Work is under way to address the recommendations and suggestions.

4 https://dfat.gov.au/international-relations/security/asno/Pages/2017-iaea-ippas-follow-up-mission-to-australia.aspx

Australia's Uranium Production and Exports

Statistics related to Australia's exports of Uranium Ore Concentrates (UOC) are listed in Table 1.

Table 1 UOC export and nuclear electricity statistics

ITEM	DATA
Total Australian UOC exports 2017–18	7,343 tonnes
Value Australian UOC exports	$575 million
Australian exports as percentage of world uranium requirements[5]	9.6%
No. of reactors (GWe) these exports could power[6]	39
Power generated by these exports	246 TWh
Expressed as percentage of total Australian electricity production[7]	96%

Geoscience Australia estimates Australia's Reasonably Assured Resources (RAR) of uranium recoverable at costs of less than USD130 per kilogram uranium to be 1,270,000 tonnes uranium.[8]

This represents around 29 per cent of world resources in this category. In addition, Australia has an Inferred Resource (IR) of uranium recoverable of 915,000 tonnes, giving a combined estimate of Australia's uranium reserves of 2,185,000 tonnes uranium, or 38 per cent of the world's uranium resources.[9]

In 2016, Olympic Dam was the world's fourth largest (five per cent of world uranium production) uranium producer.[10] Overall, Australia is the third largest uranium producing country after Kazakhstan and Canada. In the decade to 2016, Kazakh uranium production increased by over 370 per cent, resulting in Kazakhstan being responsible for almost 40 per cent of global uranium production in 2016.[11]

Worldwide, in 2016 uranium mining provided the equivalent of 98 per cent of the global nuclear power industry's uranium requirements, the closest to parity it has been in almost 30 years.[12] The global installed and operating capacity of nuclear power continues to steadily grow, with a net increase capacity of nine GWe in 2016, the majority of which was due to new reactors coming online in Asia. Despite 43 new reactors being connected to the grid since 2011,[13] offsetting some of the drop in nuclear power due to continued shutdowns in Japan and phasing out of nuclear power in Germany, the uranium price remains near its lowest point in a decade. This is due to the high

5 Based on 2017 world requirements of 65,014 tonnes UOC from the World Nuclear Association's World Nuclear Power Reactors & Uranium Requirements (July 2018) – http://world-nuclear.org/information-library/facts-and-figures/world-nuclear-power-reactors-and-uranium-requireme.aspx

6 Based on a comparison of GWe of nuclear electricity capacity and uranium required, for countries eligible to use AONM from the World Nuclear Association's World Nuclear Power Reactors & Uranium Requirements (July 2018) – http://world-nuclear.org/information-library/ facts-and-figures/world-nuclear-power-reactors-and-uranium-requireme.aspx.

7 Based on Australia's electricity generation in 2015-16 of 257 TWh from the Bureau of Resources and Energy Economics, 2017 Australian Energy Update (September 2017) – https://www.energy.gov.au/publications/australian-energy-update-2017

8 From Geoscience Australia, Australia's Identified Mineral Resources 2017, http://www.ga.gov.au/scientific-topics/minerals/mineral-resources/aimr

9 From OECD Nuclear Energy Agency and International Atomic Energy Agency in 'Uranium 2016: Resources, Production and Demand', https://www.oecd-nea.org/ndd/pubs/2016/7301-uranium–2016.pdf

10 World Nuclear Association's World Uranium Mining Production (July 2017) – http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/mining-of-uranium/world-uranium-mining-production.aspx

11 World Nuclear Association – Uranium and Nuclear Power in Kazakhstan (June 2018) – http://www.world-nuclear.org/information-library/country-profiles/countries-g-n/kazakhstan.aspx

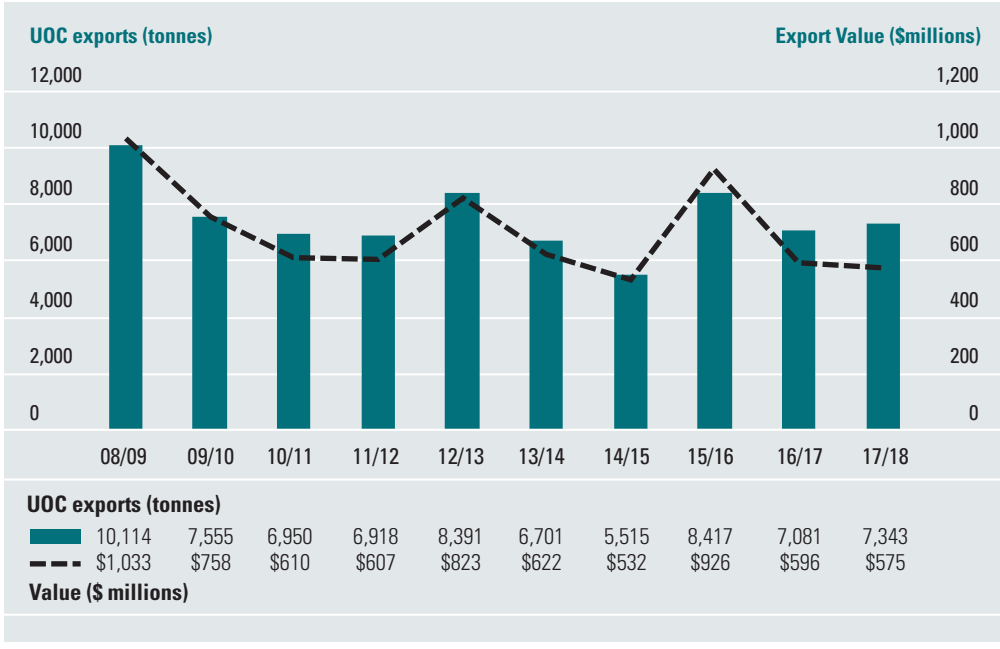
12 World Nuclear Association's World Uranium Mining Production (June 2017) – http://world-nuclear.org/information-library/ nuclear-fuel-cycle/mining-of-uranium/world-uranium-mining-production.aspx

13 IAEA PRIS: 'Nuclear Power Reactors in the World' 2018 Edition: https://www-pub.iaea.org/books/IAEABooks/13379/Nuclear-Power-Reactors-in-the-World

ASNO participated in a tour of Cameco's facility of Port Hope, Canada.

level of uranium production, coupled with improvements in reactor productivity and higher capacity factors, continuing to dampen the corresponding demand for uranium as less uranium is required per kWh output. Asian countries with plans to increase their reactor fleets are taking advantage of low uranium prices to ensure supply into the future. As a result, future global demand of uranium will likely increase more slowly than the net capacity of the global nuclear power sector.

Figure 1 Quantity and value of Australian UOC exports from 2008/09 to 2017/18 FY



Australia's nuclear safeguards policy

The Australian Government's uranium policy limits the export of Australian uranium to countries that: are a party to the Nuclear Non-Proliferation Treaty (NPT)[14]; have a Safeguards Agreement and Additional Protocol with the IAEA in force; and are within Australia's network of bilateral nuclear cooperation agreements. These nuclear cooperation agreements are designed to ensure IAEA safeguards and appropriate nuclear security measures are applied to AONM exported overseas, as well as a number of supplementary conditions. Nuclear material subject to the provisions of an Australian nuclear cooperation agreement is known as AONM. The obligations of Australia's agreements apply to uranium as it moves through the different stages of the nuclear fuel cycle, and to nuclear material generated through the use of that uranium.

All Australia's nuclear cooperation agreements contain treaty-level assurances that AONM will be used exclusively for peaceful purposes and will be covered by safeguards arrangements under each country's safeguards agreement with the IAEA.

In the case of non-nuclear-weapon states, it is a minimum requirement that IAEA safeguards apply to all existing and future nuclear material and activities in that country. In the case of nuclear-weapon states, AONM must be covered by safeguards arrangements under that country's safeguards agreement with the IAEA, and is limited to use for civil (i.e. non-military) purposes.

The principal conditions for the use of AONM set out in Australia's nuclear cooperation agreements are:

- AONM will be used only for peaceful purposes and will not be diverted to military or explosive purposes (here military purpose includes: nuclear weapons; any nuclear explosive device; military nuclear reactors; military propulsion; depleted uranium munitions, and tritium production for nuclear weapons)
- IAEA safeguards will apply
- Australia's prior consent will be sought for transfers to third parties, enrichment to 20 per cent or more in the isotope ^{235}U and reprocessing[15]
- Fall-back safeguards or contingency arrangements will apply if for any reason NPT or IAEA safeguards cease to apply in the country concerned
- internationally agreed standards of physical security will be applied to nuclear material in the country concerned
- detailed administrative arrangements will apply between ASNO and its counterpart organisation, setting out the procedures to apply in accounting for AONM
- regular consultations on the operation of the agreement will be undertaken
- provision will be made for the removal of AONM in the event of a breach of the agreement.

Australia currently has 25 bilateral nuclear cooperation agreements in force, covering 43 countries plus Taiwan.[16]

14 On 17 October 2012, the Australian Government announced that it would exempt India from its policy allowing supply of Australian uranium only to those States that are Parties to the NPT.

15 Australia has given reprocessing consent on a programmatic basis to EURATOM and Japan. Separated Australian-obligated plutonium is intended for blending with uranium into mixed oxide fuel (MOX) for further use for nuclear power generation.

16 Twenty-eight of the countries making up this total are European Union member states.

Accounting for Australian uranium

Australia's bilateral partners holding AONM are required to maintain detailed records of transactions involving AONM. In addition, counterpart organisations in bilateral partner countries 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 reconciliation and bilateral visits to counterparts
- regular liaison with counterpart organisations and with industry
- IAEA safeguards activities and IAEA conclusions on each country.

Australia's uranium transhipment security policy

For countries with which Australia does not have a bilateral nuclear cooperation agreement in force, but through which Australian uranium ore concentrates (UOC) are transhipped, there must be arrangements in place with such States to ensure the security of UOC during transhipment. If the State:

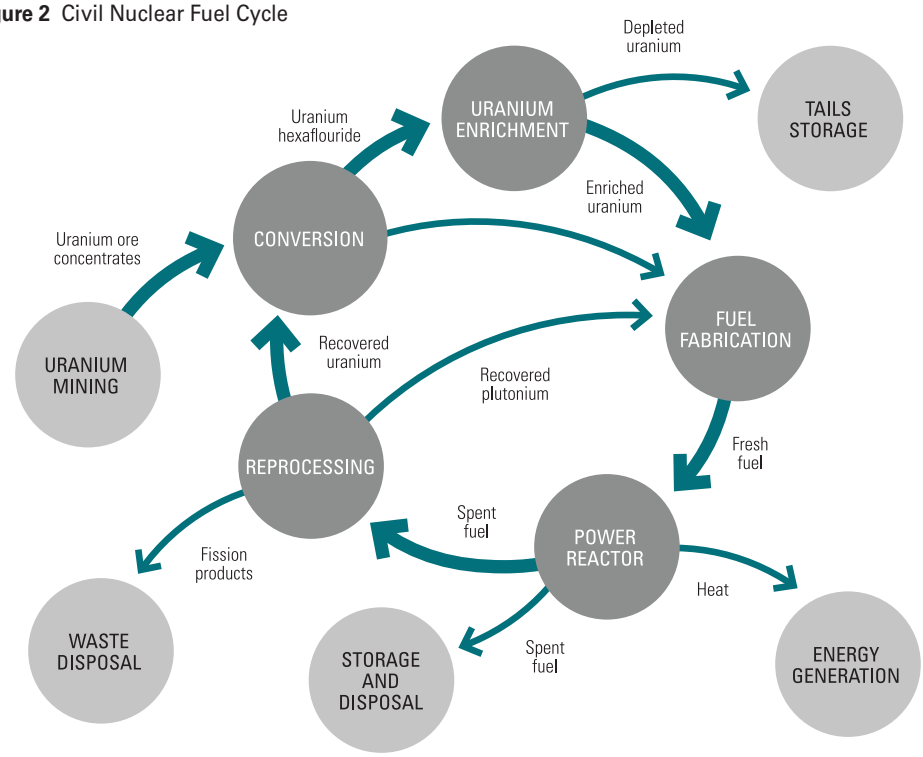
- is a party to the Convention on the Physical Protection of Nuclear Material (CPPNM)
- has a safeguards agreement and adopted the IAEA's Additional Protocol on strengthened safeguards
- and acts in accordance with these agreements;

then arrangements on appropriate security can be set out in an instrument with less than treaty status.[17] Any such arrangement of this kind would be subject to risk assessment of port security.

For States that do not meet the above requirements, treaty-level arrangements on appropriate security may instead be required.

17 See page 26 of ASNO's 2008-09 Annual Report for more details on the establishment of this policy.

Figure 2 Civil Nuclear Fuel Cycle



A characteristic of the nuclear fuel cycle is the international interdependence of facility operators and power utilities. It is unusual for a country to be entirely self-contained in the processing of uranium for civil use. Even in the Nuclear-Weapon States, power utilities will often go to other countries seeking the most favourable terms for uranium processing and enrichment. It would not be unusual, for example, for a Japanese utility buying Australian uranium to have the uranium converted to uranium hexafluoride in Canada, enriched in France, fabricated into fuel in Japan and reprocessed in the United Kingdom.

The international flow of nuclear material means that nuclear materials are routinely mixed during processes such as conversion and enrichment and as such cannot be separated by origin thereafter. Therefore, tracking of individual uranium atoms is impossible. Since nuclear material is fungible—that is, any given atom is the same as any other—a uranium exporter is able to ensure its exports do not contribute to military applications by applying safeguards obligations to the overall quantity of material it exports. This practice of tracking quantities rather than atoms has led to the establishment of universal conventions for the industry, known as the principles of equivalence and proportionality. The equivalence principle provides that where AONM loses its separate identity because of process characteristics (e.g. mixing), an equivalent quantity of that material is designated as AONM. These equivalent quantities may be derived by calculation, measurement or from operating plant parameters. The equivalence principle does not permit substitution by a lower quality material. The proportionality principle provides that where AONM is mixed with other nuclear material and is then processed or irradiated, a corresponding proportion of the resulting material will be regarded as AONM.

SECTION 3

Overview of ASNO

Goal

The goal of ASNO is to enhance Australian and international security through activities which contribute to effective regimes against the proliferation of nuclear and chemical weapons.

Functions

The principal focus of ASNO's work is on international and domestic action to prevent the proliferation of nuclear and chemical weapons. Thus, ASNO's work relates directly to international and national security. ASNO performs domestic regulatory functions to ensure that Australia is in compliance with treaty commitments and that the public is protected through the application of high standards of safeguards and physical protection to nuclear materials and facilities. ASNO also works to strengthen the operation and effectiveness of relevant treaty regimes through the application of specialist knowledge to complex policy problems in technical areas, including treaty verification and compliance.

The *Non-Proliferation Legislation Amendment Act 2003* enabled the offices of the national authority for safeguards, the national authority for the Chemical Weapons Convention (CWC) and the national authority for the Comprehensive Nuclear-Test-Ban Treaty (CTBT) to be formally consolidated under a common title, named the Australian Safeguards and Non-Proliferation Office (ASNO). The legislation also enabled the titles of each of the directors of the three national authorities to be combined as the Director General ASNO.

Nuclear Safeguards Functions

Entering into force in March 1970, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is the cornerstone of the international nuclear non-proliferation regime and considered to be one of the United Nations' most successful multilateral treaties. The NPT has become almost universal, with 191 Parties[18] India, Israel, Pakistan and South Sudan have never joined the NPT. The DPRK (North Korea) purported to withdraw from the NPT in 2003.

Under the NPT, non-nuclear-weapon states (NNWS) agree not to receive, manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices. The five nuclear-weapons states (NWS) agree not to transfer nuclear weapons or other nuclear explosive devices, and not in any way assist, encourage or induce an NNWS to acquire nuclear weapons.

The *Nuclear Non-Proliferation (Safeguards) Act 1987*

The *Nuclear Non-Proliferation (Safeguards) Act 1987* (Safeguards Act), which took effect on 31 March 1987, forms the legislative basis for ASNO's nuclear safeguards activities across Australia.

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

- the NPT;
- Australia's Comprehensive 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;

18 According to the United Nations Office for Disarmament Affairs, http://disarmament.un.org/treaties/t/npt. This number includes the DPRK.

- the Amended Convention on the Physical Protection of Nuclear Material (CPPNM); and
- the International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT).

The Safeguards Act also establishes a system for control over nuclear material and associated items in Australia through requirements for permits for their possession and transport. Communication of information contained in sensitive nuclear technology is also controlled through the grant of authorities.

The functions of the ASNO and Director General ASNO are set out in Part IV of the Safeguards Act and include:

- ensuring the effective operation of the Australian safeguards system;
- ensuring the physical protection and security of nuclear material and items in Australia;
- carrying out Australia's obligations under Australia's safeguards agreement and Additional Protocol with the IAEA carrying out Australia's obligations under Australia's nuclear cooperation agreements with other countries and Euratom;
- operating Australia's bilateral nuclear cooperation agreements and monitor compliance with the provisions of these agreements;
- undertaking, coordinating and facilitating research and development in relation to safeguards; and
- advising the Minister for Foreign Affairs on matters relating to the international nuclear non-proliferation regime and the international safeguards system.

Comprehensive Nuclear-Test-Ban Treaty Functions

Article IV of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) provides that its verification regime shall be capable of meeting the requirements of the Treaty when it enters into force. This has required a substantial program of preparation in advance of the Treaty's entry into force.

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. The tasks of the PrepCom include the establishment and provisional operation of an International Monitoring System (IMS) comprising 337 facilities around the world and an International Data Centre in Vienna. The PrepCom must also establish a capability to conduct an on-site inspection if concerns are raised about a possible nuclear explosion.

ASNO is Australia's designated national authority for the CTBT. This role is one of liaison and facilitation to ensure that the 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. ASNO also assists DFAT with efforts to encourage ratification of the CTBT by countries that have not yet done so.

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;
- coordinating the establishment and operation of IMS facilities in Australia, and of measures to enable Australia to effectively monitor and analyse IMS and other CTBT verification data;

- contributing to the development of Treaty verification, through the PrepCom and its working groups; and
- participating in development and implementation of Australian policy relevant to the CTBT.

Comprehensive Nuclear-Test-Ban Treaty Act 1998

The *Comprehensive Nuclear-Test-Ban Treaty Act 1998* (CTBT Act) gives effect to Australia's obligations as a Party to the 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 this prohibition. The CTBT Act also prohibits Australian nationals from causing a nuclear explosion in any other place.

The CTBT Act requires the Australian Government to facilitate verification of compliance with CTBT provisions, including the obligation to arrange for the establishment and operation of Australian IMS 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 CTBT 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 CTBT Act provides comprehensive powers for inspection arrangements, including the right for inspectors to gather information, to collect and remove samples, and to apply a range of monitoring and sensing techniques over a designated area. Access to locations by inspectors is by consent of the occupier of any premises, or by warrant issued by a magistrate.

The CTBT 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 9, 48 to 50, 62 to 65, 68 to 72, 74, 75 and 78; and Schedule 1 to the CTBT Act came into effect following proclamation by the Governor-General. The proclaimed provisions were to:

- 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.

Chemical Weapons Convention Functions

The CWC prohibits the development, production, acquisition, stockpiling, retention, transfer and use of chemical weapons. Its verification regime is based on declaration by States Parties of facilities and activities dealing with particular chemicals, and on confirmation of compliance through on-site inspections.

ASNO is the focal point in Australia for liaison between domestic CWC stakeholders such as declared chemical facilities, the Organisation for the Prohibition of Chemical Weapons (OPCW), and the national authorities of other States Parties.

Through a system of permits and notifications under the *Chemical Weapons (Prohibition) Act 1994* and the Customs (Prohibited Imports) Regulations 1956, ASNO gathers information from the chemical industry, traders, universities and research institutions to compile declarations that Australia must submit to the OPCW. ASNO has the right to conduct compliance inspections of relevant facilities in Australia, but such powers are exercised only in exceptional circumstances. ASNO conducts

outreach activities, including site visits, to promote compliance and to check the accuracy of information provided by industry.

The OPCW conducts routine inspections of facilities listed in Australia's CWC declarations. ASNO facilitates these inspections to ensure Australia's obligations are met, and to protect the rights of facility operators.

ASNO promotes effective international implementation of the CWC, particularly in Australia's region. It works with the OPCW and other States Parties in the formulation of verification policy and by providing practical implementation assistance and advice.

Key CWC functions are:

- Australia's point of contact for liaison on CWC implementation;
- identifying and gathering information on industrial chemical facilities and other activities required to be declared to the OPCW;
- preparing for and facilitating OPCW inspections in Australia;
- promoting awareness and effective implementation of the CWC, both domestically and internationally;
- providing technical and policy advice to Government; and
- administering and developing related regulatory and administrative mechanisms.

Chemical Weapons (Prohibition) Act 1994

The *Chemical Weapons (Prohibition) Act 1994* (CWP Act) was enacted on 25 February 1994. Division 1 of Part 7 of the CWP Act (establishing Australia's national authority for the CWC, 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 CWP 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 CWP Act, dealing with routine compliance inspections of Other Chemical Production Facilities, came into effect on 17 August 2000.

The CWP Act gives effect to Australia's obligations, responsibilities and rights as a State Party to the CWC. In particular, the CWP 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 CWC, 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 CWP Act; and
- provides for procedures should another State Party seek clarification concerning compliance with the CWC at any facility or other place or by any person in Australia.

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

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

Other Functions

South Pacific Nuclear Free Zone Treaty

The South Pacific Nuclear Free Zone (SPNFZ) Treaty, (also known as the Treaty of Rarotonga) prohibits the manufacture, possession, stationing and testing of nuclear explosive devices, as well as research and development relating to manufacture or production of nuclear explosive devices, in any area for which the Signatory Parties are responsible. The SPNFZ Treaty also bans the dumping of radioactive waste at sea. Australia ratified the Treaty on 11 December 1986, providing the final trigger for its entry into force. The treaty has 13 full members: Australia, Cook Islands, Fiji, Kiribati, Nauru, New Zealand, Niue, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu and Samoa.

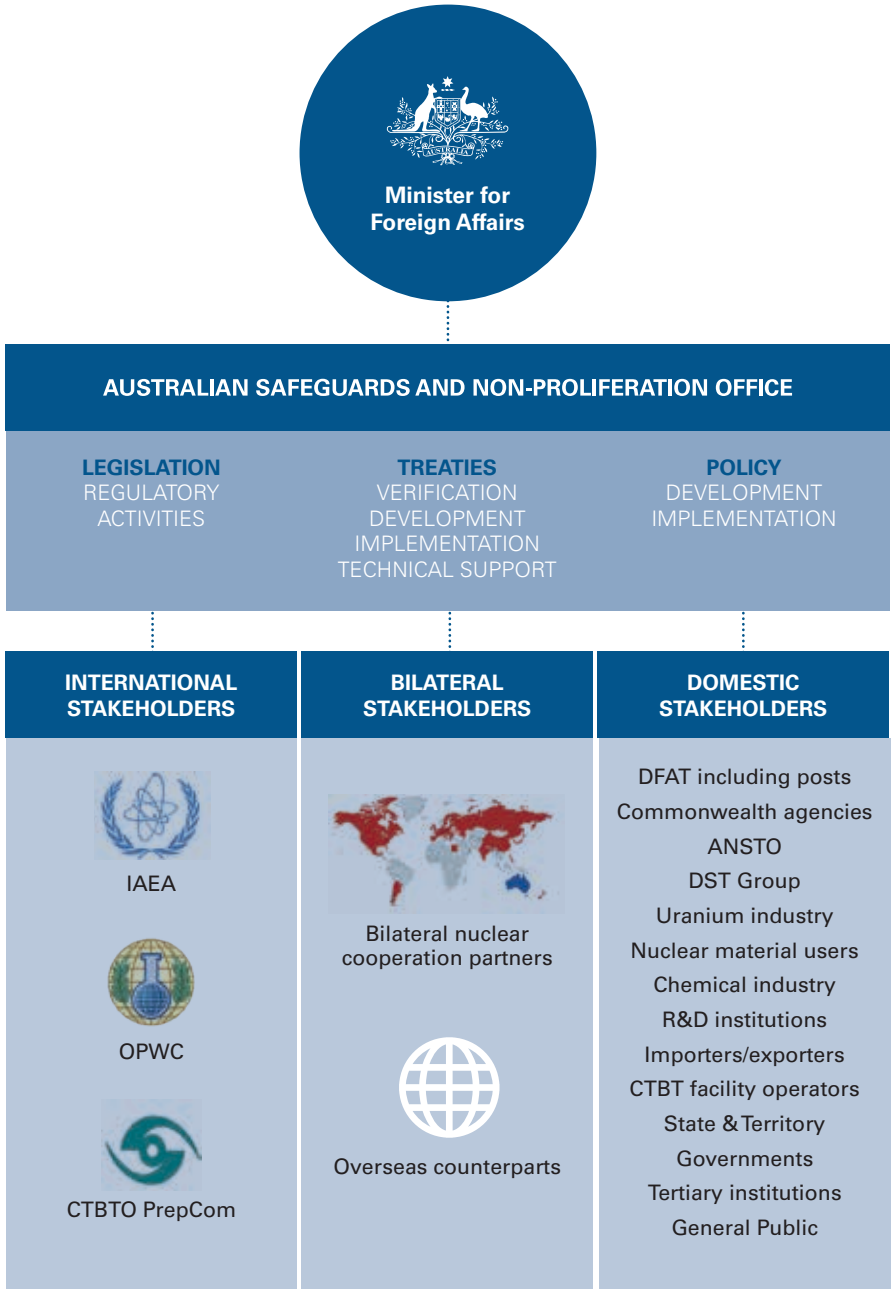
The SPNFZ Treaty has three protocols. Under Protocol 1 the US, UK and France, are required to apply the basic provisions of the Treaty to their respective territories in the zone established by the Treaty. Under Protocol 2, the US, France, UK, Russia and China agree not to use or threaten to use nuclear explosive devices against any party to the Treaty or to each other's' territories located within the zone. Under Protocol 3, the US, France, UK, Russia and China agree not to test nuclear explosive devices within the zone established by the Treaty. France and the UK have ratified all three protocols. Russia and China have ratified the protocols relevant to them, Protocols 2 and 3. The US is yet to ratify the SPNFZ Treaty protocols; however, these were submitted to the US Senate on 2 May 2011 for advice and consent as part of the process prior to ratification.

South Pacific Nuclear Free Zone Treaty Act 1986

The *South Pacific Nuclear Free Zone Treaty Act 1986* (SPNFZ Act), which came into force in Australia on 11 December 1986, gives effect to Australia's obligations, responsibilities and rights under the South Pacific Nuclear Free Zone Treaty (SPNFZ Treaty). The SPNFZ Act also establishes the framework for SPNFZ Treaty inspections. Safeguards inspectors appointed under the Safeguards Act are also inspectors for the purposes of the SPNFZ Act. These inspectors are to assist SPNFZ Treaty inspectors and authorised officers in carrying out SPNFZ Treaty inspections and to investigate possible breaches of the SPNFZ Act.

Operating Environment

Figure 3 Australian Safeguards and Non-Proliferation Office's Operating Environment



Outcomes and Outputs Structure

Table 2 ASNO's Outcomes and Outputs Structure

Outcome 1	Australian and international security protected and advanced through activities which contribute to effective regimes against the proliferation of nuclear and chemical weapons	
	Output 1.1	Operation of Australia's national system of accounting for, and control of, nuclear material, items and facilities
	Output 1.2	Protection of Australia's nuclear facilities, nuclear material and nuclear items against unauthorised access and sabotage, including Australia's uranium supplied overseas
	Output 1.3	Nuclear material and associated items exported from Australia under bilateral agreements remain in exclusively peaceful use
	Output 1.4	Contribution to the development and effective implementation of international safeguards and the nuclear non-proliferation regime
	Output 1.5	Regulation and reporting of Australian chemical activities in accordance with the Chemical Weapons Convention, and strengthening international implementation of the Convention
	Output 1.6	Development of verification systems and arrangements in support of Australia's commitments related to the Comprehensive Nuclear-Test-Ban Treaty
	Output 1.7	Contribution to the development and strengthening of other weapons of mass destruction non-proliferation regimes
	Output 1.8	Provision of high-quality, timely, relevant and professional advice to Government
Outcome 2	Knowledge about Australian's efforts to prevent the proliferation of weapons of mass destruction enhanced through public advocacy	
	Output 2.1	Provision of public information on the development, implementation and regulation of weapons of mass destruction, non-proliferation regimes, and Australia's role in these activities

SECTION 4
Performance

Output 1.1: National Safeguards System

Operation of Australia's national system of accounting for, and control of, nuclear material, items and facilities.

Performance Measures

- Australia's obligations are met under Australia's safeguards agreement with the IAEA.
- Australia's system of safeguards permits and authorities is administered in a timely and effective manner.
- Australian uranium at mines and in transit is accounted for properly.

Performance Assessment

International Obligations

Reporting Obligations under the Australia–IAEA Comprehensive Safeguards Agreement

ASNO met all of Australia's obligations during the reporting period for the submission of declarations and notifications on nuclear materials, facilities and activities, as required by Australia's safeguards agreements with the IAEA.

For each material balance area (summarised in Table 3), ASNO provided reports to the IAEA as required by the Comprehensive Safeguards Agreement. Report statistics are summarised in Tables 4 and 5 below. There were efficiency improvements during 2017–18 in the collection of reports on inventory and inventory transactions from permit holders, due to the new Nuclear Material Balance and Tracking (NUMBAT) database under development. During 2017–18, the first phase of a permit holder portal to the NUMBAT database was launched for around 100 permit holders.

Table 3 Material Balance Areas (MBAs) in Australia for IAEA safeguards purposes

LOCATION	MATERIAL BALANCE AREA[19] (MBA)	NAME OF FACILITY OR LOCATION OUTSIDE FACILITY (AS DESIGNATED IN AUSTRALIA'S SUBSIDIARY ARRANGEMENTS WITH THE IAEA)
Lucas Heights	AS-A	HIFAR (Note: de-fuelled in 2007)
Lucas Heights	AS-C	Research and development laboratories
Lucas Heights	AS-D	Vault storage
Elsewhere	AS-E	Other locations in Australia (e.g. universities, industrial radiography companies, hospitals)
Elsewhere	ASE1	Other locations in Australia (e.g. universities, industrial radiography companies, hospitals)
Lucas Heights	AS-F	OPAL reactor
Lucas Heights	AS-H	Synroc waste immobilisation plant[20]
CSIRO (various sites)	AS-I	CSIRO[21]

19 Material balance areas are delineations for nuclear accounting purposes as required under Australia's Comprehensive Safeguards Agreement with the IAEA.

20 The Synroc waste immobilisation plant was designated a facility for safeguards purposes in 2014 upon the submission to the IAEA of the first design information questionnaire (DIQ) on this plant. As of the end of the reporting period, construction had not yet commenced.

21 Commonwealth Scientific and Industrial Research Organisation (CSIRO) was consolidated into one MBA in February 2018 following the consolidation of several permits into one. CSIRO sites were previously included in MBAs AS-E and ASE1.

The portal allows permit holders to manage many aspects of their permit without forms, including updates to their nuclear material inventory and authorised points of contact.

The high number of reports in Table 4 attributed to 'other locations' primarily relates to small holdings of uranium and thorium compounds by universities and research institutions.

Table 4 Number of line entries in inventory and inventory change reports submitted by ASNO to the IAEA

FACILITY	2017–18
ANSTO research laboratories	958
HIFAR (de-fuelled 2007)	0
ANSTO vault storage	359
OPAL reactor	701
Other locations	2737
TOTAL	4755

Table 5 Number of line entries (by report type) submit by ASNO to the IAEA across all facilities

TYPE OF DATA	2017–18
Inventory Change Report (monthly)	2151
Physical Inventory Listing (annual)	2341
Material Balance Report (annual)	263

Table 6 is a summary of total quantities of nuclear material by category in Australia. A small quantity (2.7 kg) of ^{235}U in high enriched uranium is retained in Australia and used for a variety of purposes primarily due to the utility of the particular chemical, physical and isotopic characteristics. Typical uses of this material include: research and development related to nuclear non-proliferation activities; validating the commercial application of ANSTO's Synroc waste immobilisation technology; nuclear forensics for identifying illicit nuclear materials; development of detection technologies and chemistry work. The quantity comprises several items in various locations around Australia such as ANSTO and some universities.

Table 6 Nuclear Material in Australia at 30 June 2018

CATEGORY	QUANTITY	INTENDED END-USE
Source Material		
Uranium Ore Concentrates (UOC)	922 tonnes	Export for energy use pursuant to bilateral agreements
	3.5 tonnes	Storage
Natural Uranium (other than UOC)	4,500 kg	Research and shielding
Depleted Uranium	27,866 kg	Research and shielding
Thorium Ore Residues	59 tonnes	Storage/disposal
Thorium (other than Thorium Ore Residues)	1,940 kg	Research, industry
Special Fissionable Material		
^{235}U – low enriched	228,530 grams	Research, radioisotope production, storage
^{235}U – high enriched	2,741 grams	Research, storage
^{233}U	3.8 grams	Research
Plutonium (other than ^{238}Pu)	1,203 grams	Research, neutron sources

As well as requiring reporting on nuclear material inventory and transactions, the Comprehensive Safeguards Agreement also requires reporting on design and operational attributes (relevant to safeguards) of nuclear facilities. This information is provided to the IAEA in Design Information Questionnaires (DIQs) for each facility MBA, and in the case of MBAs for locations outside facilities (LOFs), in LOF information questionnaires. ASNO and CSIRO drafted and submitted a LOF information questionnaire for the new MBA, AS-I, in April 2018.

The Safeguards Act requires permits for possession of associated material, associated equipment and associated technology (collectively termed associated items). Permits for associated items ensure Australia can maintain regulatory controls on technology, equipment and material with potential proliferation risks, can report on design attributes for DIQs, and meet other reporting obligations under various nuclear cooperation agreements. Table 7 lists the inventory of associated items in Australia.

Reporting Obligations under the Australia–IAEA Additional Protocol

The Additional Protocol (AP) gives the IAEA greater access to information and locations related to nuclear fuel cycle activities, thereby allowing the IAEA to provide greater assurances not only that all declared nuclear material is accounted for but also the absence of any undeclared nuclear material and activities in States. Australia was the first country to sign and ratify the IAEA's AP, which came into force for Australia on 12 December 1997.

Table 7 Associated Items in Australia at 30 June 2018

CATEGORY	QUANTITY	INTENDED END-USE
Associated Material		
Deuterium and heavy water	20.9 tonnes	Research, reactors
Nuclear grade graphite	83.4 tonnes	R&D and storage
Associated Equipment		
HIFAR[22]	1	Reactor
HIFAR coarse control arms (unused)	5	Reactor components
HIFAR coarse control arms (used)	14	Reactor components
HIFAR safety rods	3	Reactor components
HIFAR fuel charging and discharging machines	2	Reactor components
OPAL reactor[23]	1	Reactor
OPAL control rods	13	Reactor components
OPAL control rod drives	6	Reactor components

22 The ANSTO Board decided to cease operation of HIFAR in January 2007. The reactor was de-fuelled in May 2007. It is awaiting decommissioning.
23 Includes, inter alia, the reactor reflector vessel and core grid.

ASNO prepares and provides annual declarations under a range of AP categories, as well as quarterly declarations on relevant exports. Table 8 lists the number of declarations made under each category. An important aspect of the Additional Protocol is reporting to the IAEA on nuclear-fuel-cycle-related research and development activities. ASNO ensured that all IAEA requirements were met during the reporting period with respect nuclear research and development.

Table 8 Number of Declarations Made under the Additional Protocol

TYPE OF DECLARATION UNDER ARTICLE 2.A AND 2.B OF THE ADDITIONAL PROTOCOL		2013-14	2014-15	2015-16	2016-17	2017–18
2.a.i	Government funded, authorised or controlled nuclear fuel cycle-related research and development activities not involving nuclear material	2	2	3	8	10
2.a.ii	OPAL operational schedules	-	1	1	2	1
2.a.iii	General description of each building on each site, e.g. ANSTO, universities	175	154	156	289	274
2.a.iv	Manufacturing or construction of specified nuclear related equipment	1	1	2	2	2
2.a.v	Location, operational status and production capacity of uranium or thorium mines or concentration plants	4	4	4	4	6[24]
2.a.vi	Information on source material that is not of a composition or purity that requires full IAEA safeguards requirements.	7	7	8	7	7
2.a.vii	Information on nuclear material exempted from safeguards	6	6	4	4	4
2.a.viii	Information related to the further processing of intermediate or high-level waste containing plutonium	-	-	2	2	2
2.a.ix	Exports or imports of nuclear-related equipment listed in Annex II of the Additional Protocol	-	-	-	-	-
2.a.x	General 10-year plans related to nuclear fuel cycle activities	3	3	3	4	4
2.b.i	Nuclear fuel cycle-related research and development activities not involving nuclear material and not funded, authorised or controlled by the Government	1	1	2	-	-

24 This value includes one entry for each Australia's four uranium mines, one entry for the total production of all mines, and one entry with the total production of all concentration plants at all mines.

Safeguards Developments in Australia

The IAEA implements safeguards in Australia in accordance with the provisions in a range of instruments: the Comprehensive Safeguards Agreement; Additional Protocol; Subsidiary Arrangements; and facility attachments for each material balance area (MBA). Australia's MBAs are described in Table 3. The overarching framework the IAEA uses to prioritise and optimise various in-field and headquarters activities under these instruments is the State-level approach for Australia, which is based on the concepts described in IAEA document *The Conceptualization and Development of Safeguards Implementation at the State Level* (GOV/2013/38) and supplementary document (GOV/2014/41) (see page 64 in the 2013–14 Annual Report for more details).

In Australia, the IAEA and ASNO apply most of their respective safeguards efforts to the Australian Nuclear Science and Technology Organisation (ANSTO). In November 2017, the Australian Nuclear Medicine (ANM) project reached practical completion, and in April 2018, Director General ASNO endorsed the commissioning report with respect to safeguards and security requirements under ANSTO's permit to possess nuclear material[25]. During the reporting period the IAEA conducted some inspections and visits in relation to the ANM plant. When operational, the facility is designed to ensure future security of supply of nuclear medicines for Australian patients, and will allow ANSTO to supply up to 25 per cent of the world's needs for molybdenum-99 (Mo-99)[26].

During 2017–18, ASNO granted a new permit to possess nuclear material to the Commonwealth Scientific and Industrial Research Organisation (CSIRO). ASNO developed the permit, in consultation with CSIRO, as a way of combining the five permits already held by individual CSIRO business units into a single set of requirements, to better facilitate centralised management of nuclear safeguards and security compliance across the whole of CSIRO. In conjunction with the new permit, ASNO also created a new Material Balance Area (MBA), AS-I. The MBA is Australia's third location outside facility (LOF) MBA. The other MBAs, AS-E and ASE1, are catch-all MBAS for universities, companies, hospitals etc, that hold or use small quantities of nuclear material. The new MBA structure readily provides IAEA with site-specific visibility of CSIRO's inventory and can more efficiently adapt to changes in CSIRO's business units and/or research functions. As part of the establishment of a new LOF MBA, ASNO and CSIRO prepared what is known as a LOF information questionnaire on CSIRO's structure, holdings and activities, from which the IAEA is developing what is known as a facility attachment outlining implementation rules in relation to reporting, record keeping and inspections.

ASNO continues to engage with the Department of Industry, Innovation and Science's (DIIS) process to establish a facility for Australia's radioactive waste. During the reporting period, ASNO provided advice on the safeguards and security requirements for waste containing nuclear material through working group, advisory meetings and document reviews.

25 The CEO of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), Dr Carl-Magnus Larsson, also issued an operating licence for ANM on 12 April 2018.

26 Mo-99 is the parent product of the world's most widely used nuclear medicine, technetium-99m (Tc-99m).

Table 9 Status of Permits and Authorities under the Safeguards Act as at 30 June 2018

PERMIT OR AUTHORITY	CURRENT TOTAL	GRANTED	VARIED	REVOKED	EXPIRED
Possess nuclear material	108	4	12	8	0
Possess associated items	10	1	8	0	4
Transport nuclear material	19	2	0	0	0
Transport associated items	0	0	0	0	0
Establish a facility	2	0	0	0	0
Decommission a facility	1	0	0	0	0
Communicate information contained in associated technology	7	0	7	0	3
TOTAL	147	7	27	8	7

Permits and Authorities System

ASNO continued to operate Australia's state system of accounting for and control of nuclear material in accordance with Australia's Comprehensive Safeguards Agreement with the IAEA and national legislation.

Notice of all permit changes were published in the Australia Government Gazette as required by subsection 20(1) of the Safeguards Act. A list of all permits granted, varied, revoked and expired is in Table 9.

Continuing from ASNO's comprehensive review of permits under the Safeguards Act (described on page 61 of ASNO's 2016–17 Annual Report, and page 56 of ASNO's 2015-16 Annual Report), ASNO completed a review and redesign of permits to possess associated items and authorities to communicate information. The revised permits and authorities follow the new compliance code format introduced in aforementioned reviews, and were done consistent with the governance and risk management policies under the Government's regulatory reform agenda. Eight permits were revoked due to organisations no longer holding nuclear material or as a result of organisational restructure.

IAEA Inspections

During the reporting period the IAEA conducted inspections in accordance with standard arrangements under Australia's Comprehensive Safeguards Agreement and the Additional Protocol. Inspections were conducted at ANSTO's Lucas Heights site, Monash University, and CSIRO's site at Clayton, Victoria. The IAEA conducted its annual, scheduled physical inventory verification inspection at ANSTO in May, and a short notice random inspection in September. Details on all inspections are provided in Table 10, and the IAEA's findings from these inspections (where available at the time of publishing this Annual Report) are listed in Appendix D.

ASNO officers facilitated access for the IAEA inspectors in accordance with conditions under respective permits issued under the Safeguards Act and accompanied the inspectors during all of their activities. The IAEA's 91(b) statement of conclusions (See Appendix B) for material balance area AS-C for the period 1 June 2016 to 5 April 2017 included: "The IAEA also concluded to the extent possible that declared nuclear material has been accounted for although it is

noted that verification of much of the enriched uranium inventory is pending the implementation of a suitable method."

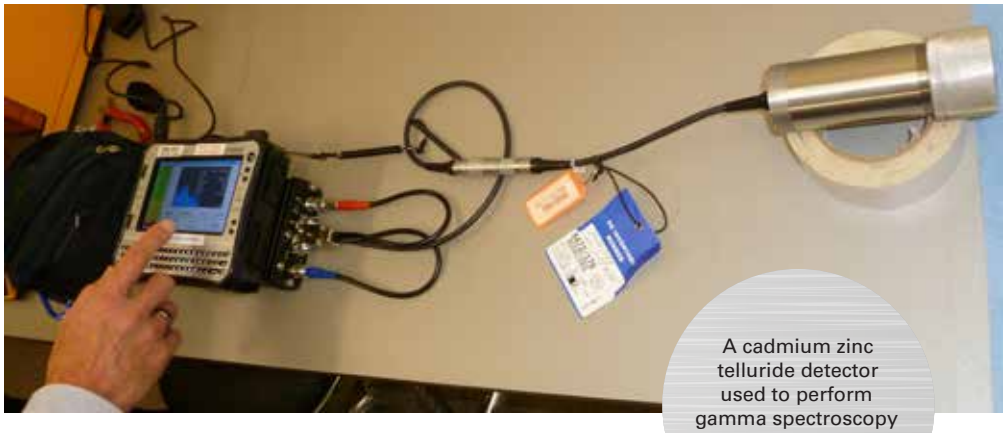
As reported in ASNO's 2016-17 Annual Report (page 58), there is a technical challenge regarding the IAEA measuring uranium content in solid waste from molybdenum–99 (Mo–99) radio-pharmaceutical production. ASNO and ANSTO have been working closely with the IAEA on a solution, and the has now constructed a prototype detection for measuring the uranium content in the waste. The detector is an active well coincidence counter (AWCC) that measures uranium by counting multiple neutrons in coincidence through induced fission from a small neutron source in the detection system. Planning is underway to test this device at ANSTO in late 2018, subject to safety approval by ARPANSA.

IAEA inspectors and ASNO inspectors during design information verification at the HIFAR reactor.

Table 10 IAEA Safeguards Inspections 2017–18

DATE	FACILITY	MATERIAL BALANCE AREA[27]	TYPE[28]
12–13 September 2017	ANSTO	AS-F	Short Notice Random Inspection
		AS-C and AS-F	Complementary Access (4.a.i)
3–5 October 2017	ANSTO	AS-C	Design Information Verification[29]
29–30 January 2018	ANSTO	AS-C	Technical visit for dimensional checks on the AWCC detector
26 April 2018	Monash University	AS-E	Physical Inventory Verification
27 April 2018	CSIRO – Clayton	AS-I	Complementary Access (4.a.i)
30 April–4 May 2018	ANSTO	AS-A	Design Information Verification
		AS-F	Design Information Verification & Physical Inventory Verification
		AS-C	Design Information Verification & Physical Inventory Verification
		AS-D	Design Information Verification & Physical Inventory Verification

27 See explanation of each material balance area in Table 3.
28 Details on different types of inspections are outlined in Appendix D.
29 Included base-line environmental sampling of hot cells in ANSTO's ANM plant.



A cadmium zinc telluride detector used to perform gamma spectroscopy (non-destructive assay).

The IAEA recognises that this is a technical challenge for which a solution is well advanced with the upcoming plans to test the AWCC detector. Accordingly, this has not affected its overall conclusions for this material balance area or for Australia as a whole. The IAEA's 91a statement for material balance area AS-C (see Appendix B) concludes with "The IAEA did conclude that there were no indications of the undeclared presence, production or processing of nuclear material". Furthermore, the IAEA has maintained the broader conclusion for Australia that "all nuclear material remained in peaceful activities" (see Appendix B).

The AS-E and ASE1 Material Balance Area includes other locations in Australia holding nuclear material (e.g. universities, industrial radiography companies, hospitals). While the IAEA regularly conduct complementary access inspections at locations within AS-E and ASE1, a physical inventory verification (PIV) is conducted about every four years at a location selected by the IAEA. This frequency is reflective of the small quantities of nuclear material held across all of these locations.

The fourth physical inventory verification (PIV) in AS-E and ASE1 was conducted in April 2018 (the previous one in March 2014). Monash University was chosen by the IAEA as the site for inspection at which IAEA inspectors completed a thorough check of all nuclear material inventory. An explanation of how the IAEA reports on the outcomes of these inspections is included in Appendix B.

ASNO Inspections

During 2017–18, ASNO accompanied the IAEA on all of the inspections listed above. ASNO attends these inspections to ensure Australia's obligations were met in a timely and efficient manner, and to ensure the inspections are conducted effectively.

The IAEA holds inspections to help it draw its conclusions on the correctness and completeness of Australia's nuclear accounting reports and safeguards declarations. ASNO inspectors are able also to use these opportunities to observe the inspected organisation's performance against their domestic permit conditions. This proves an efficient mechanism for ASNO's stakeholder outreach on regulatory requirements.

Table 11 Inventory Differences Recorded during 2017–18

MATERIAL BALANCE AREA	DIFFERENCE BETWEEN BOOK AND PHYSICAL INVENTORY*	COMMENT
ANSTO research laboratories (MBA AS-C)	0.00 (0.01) g enriched ^{235}U	Corrections of rounding errors in batch weights.
Other locations (MBA AS-E)	–0.49 kg depleted uranium –0.02 (–0.02) g enriched ^{235}U –0.03 (–0.03) g enriched ^{233}U 0.38 kg natural uranium 0.17 kg thorium	Primarily due to re-measurements of batches.
Other locations (MBA ASE1)	5.71 kg depleted uranium 0.05 (0.00)g enriched ^{235}U 0.08 kg natural uranium <0.01 kg thorium	Primarily due to re-measurements of batches (including one batch of legacy depleted uranium counter weights from aircraft).
CSIRO (MBA AS-I)	–2.02 kg depleted uranium –0.03 kg natural uranium –0.26 kg thorium	Re-measurement of batches as part of efforts by CSIRO to more accurately characterise its inventory.

* Figures in brackets refer to isotope weight

In addition to the IAEA inspections, ASNO conducted a safeguards inspection at Monash University to prepare for the scheduled IAEA Physical Inventory Verification inspection. Some safeguards aspects were also included in some of the security inspections conducted by ASNO.

During the reporting period, some small inventory differences were reported to the IAEA in conjunction with inventory change reports and physical inventory listings. Details are provided in Table 11. These were primarily due to re-measurement of batches at by permit holders with small holdings of nuclear material (e.g. universities, research institutes).

Output 1.2: Nuclear Security

Protection of Australia's nuclear facilities, nuclear material and nuclear items against unauthorised access and sabotage, including Australia's uranium supplied overseas.

Performance Measures

- Security of nuclear material, technology and facilities meets Australia's obligations under the Amended Convention on the Physical Protection of Nuclear Material (CPPNM), the International Convention for the Suppression of Acts of Nuclear Terrorism and bilateral nuclear cooperation agreements, as well as being in accordance with IAEA guidelines.
- Internationally agreed standards for the security of nuclear material are applied to all AONM.
- Proactive and professional contributions are made to the development and effective implementation of nuclear security worldwide.

Performance Assessment

International and Bilateral Obligations

ASNO's regulation of permit holders established that security arrangements at Australian nuclear facilities were in accordance with Australia's obligations under the CPPNM, its 2005 Amendment and relevant bilateral nuclear cooperation agreements, as well as being in accordance with IAEA recommendations. ASNO also met Australia's international shipment notification obligations under the CPPNM by notifying relevant parties of the transhipment of uranium ore concentrates (UOC) exported from Australia.

On the 30-31 January 2018, Australia hosted a US delegation from the National Nuclear Security Administration, the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), the Department of State and Sandia National Laboratories for a bilateral security visit pursuant to the Australia–US Nuclear Cooperation Agreement to assess the security of US-obligated nuclear material in Australia. The previous bilateral visit took place in 2013 (see page 63, 2012-13 Annual Report). The US delegation visited facilities where US-obligated nuclear material is used or stored, verifying the improvements from previous suggestions to enhance security. The US delegation concluded that physical security at the buildings visited meets the intent of INFCIRC/225/Rev.5.

Exports of Australian Uranium

Transport of all Australian UOC to destinations abroad is done in accordance with new model transport permit requirements that include verifying the integrity of containers holding UOC. Container seals are checked at each port of unloading or transhipment to detect any breaches of integrity. There were no security incidents (malicious acts) involving the transport of UOC in Australia during the reporting period. Mining companies requested the ability to conduct a final inspection of UOC drum strapping just prior to shipping. ASNO specifically included provisions to do this in revised permit conditions.

Nuclear Security of UOC at Australian Mines and in Transport

Continuing from ASNO's comprehensive review of permits under the Safeguards Act, ASNO completed a review of permits issued to uranium producers and exporters. The revised permits were designed to integrate seamlessly with transport permits recently reviewed for the UOC transport industry. On 23 March 2018, ASNO issued new Permits to Possess Nuclear Material to approved uranium producers.

ASNO conducted an inspection of the Flinders Adelaide Container Terminal.

The physical protection of UOC in transport extends from mine to port and in keeping with ASNO's outreach and engagement activities; the South Australian port facilities were included in an inspection and permit review discussion on 15 May 2018. In addition, on 16 May 2018 ASNO visited a transport carrier conveying UOC to this port. The carrier sought regulatory guidance for the physical protection of UOC during transport and storage incidental to transport.

IPPAS mission team leader Kristof Horvath delivering the draft mission report to John Kalish (AS ASNO).

Australia's Follow-up IPPAS Mission

As reported under Current Topics, ASNO hosted the International Physical Protection Advisory Service (IPPAS) during the weeks of 30 October to 10 November 2017. This IPPAS mission was a follow-up from the initial mission conducted in 2013 and was the 80th mission conducted by the IAEA since the introduction of this service in 1995. The IPPAS team final report included four recommendations, fifteen suggestions and also identified five good practices. A redacted version of the report (to exclude security sensitive information) is posted on ASNO's website. Work is under way to address the recommendations.

Nuclear Security at Lucas Heights

In August ASNO completed an in-depth review of ANSTO's upgraded nuclear security arrangements for its nuclear material storage building. ASNO concluded that the security arrangements met permit requirements and were consistent with international guidelines. This assessment was confirmed during the subsequent IPPAS mission and bilateral visit from USA, as reported above.

Recent completion of the new ANSTO Nuclear Medicine (ANM) facility opens the way for Australia to supply a very significant proportion of the growing world market for nuclear medicine. ASNO worked with ANSTO and ARPANSA to finalise the regulatory requirements for physical security and facility safety. The Director General endorsed ANSTO's commissioning report for safeguards and security on 3 April 2018, allowing the operation of the facility under ANSTO's permit issued under the Safeguards Act. The ANM facility was also reviewed during the IPPAS mission and bilateral visit from USA, as reported above.

Shipment of Spent Fuel from the OPAL Reactor

ASNO, together with several State and Federal Government agencies worked closely with ANSTO on preparations for the transport of OPAL spent fuel assemblies to France for reprocessing. This was Australia's 9th routine transport of spent nuclear fuel assemblies[30]. ASNO's involvement included approving the transport plan, transfer approvals under three nuclear cooperation agreements and giving prior notice to the IAEA.

SILEX Enrichment Technology

ASNO conducted an inspection of Silex Systems Limited (SSL) on 1 February 2018 to review their updated security plan arising from the revised permit condition issued in June 2017. The US NRC and DOE visited Australia in March 2018 to discuss ongoing developments with SILEX Technology, the protection of US restricted data and Australian associated technology under the Silex Agreement and to discuss possible updates to the associated Administrative Security Arrangements. The discussions were focused on future possible scenarios for the future cooperation between SSL and its US commercial partner Global Laser Enrichment (GLE).

In June 2018, the Silex Board decided to abandon the acquisition of a majority stake in GE-Hitachi GLE. ASNO remains in contact with key stakeholders while the possible preservation of the technology in USA and/or its repatriation to Australia is being considered. SSL continues to hold a permit to possess associated technology with ASNO and regulatory activities will be reviewed based on the future disposition of the technology in USA and Australia.

Other Enrichment Technologies

ASNO has received an application to possess associated technology for a possible innovation into uranium enrichment. Prudently, ASNO is working with the applicant to apply provisional nuclear security measures while the application is under consideration.

30 The shipment departed on 29 July 2018, outside of the reporting period of this report.

(a) ASNO inspection at Kalari logistics company
(b) Mobicon used by Kalari to move containers of UOC.

South Australian UOC Transport Working Group

The ongoing efforts of the South Australia UOC Transport Working Group and a Transport Steering Committee is providing industry leading best practice outcomes. ASNO contributed transport security expertise to the working group and the steering committee convened by the South Australian Environment Protection Authority (EPA) and attended by State Government, industry and first responders.

At its conclusion (at the end of 2018), the working group plans to have finalised a number of key outcomes such as establishing an Incident Response Resource Table detailing both the resources and capabilities of the mining industry, transporters and emergency services, providing detailed location and capability information for rapid and effective response to an incident. The working group also intends to produce guidance materials for new and emerging mining companies to adopt such as a model UOC Transport Management Plan Template. The working group facilitated training material to assist the South Australia Metropolitan Fire Service (MFS) and the South Australian Country Fire Service (CFS).

International Conference on the Physical Protection of Nuclear Materials and Nuclear Facilities

ASNO attended and presented at the International Conference on Physical Protection of Nuclear Materials and Nuclear Facilities held at the IAEA, Vienna during 13–17 November 2017. The conference drew some 700 participants from 95 Member States, representing competent authorities, facility operators, shippers and carriers and technical support organizations. ASNO submitted a paper on Regulating the Transport of UOC in Australia and provided a presentation on this topic that was well received.

Regional Workshop to promote the Implementation of the CPPNM and its Amendment

As part of ASNO's outreach and engagement activities, ASNO gave two presentations at the Regional Workshop to Promote the Universalisation of the Amendment to the Convention on Physical Protection of Nuclear Material (CPPNM) in Tokai, Japan on 28–31 May 2018. The workshop presented by the IAEA and hosted by the Japan Atomic Energy

Agency (JAEA) provides a forum for an exchange of views and information on the implementation of the 2005 Amendment to the CPPNM. ASNO presented on "Australia's Experiences in Ratification and Implementation of the Amended CPPNM" and "Australia's Application of Physical Protection under the Amended CPPNM".

Regional Training Course – Conducting Computer Security Assessments

In building ASNO's capacity to effectively conduct computer security assessments, ASNO attended the IAEA Regional Training Course held in Bangkok, Thailand, which was hosted by the Office of Atoms for Peace on 5–9 March 2018. The training and exercises were designed to assist in the development and conducting of computer security assessment programmes as part of regulatory oversight.

AUSIMM

ASNO attended the AusIMM International Uranium Conference in Adelaide on 5–6 June 2018. The AusIMM uranium conference was an excellent opportunity to engage with uranium exploration companies and prospective uranium miners who do not yet have a formal regulatory relationship with ASNO.

ASNO's Michal Botha attended the regional workshop on the Universalization of the Amendment to the Convention on the Physical Protection of Nuclear Material held in Tokai, Japan.

Uranium Council Meeting

ASNO attended the annual Uranium Council Meeting held in Adelaide on 7 June 2018. The meeting provides a forum for stakeholders (federal and state regulators and industry) to present on contemporary challenges as well as providing updated information of current developments in this field.

Nuclear Security Guidance Committee (NSGC)

The core role of the NSGC is to manage the production of guidance documents in the IAEA nuclear security series (NSS). The NSGC comprises over 50 IAEA member states, is constituted on rolling three-year terms and meets twice per year at the IAEA in Vienna (i.e. six meetings per term). Australia (through ASNO) has been a member since its inception in 2012. The NSGC's 12th meeting, being the final for its second three-year term, was held on 27–30 November 2017. At this meeting, the NSGC refined the publication roadmap which sets the framework and priorities for the nuclear security series. It also made a number of recommendations for the NSGC's third term to consider.

Director, Nuclear Security (Dr. Stephan Bayer) took up the Chair of the NSGC's third term at its 13th meeting on 11–14 June 2018. The main discussion points were the publication roadmap, the Secretariat's planned review of the top-tier Nuclear Security Series documents and the Nuclear Security Series Glossary. The meeting approved eight documents for progress in the publication process, including four for final publication. The meeting also included a joint session with the IAEA's Emergency Preparedness and Response Safety Committee (EPReSC) which discussed matters where nuclear security interfaces with emergency response whether it be initiated from a security event or an accident.

Symposium on the Minimisation of HEU

ASNO and ANSTO attended the third Symposium on the Minimisation of High Enriched Uranium (HEU) held in Oslo on 5–7 June 2018. The Symposium highlighted international efforts in the minimisation of HEU in civilian applications. Three Working Groups (WG1 on "HEU Research Reactor Conversion and Technological Advances", WG2 on "HEU Removals and Disposition", and WG3 on "Radio-Isotope Production") delivered final reports which are accessible on the Symposium website[31]. Involvement in the Symposium fulfils a commitment Australia made in joining the Nuclear Security Summit Gift Basket[32] covering this topic.

Post Nuclear Security Summit Activities

Australia is a member of the post-nuclear security summit Nuclear Security Contact Group (NSCG), whose Statement of Principles[33] include advancing implementation of nuclear security commitments and building a strengthened, sustainable and comprehensive global nuclear security architecture. The NSCG, currently chaired by Jordan, met in Vienna, Amman Beijing and Lyon (hosted by INTERPOL) during the reporting period. Director General ASNO is Australia's NSCG designate. Within the NSCG, Australia continued leading a discussion on preparing for the Amended CPPNM review conference which is mandated to take place in 2021.

In further initiatives to promote nuclear security internationally, Director General ASNO continues to be active in track 1.5 dialogues, in particular the Nuclear Threat Initiative's Global Dialogue on Nuclear Security Priorities, which like the NSCG, has been active in promoting nuclear security summits goals and commitments.

31 http://heusymposium2018.org/
32 http://www.nss2016.org/document-center-docs/2016/4/1/joint-statement-on-heu-minimization-gb
33 https://www.iaea.org/sites/default/files/publications/documents/infcircs/2016/infcirc899.pdf

DG ASNO at Nuclear Security Contact Group meeting in Jordan viewing a simulated interdiction of radiological material at a border crossing, February 2018.

Output 1.3: Bilateral Safeguards

Nuclear material and associated items exported from Australia under bilateral agreements remain in exclusively peaceful use.

Performance Measures

- AONM is accounted for in accordance with the procedures and standards prescribed under relevant bilateral agreements.
- Implementing arrangements for the bilateral agreements are reviewed and revised as necessary to ensure their continuing effectiveness.

Performance Assessment

Australian Obligated Nuclear Material

On the basis of reports from bilateral treaty partners, other information and analysis, ASNO concluded that all AONM is satisfactorily accounted for. Details are provided in Table 12.

Based on ASNO's analysis of reports and other information from counterparts on AONM located overseas, ASNO concludes that no AONM was used for non-peaceful purposes in 2017.

Table 12 Summary of net accumulated AONM by category, quantity and location at 31 December 2017[34]

CATEGORY	LOCATION	TONNES[35]
Depleted Uranium	Canada, China, European Union, Japan, Republic of Korea, Russia, United States	134,323
Natural Uranium	Canada, China, European Union, Japan, Republic of Korea, United States, India	25,082
Uranium in Enrichment Plants	China, European Union, Japan, United States	27,688
Low Enriched Uranium[36]	Canada, China, European Union, Japan, Mexico, Republic of Korea, Switzerland, Taiwan, United States	18,523
Irradiated Plutonium[37]	Canada, China, European Union, Japan, Mexico, Republic of Korea, Switzerland, Taiwan, United States	191
Separated Plutonium[38]	European Union, Japan	1.6
TOTAL		205,809

34 Figures are based on yearly reports to ASNO in accordance with Australia's bilateral agreements and other information held by ASNO.

35 All quantities are given as tonnes weight of the element uranium or plutonium. The isotope weight of ^{235}U is 0.711 per cent of the element weight for natural uranium and from one to five per cent for low enriched uranium.

36 More than 85 per cent of Australian obligated low enriched uranium is in the form of irradiated reactor fuel.

37 Almost all Australian-obligated plutonium is irradiated, i.e. contained in irradiated power reactor fuel or plutonium reloaded in a power reactor following reprocessing.

38 Separated plutonium is plutonium recovered from irradiated nuclear fuel by reprocessing. This plutonium is mixed with uranium to produce another type of reactor fuel—termed mixed oxide (MOX) fuel - which is return to reactors for further power generation. A significant proportion of Australian obligated separated plutonium is stored as MOX. On return to reactors, the plutonium returns to the "irradiated plutonium" category, resulting in fluctuations of the separated plutonium holdings.

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

Table 13 Supply of Australian uranium by region during 2017

REGION	TONNES UOC (U_3O_8)	% OF TOTAL
Asia	1,593	24
Europe	1,617	24
North America	3,543	52
TOTAL	6,753	100

Table 14 Summary of AONM Transfers during 2017[39]

	DESTINATION	U (TONNES)
Conversion	Canada	1,152
	China	1,351
	European Union	1,275
	United States	2,377
Enrichment	European Union	2,563
Fuel Fabrication	Republic of Korea	313
	Japan	11
	United States	226

The shipper's weight for each UOC consignment is entered on ASNO's record 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 in the international nuclear fuel cycle. ASNO notifies each export to the safeguards authorities in relevant countries. In every case, those safeguards authorities confirmed to ASNO receipt of the shipment. ASNO also notified the IAEA of each export to non-nuclear weapon States pursuant to Article 35(a) of Australia's Safeguards Agreement with the IAEA, as well as to nuclear-weapon States under the IAEA's Voluntary Reporting Scheme. Countries which received these exports also report the receipts to the IAEA.

39 Figures are for transfers completed between jurisdictions from 1 January to 31 December 2017. Figures do not include transfers of AONM made within the fuel cycle of a state (or of Euratom), return of heels (residual UF_6 remaining in cylinders after emptying), or damaged product.

Bilateral Agreements

Reporting

Reports from ASNO's counterpart organisations were received in a timely fashion enabling efficient analysis and reconciliation with ASNO's records. Figures provided in Table 12 and Table 14 are based on ASNO's analysis of all available information at the time of publication.

Australia-Ukraine Nuclear Cooperation

The Australia-Ukraine Nuclear Cooperation Agreement (NCA) entered into force on 15 June 2017.

Transfers under this Agreement can commence when the Administrative Arrangement (AA) has been signed. ASNO and its Ukrainian counterparts have finalised the text of the AA, and are working to arrange an appropriate signing date in the coming months. The signature of the AA is required before commercial transfers of Australian obligated nuclear material to Ukraine can occur.

Implications of Brexit and the United Kingdom leaving Euratom

The UK has made clear that when it leaves the EU it will also withdraw from Euratom. While the UK will formally leave the EU on 29 March 2019, subject to final agreement between the UK and EU, a planned transition period will see the UK remain subject to the EU Acquis Communitaire (the total body of EU laws and regulations) including its obligations stemming from the NCA between Australia and Euratom, from 30 March 2019 to 31 December 2020. Accordingly, transfers of Australian uranium to the UK could continue taking place under the Australia-Euratom NCA, (which currently allows for Australian uranium to be processed and used for civil nuclear power generation in all 28 Euratom/EU States) until 31 December 2020. The proposed NCA would provide the framework for cooperation between Australia and the UK in the peaceful uses of nuclear energy, once the Australia-Euratom NCA ceases to apply to the UK. ASNO is working to ensure that the new NCA with the UK will be ready to enter into force in March 2019 in the event that this transition period does not eventuate.

ASNO staff at Global Advanced Metal's Boyertown, PA Facility, USA.

ROK (NSSC/ KINAC) – Australia (ASNO) technical meeting in Seoul, November 2017.

The updated Australia-UK NCA will continue to require Australian uranium to be used exclusively for peaceful purposes, be subject to IAEA safeguards, and be protected by internationally agreed standards of physical protection.

Implementation of the Australia-India Nuclear Cooperation Agreement

The Australia-India NCA entered into force on 13 November 2015 and the *Civil Nuclear Transfers to India Act 2016* commenced on 8 December 2016.

In April 2018, ASNO hosted its counterparts from the Indian Department of Atomic Energy (DAE) in Canberra for meetings of the Australia-India Joint Committee and the Joint Technical Working Group. The DAE delegation also visited the Australian Nuclear Science and Technology Organisation, and toured the OPAL research reactor.

ASNO continued to engage with Australian uranium producers exploring UOC exports to India. A small test sample of UOC was sent to India for chemical analysis under the Australia-India NCA in July 2017.

Bilateral and multilateral engagement on Nuclear Cooperation Agreements

ASNO has continued to liaise closely with bilateral counterparts within our network of nuclear cooperation agreements to ensure the effective operation of the Agreements. This has included meeting bilaterally with counterparts from Canada, China, Euratom, India, Japan, Republic of Korea, the UK and the US.

Output 1.4: International Safeguards and Non-Proliferation

Contribution to the development and effective implementation of international safeguards and the nuclear non-proliferation regime.

Performance Measures

- Contribute to the strengthening of international safeguards in ways that advance Australia's interests.
- Contribute to policy development and diplomatic activity by the Department of Foreign Affairs and Trade (DFAT).
- Contribute to the IAEA's Standing Advisory Group on Safeguards Implementation (SAGSI).
- Manage the Australian Safeguards Support Program (ASSP).
- Cooperate with counterparts in other countries in the strengthening of international safeguards and improvement of domestic safeguards implementation.
- Provide advice and assistance to the Australian Intelligence Community in support of national and international non-proliferation efforts.
- Manage ASNO's international outreach program.
- Assess developments in nuclear technology.

Performance Assessment

Strengthening International Safeguards

During the reporting period, ASNO continued to take an active role in the review, development and effective implementation of international safeguards, through engagement with the IAEA both at senior management levels and at operational levels; as well as through other international fora covering safeguards.

This engagement enables ASNO to build and maintain specialist knowledge on developments and emerging issues in safeguards that could potentially affect nuclear industrial and research activities in Australia, such as for the National Radioactive Waste Management Facility project. Maintaining specialist knowledge also supports ASNO's monitoring and administration of Australia's various bilateral nuclear cooperation agreements, and supports policy advice to Government on developments in IAEA safeguards and other international non-proliferation issues.

A recent example in relation to policy advice to Government, is the discussion on the DPRK's nuclear arsenal (see Year in Review section). ASNO coordinated an examination of the areas where Australia has capabilities in the technical aspects of nuclear verification that could potentially support an international verification effort. This could draw on expertise in inspections and support areas within Australian Government agencies, as well as the specialised technical capabilities developed through the various Australian Safeguards Support Programme (ASSP) projects described in the following section.

On broader aspects of safeguards implementation, ASNO's engagement included the IAEA Director General's Standing Advisory Group on Safeguards Implementation (SAGSI), technical meetings on IAEA safeguards projects, and various conferences and workshops. ASNO was

Member State Support Programme Coordinators' Meeting February 2018 in Vienna.

part of the Australian delegation to the IAEA Board of Governors and General Conference meetings in September 2017, and contributed to the negotiation of the Safeguards Resolution ("Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards") which was agreed by consensus.

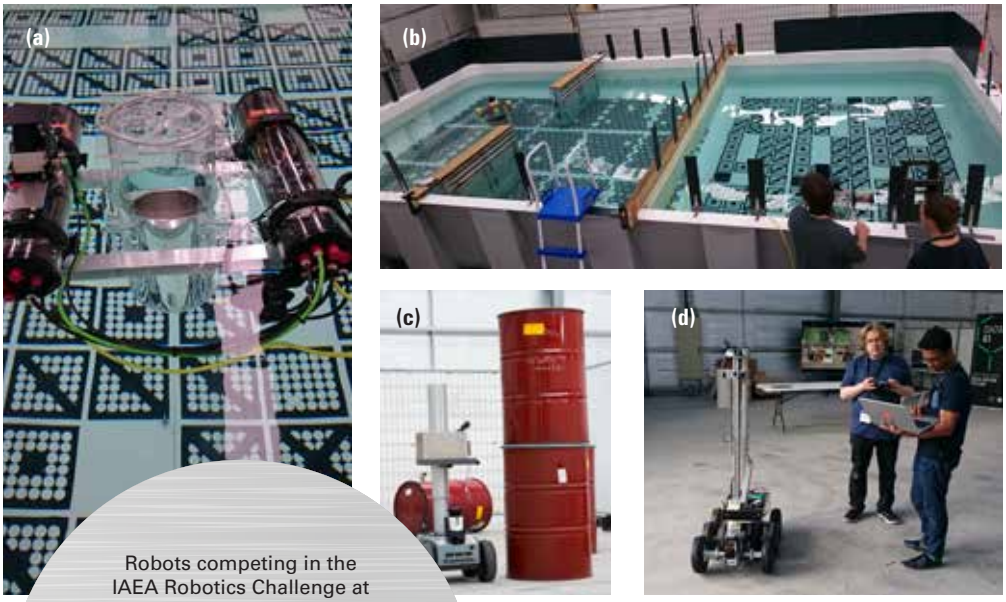
Australian Safeguards Support Program

The Australian Safeguards Support Program (ASSP), coordinated by ASNO, is one of 21 programs established by member States and the European Commission to assist the IAEA in safeguards research and development. Australia has one of the longest-running programs, having been in place since 1980.

Nuclear Inspection Robots and Other Emerging Technologies

In November 2017, Australia hosted the IAEA's Robotics Challenge, an event aimed at developing robotic systems to help inspectors perform repetitive inspection tasks more efficiently and consistently, particularly in areas of facilities that may be difficult to access. Automating these tasks could free up inspectors to concentrate more on other aspects of the safeguards mission and help the IAEA to cope with the ever-increasing volumes of nuclear material under safeguards.

The Robotics Challenge is one outcome of discussions among ASNO, CSIRO and the IAEA on opportunities for cooperation in the fields of robotics, 3D scanning, chemical identification and advanced analytics (reported in ASNO's Annual Report 2016-17).



Robots competing in the IAEA Robotics Challenge at CSIRO in Brisbane in November 2017: **(a)-(b)** unmanned surface vehicles for verifying spent fuel in ponds by recording images of radiation glow patterns, and **(c)-(d)** unmanned ground vehicles for verifying nuclear materials by identifying items of a specific geometry, recording ID tags, 3D scans, and carrying IAEA instrument payloads.

The challenge involved teams of robotics experts designing and building robots capable of performing specific inspection tasks. The Data61 innovation network of CSIRO constructed simulated nuclear facilities (no nuclear or radiological material was used) to test the robots at its site in Pullenvale, Brisbane.

Twelve teams of robotics experts from nine Member States brought their robots to CSIRO where they were required to navigate autonomously inside the simulated facilities and carry out inspection tasks in accordance with realistic experimental protocols. ASNO and the IAEA prepared a full report evaluating the robots based on the extent to which each one fulfilled the inspection scenarios during the challenge.

Two categories of robotic platforms were evaluated during the challenge: floating robots ("unmanned surface vehicles") for verifying spent fuel in ponds, and land-based robots ("unmanned ground vehicles") for verifying nuclear material in other forms of storage, such as uranium hexafluoride cylinders and dry casks.

The unmanned surface vehicles are designed to propel themselves autonomously across the surface of a spent fuel pond, while holding steady a device for measuring radiation glow patterns from spent nuclear fuel. During the challenge, these robots were tested in a swimming pool lined with images representing spent fuel assemblies.

The IAEA has now selected some of the unmanned surface vehicles for proof-of-concept testing in spent fuel ponds at real nuclear reactors (planned for FY 2018–19). Following proof-of-concept testing, the IAEA may award purchase agreements to the teams with satisfactory systems.

Robots tested during the IAEA Robotics Challenge at CSIRO in Brisbane in November 2017.

Separate from the Robotics Challenge, the CSIRO is also developing robots for surveying radioactive material in drum storage. These robots may have safeguards applications, including building maps of storage facilities, identifying the locations of nuclear material, characterizing that material, and verifying seals in otherwise inaccessible locations.

In addition, the IAEA and ANSTO have conducted a comparative test of IAEA and ANSTO imaging techniques for gamma rays. Gamma imaging systems can assist with surveying active areas by localising sources of radiation and performing radionuclide identification, while limiting exposure to personnel, particularly in areas that may have elevated radiation levels (e.g. inside hot cells, shielded storage, or reactor vessels).

Researchers at the School of Electrical Engineering and Telecommunications, University of New South Wales are evaluating the potential safeguards applications of blockchain (shared ledger) technology for nuclear material accounting. The technology is designed to ensure the consistency and immutability of electronic data held among multiple parties, which may prove useful for reporting inventories and transactions among nuclear operators, state regulatory authorities and the IAEA.

Helping detect undeclared nuclear activities using mass spectrometers

ANSTO's Centre for Accelerator Science participates in the IAEA Department of Safeguards Network of Analytical Laboratories (NWAL), providing bulk analysis of swipe samples. Recently, ANSTO's Accelerator Mass Spectrometry system has demonstrated world-leading sensitivity to trace levels of plutonium isotopes in environmental samples. Certain isotopes can be detected when less than 1000 atoms are present in the sample. During 2017–18, ANSTO has continued work to resolve an outstanding issue with detection of low levels of uranium. Significant progress has been made in identifying the source of naturally occurring uranium background in the system. ANSTO is currently participating in an IAEA and US Department of Energy sponsored inter-comparison exercise, with other NWAL members. Subject to favourable results from further testing, ANSTO expects to resume routine analysis for NWAL.

During the reporting period, a staff member from the University of Western Australia undertook a consultancy at IAEA's Safeguards Analytical Laboratories in Seibersdorf, Austria from August to December 2017. The aim of the consultancy was to evaluate the procedures and practices currently used by the micro-particle analysis team in the measurement of particles using LG-SIMS and associated technologies. Approaches to sample preparation, particle picking, data analysis and reporting were compared to approaches used by other NWAL labs.

Assessment of Proliferation Pathways

In 2017, IAEA commenced its first systematic review of the Physical Model since the early 2000s. The Physical Model is the IAEA's set of documentation that details the technology, possible diversion paths, proliferation indicators and emerging issues for each step of the nuclear fuel cycle. The IAEA Department of Safeguards uses the Physical Model in planning for inspections and in headquarters analysis.

ANSTO Minerals made a significant contribution to the updating of the chapter on uranium mining and milling. An ANSTO Minerals expert attended review meetings in Vienna on 21-25 August and 21-23 November and contributed his expertise between the two meetings.

ANSTO assisted in expanding the Physical Model sections from focussing on select processing methods to covering a greater range of processing routes, including recent developments for commercial production and on alternative sources of production, such as the recovery of by-products from other commodities. Images of mineral processing equipment were also included to help IAEA inspectors—who may have expertise in different stages of the nuclear fuel cycle—better understand mineral processing.

Open-source analysis of publications

With rising computational power, meta-analysis of data increasingly complements the IAEA's traditional in-field verification work. In particular, the field of natural language processing allows machines to learn rules for identifying when nuclear fuel cycle production activities are consistent with that declared by Member States as well as allow for the identification of potentially undeclared processing activities.

A student at the University of New South Wales is supporting IAEA capability in this this area through a Master of Engineering Science (Nuclear Engineering) dissertation. The final year project focusses on identifying discrete terms that can used to differentiate uranium from the mining of other minerals in open-source datasets and draws on Australian subject matter expertise in the minerals sector. By doing so, the project will help provide the IAEA with key sentences and paragraphs from literature, to help train their open-source analysis capability to quickly identify relevant publications related to this stage of the nuclear fuel cycle in very large datasets of open source publications.

ASNO is currently considering additional projects that can provide the IAEA with training text for other stages of the nuclear fuel cycle.

Proliferation Analysis Training

Since 2009, Australia has provided annual proliferation analysis training to IAEA safeguards staff to enhance their ability to analyse complex proliferation issues. Following the Proliferation Analysis Workshop in June 2017, the Office of National Assessments and the Australian Department of Defence worked to update course material and prepare for the eleventh workshop in July 2018.

Cooperation with other States Parties

ASNO has close and long-standing relationships with nuclear security and safeguards regulatory and policy agencies in several countries both in and outside the region. In the reporting period, ASNO signed a Memorandum of Understanding with the Korea Institute of Nuclear Nonproliferation and Control (KINAC) for the cooperation on nuclear safeguards and related matters in October 2017 augmenting this relationship. ASNO actively worked to maintain and strengthen relationships through both high-level and operational-level discussions and through projects under the Asia-Pacific Safeguards Network (APSN).

The 8th annual meeting of APSN was held in 30 October to 2 November 2017 in Busan, hosted by the Government of Korea and organised by KINAC. The Director General of Radiation Protection and Emergency Preparedness Bureau, NSSC, Mr Jae-Sik Uhm (APSN Chair) and Vice President KINAC, Dr Hosik Yoo co-chaired the meeting. The meeting was attended by 47 representatives from 16 regional countries including representatives from the IAEA and ESARDA. Cambodia joined the meeting as a member of APSN for the first time. Sri Lanka and Nepal attended the meeting as observers.

Australia coordinates the safeguards infrastructure, implementation and awareness-raising working group (WG1 of APSN). WG1 facilitated an information-sharing session on a range of safeguards implementation challenges and developments over the last year. This included a targeted discussion on emerging technologies and related safeguards challenges with APSN members gaining a better understanding of the IAEA safeguards developments, expectations and implications for their respective national programs.

During the last twelve months, assistance, expert advice and training were provided to various other professionals in a range of countries and international organisations. Presentations related to these activities are included in the list in Annex E.

Renewing agreement for nuclear safeguards and security cooperation between ASNO and KINAC.

8th Annual Meeting of Asia-Pacific Safeguards Network (APSN) Busan, South Korea, 30 October 2018.

IAEA Standing Advisory Group on Safeguards Implementation

DG ASNO chairs the IAEA Director General's Standing Advisory Group on Safeguards Implementation (SAGSI). Dr Floyd's appointment started with the 77th series of SAGSI meetings in 2013 and following his reappointment will continue in the role through 2018. SAGSI provides recommendations to the IAEA Director General on vital safeguards implementation issues. The Group currently comprises 18 international experts from 18 Member States. The members serve on the group in a personal capacity and not as representatives of their government or organisation. Each expert is invited to serve a three-year term, with the possibility of renewal. The Secretariat of SAGSI includes the IAEA Deputy Director General for Safeguards, and the Director, Division of Concepts and Planning.

SAGSI has two series of meetings each year, with each series usually comprising a working group meeting and a plenary meeting. During each series of meetings, SAGSI examines and provides advice on a list of safeguards implementation topics set by the IAEA Director General. One of the core topics examined over 2017–18 was the State specific factors related to State (and regional) systems of accounting for and control of nuclear material (SSACs) in the planning, conduct and evaluation of safeguards activities for each State.

Other core topics included: strategic planning and management of research and development priorities; lessons learned from implementing State-level safeguards approaches; strategies for coping with human and financial resource challenges with carrying out the Secretariat's safeguards mandate; planning for the 2018 Safeguards Symposium; and updating the Physical Model, which acts as a technical reference for safeguards implementation by describing each stage of the nuclear fuel cycle.

Output 1.5: CWC Implementation

Regulation and reporting of Australian chemical activities in accordance with the Chemical Weapons Convention (CWC), and strengthening international implementation of the Convention.

Performance Measures

- Australia's obligations under the CWC are met.
- Effective regulation of CWC-related activities in Australia, involving the chemical industry, research and trade.
- Contribute to strengthening CWC verification and implementation, including through cooperation with the Organisation for the Prohibition of Chemical Weapons (OPCW) and with CWC States Parties.
- Contribute to enhancing regional CWC implementation through targeted outreach.

Performance Assessment

Meeting CWC Obligations

ASNO maintained Australia's strong record of performance in meeting its CWC obligations. Comprehensive and timely annual declarations and notifications were provided to the OPCW via its Secure Information Exchange portal as follows:

- Article VI declaration of anticipated activities at six CWC-Scheduled chemical facilities during 2018 (declared in September and October 2017);

OPCW inspectors together with ASNO and Defence representatives during a routine CWC inspection at Defence Science and Technology Group, Victoria, November 2017.

- Article VI declaration of imports and exports of CWC-Scheduled chemicals and of past activities at 35 facilities with CWC-relevant chemical production, processing or consumption activities during 2017 (declared in March 2018);
- Article X, paragraph 4, declaration of Australia's national programs for protection against chemical weapons during 2017 (declared in April 2018);
- responses to OPCW Third Person Notes including routine clarification of the operational status of declared chemical plants; and
- responses to OPCW notifications and amendments/corrections to inspector details and deletions or additions to the OPCW inspectorate.

Since 1997, the OPCW has conducted 56 Article VI routine inspections at declared chemical plants and a Defence protective purposes laboratory in Australia in accordance with the provisions of the CWC. In the current reporting period, ASNO facilitated three routine OPCW inspections including its 10th inspection of Australia's Schedule 1 Facility for protective purposes (13-17 November 2017) since 1997. Two further inspections were conducted sequentially at declared 'Other Chemical Production Facilities' (OCPFs) in Victoria and New South Wales, respectively, from 30 April to 4 May 2018.

All inspections proceeded smoothly and received excellent support and cooperation from government and industry. The OPCW inspection team verified Australia's declarations, including the absence of any undeclared CWC-Schedule 1 chemical production, in accordance with the inspection mandates.

On-line reporting by regulated chemical facilities and import permit holders, in accordance with their statutory obligations, enabled ASNO's preparation of Australia's declaration of past and anticipated chemical activities to the OPCW.

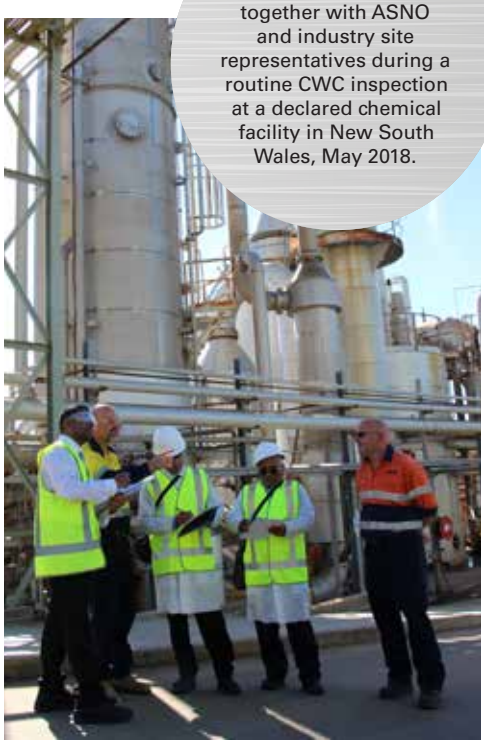
Legislation and Regulation

The permit systems, under the *Chemical Weapons (Prohibition) Act 1994* (CWP Act) and Regulation 5J of the Customs (Prohibited Imports) Regulations 1956, continued to operate well. Table 15 provides statistics for the permits issued to facilities producing, processing or consuming CWC-Scheduled chemicals during the current reporting period. Thirty-two facility permits were in effect at 30 June 2018.

One permit was issued in 2017–18 for the import of a CWC-Schedule 1 chemical for use as a standard for an OPCW biotoxin confidence-building exercise. Of the 63 permits issued for importers of CWC-Schedule 2 and 3 chemicals, nine of these were for new importers. ASNO obtained Border Integrity Checks from Australian Border Force, as necessary, prior to issuing permits for new importers of CWC-Scheduled chemicals.

ASNO provided a submission (dated 7 September 2017) to Defence Export Controls (DEC) in response to Public Consultation on proposed amendments to Regulation 13E of the Customs (Prohibited Exports) Regulations 1958. ASNO's comments and proposals related to provisions on export controls that support the effective implementation of the CWC and ASNO's roles and responsibilities as the National Authority for the CWC.

ASNO worked closely with the Australian Border Force and the Australian Bureau of Statistics to update the Import Tariff Codes and the Australian Harmonized Export Commodity Classification (AHECC) codes based on the sixth revision of the International Convention on the Harmonized Commodity Description and Coding System (commonly referred to as the Harmonized System) since its introduction on 1 January 1988. The 2017 Edition of the WCO Harmonised System Nomenclature commenced on 1 January 2017, affecting many of the chemicals listed under the CWC.



OPCW inspectors together with ASNO and industry site representatives during a routine CWC inspection at a declared chemical facility in New South Wales, May 2018.

Cooperation with the OPCW and CWC States Parties

ASNO has continued to support OPCW initiatives and has worked with other States Parties to encourage effective implementation of the CWC.

ASNO provided responses to the following OPCW surveys and requests for information to assist the OPCW to enhance verification measures under the CWC and to share best practices that promote a chemical security culture in States Parties as part of chemical counter-terrorism efforts:

- Survey on the Production of Discrete Organic Chemicals via Biomediated Processes (15 August 2017);
- Survey on the Implementation of National Measures regarding the collection and declaration of import and export data for Schedule 2 and 3 chemicals (15 September 2017);

TABLE 15 Permits for CWC-Scheduled Chemical Facilities

CWC-SCHEDULED CHEMICALS	CWP ACT 1994	PERMIT TYPE	PERMITS AT 30 JUNE 2018[40]	NEW PERMITS 2017–18	RE-ISSUED PERMITS 2017–18	PERMITS CANCELLED[41] 2017–18
Schedule 1	s19(4)	Production (Protective)	1	0	0	0
	s19(5)	Production (Research)	9	0	1	0
	s19(6)	Consumption	11	0	0	0
Schedule 2	s18(1)	Processing	8	1	2	1
Schedule 3	s18(1)	Production	3	0	3	0

40 Permit numbers include new, existing and renewed permits.

41 Permits were cancelled due to company mergers and site relocations.

- Questionnaire about the next version of the Electronic Declarations tool for National Authorities (10 October 2017);
- Voluntary submission of potentially declarable OCPF plants sites in Australia (7 December 2017). ASNO investigations resulted in no new declarable chemical facilities;
- Preparations for developing the second edition of a Needs and Best Practices Report included a Compilation of Tools, Guidance and Best Practices in Chemical Safety and Security Management in Australia (1 May 2018); and
- Request for nominations for the OPCW's Advisory Board on Education and Outreach, ASNO submitted eight Australian nominations to the OPCW (31 May 2018), taking into account their qualifications, experience, publications, academic and professional activities.

ASNO provided technical advice and contributed to policy development in preparation for OPCW Executive Council meetings, industry cluster meetings and informal consultations in The Hague. For example, ASNO:

- actively participated in the 19th Annual Meeting of National Authorities of CWC States Parties in The Hague from 22-24 November 2017, which included a break-out session of the Western Europe and Other States (WEOG) group. More than 178 participants from 137 States Parties attended the Annual Meeting which explored issues to further the effective implementation of the CWC such as: cooperation and engagement with chemical industry; identification of declarable activities; resolving discrepancies in cross-border transfer of scheduled chemicals; receiving inspections; capacity building programmes for national implementation; assistance and protection against chemical weapons; and cooperation for economic and technological development;
- attended the 22nd Conference of the States Parties to the CWC held from 27 November to 1 December 2017; various bilateral side meetings with the OPCW and other States Parties; and the side-event on Central Nervous System-Acting Chemicals jointly hosted by Australia and Switzerland;
- provided advice on issues being considered by the meetings of the OPCW Open-Ended Working Group on Future Priorities to discuss and formulate recommendations to be considered at the Fourth Review Conference in November 2018; and
- contributed to drafting seven statements by Australia, Canada and New Zealand delivered at the meetings of the Open-Ended Working Group for the Preparation of the Fourth Review Conference.

In efforts to enhance analytical skills capacity in ASEAN and South Asian Association for Regional Cooperation (SAARC) countries, ASNO worked with the OPCW and with DST Group, to host an OPCW Analytical Skills Development Course held from 4-15 December 2017 in Melbourne – the first of its kind in the southern hemisphere. Melbourne University/RMIT and Agilent Technologies assisted DST Group in delivering the course which covered the analysis of chemical warfare agents in accordance with the provisions of Articles X (economic and technological development) and Article XI (assistance and protection against chemical weapons) of the CWC. Analytical chemists attending the course came from Bangladesh, India, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Vietnam. It is hoped that the course will have enhanced capacity by regional countries to nominate as OPCW designated laboratories for the analysis of environmental samples.

We note that DST Group maintained its designation as an OPCW laboratory for the analysis of biomedical samples.

Course organisers from DST Group and the OPCW with John Kalish (AS ASNO), and participants from ASEAN and SAARC countries at the OPCW Analytical Skills Development Course, Melbourne, December 2017.

Dr John Kalish, a/g Director General, ASNO (pictured centre back row) delivered opening remarks to participants emphasising that the course "not only builds regional capacity but can have a multiplier effect in broadening the pool of experts that the OPCW and National Authorities can draw upon in the future." Dr Josy Meyer, Director, CWC Implementation Section, ASNO, presented on the "Role of Australia's National Authority in the Implementation of the Chemical Weapons Convention".

ASNO identified Australian subject matter experts to attend, and assisted in preparing presentations for, OPCW-hosted international conferences and meetings where lessons learned on the adoption of CWC legislation, chemical management, chemical security/safety, and analysis of samples, respectively, were shared with participants from States Parties. Some with OPCW support, the following participants attended a range of international meetings held in Qatar, The Netherlands, Finland, Cambodia and France as described below:

- Ms Kathryn Walton, Regulatory Policy Manager, Chemistry Australia - Australia's peak industry body - and Mr Nathan Goldstein, Second Secretary, Australian Embassy, Doha, attended the Fourth Annual Meeting of Chemical Industry Representatives and National Authorities of States Parties to the CWC held in Doha from 17-19 October 2017. Australia actively participated in break-out sessions which focussed on issues such as: chemical terrorism and emerging threats; industry outreach; declaration review; and the recommendations of the OPCW Scientific Advisory Board's Temporary Working Group on Verification.
- Ms Alexandra Norris, Office of International Law, Attorney-General's Department, presented at the Stakeholders Forum for States Parties in Asia on the Adoption of National CWC Implementing Legislation held in The Hague from 13-15 November 2017. Australia, together with Bangladesh, Japan and Jordan, shared their experiences

Participants at the Stakeholders Forum for States Parties in Asia on the Adoption of National Implementing Legislation of the CWC, The Hague, November 2017.

and lessons learned from enacting CWC implementing legislation. Based on statistics as of July 2016, out of 53 States Parties in Asia, 13 had yet to adopt legislation, while 10 had legislation covering only some of the initial measures. The key outcome was the development of roadmaps towards adoption of national CWC implementing legislation for target States Parties, including Timor Leste.

- Dr Craig Brinkworth, DST Group, attended an International Workshop on Analysis of Chemical Warfare Agents to mark the 20th Anniversary of the CWC held at VERIFIN in Helsinki from 11-13 December 2017. Topics included the New Blue Book 2017 and analysis of biomedical samples, toxins and Central Nervous System-Acting chemicals. Dr Brinkworth also attended discussions at the OPCW from 19-21 June 2018 to exchange experiences and best practices covering all aspects of the environmental and biomedical OPCW Proficiency Tests and the biotoxin exercise.
- Dr Harry Rose, DST Group, attended the Seminar on Chemical Safety and Security Management for CWC Member States in the Asia Group which was held in Doha from 26 to 28 February 2018. Dr Rose spoke on 'Management of Highly Toxic Chemicals: Perspectives from Australia's Defence Science and Technology Group' to an audience of fifty-three. Participants shared their views on: new approaches to various aspects of chemical safety and security; the development of national policy and legislation on chemical safety and security management including risk management; the role of academia in chemical processes safety management; vulnerability assessment; and toxic waste management.
- Mr Bernard Lee, Director Policy and Regulation, Chemistry Australia, presented on Australia's experiences at an OPCW Seminar on Chemical Safety and Security Management for CWC Member States held in Siem Reap from 7-9 May 2018. Thirty-seven participants attended from 13 States Parties in the Asia Group plus Australia. Topics included: new approaches to chemical safety and security risk management; the crucial role of industry associations in chemical processes and safety management; and chemical threat reduction.
- Dr Genevieve Dennison, DST Group, presented on 'Chemical Security for Australia's Chemical Facilities' at the Australia Group (AG) Plenary meeting held in Paris between 4-8 June 2018.

Chemical safety and security specialists from Asia at the Seminar on Chemical Safety and Security management for OPCW Member States, Qatar, February 2018.

- Representatives from the Australian Defence Force, the Department of Home Affairs, Queensland Police Service and The Hague Embassy, attended the OPCW's inaugural Conference on Countering Chemical Terrorism held in The Hague between 7–8 June 2018. Experts and practitioners in the field of counter-terrorism from government, international organisations, industry, academia and civil society examined the threat posed to international security and to the CWC by chemical terrorism and considered approaches to preventing and responding to non-State actor use of chemical weapons.

Dr Robert Mathews, former DST Group staff member, in his capacity as a previous OPCW-The Hague Award laureate, participated in an international symposium on Medical Treatment of Chemical Warfare Victims convened from 28 to 29 June 2018 in The Hague. A Symposium Declaration was produced with recommendations on how victims of chemical weapons could be supported by the OPCW and by the International Support Network for Victims of Chemical Weapons.

Australia recognises the important role of the Scientific Advisory Board (SAB) in advising the Director-General, OPCW, on scientific and technological advancements that impact the CWC. During the current reporting period, ASNO made a voluntary contribution to the SAB Trust fund to support the work of the SAB's Temporary Working Group on Investigative Science and Technology, chaired by Australian expert Dr Veronica Borrett.

Domestic Outreach

ASNO continued its close cooperation on CWC implementation issues with relevant Government agencies including the Department of Home Affairs; Defence Export Controls (DEC); Australian Border Force; Australian Bureau of Statistics; the National Industrial Chemicals Notification and Assessment Scheme; the Australian Pesticides and Veterinary Medicines Authority; and the Attorney General's Department. ASNO discussed the CWC with DEC staff in November 2017, clarifying CWC obligations for exports of CWC-Scheduled chemicals and also participated in meetings of the Network of Regulatory Scientists held in Canberra. Members at these meetings discussed a range of issues and challenges faced by regulatory authorities.

To assist ASNO in meeting its CWC reporting obligations and to ensure compliance with CWC-relevant legislation, ASNO also continued to strengthen engagement with its constituency in industry, research and trade, including with non-Government agencies and associations including Chemistry Australia and The Royal Australian Chemical Institute.

Output 1.6: CTBT Implementation

Development of verification systems and arrangements in support of Australia's commitments related to the Comprehensive Nuclear-Test-Ban Treaty.

Performance Measures

- Australia's obligations under the Comprehensive Nuclear-Test-Ban Treaty (CTBT) are met.
- Legal and administrative mechanisms which support Australia's commitments related to the CTBT are effective.
- Contribute to the development of CTBT verification, including through the work of the CTBT Organization (CTBTO) Preparatory Commission.
- Contribute to Australia's CTBT outreach efforts.

Performance Assessment

International Obligations

Of the 21 facilities that Australia will host for the CTBT International Monitoring System (IMS), 20 are in place and certified as operating to CTBTO technical specifications.

Work on the final facility to be established, an infrasound monitoring station at Davis station, Australian Antarctic Territory, was completed in early 2018. Testing to certify that the station meets CTBT requirements, is underway. The station should come fully into operation in late 2018, completing Australia's segment of the IMS.

The uninterrupted operation of Australia's IMS stations is a routine focus for ASNO. During the year, ASNO has been working with the CTBTO and Western Australian Government agencies to reduce the risk of accidental damage to the seabed cable that brings to shore data from the Cape Leeuwin hydrophone array. ASNO is working also with ARPANSA and the Australian Antarctic Division to ensure that the redevelopment of facilities on Macquarie Island has minimal impact on the operation of the IMS radionuclide monitoring facility on the island.

Legal and Administrative Measures

ASNO administers funding for Geoscience Australia to carry out nuclear test monitoring through its network of seismic stations. This arrangement, set out in a Letter of Understanding between Geoscience Australia and ASNO that is reviewed each year. ASNO is satisfied that Geoscience Australia has met its requirements under the Letter of Understanding during the reporting period. ASNO and Geoscience Australia again reviewed the arrangement in 2018, concluding that current arrangements remain adequate for Australia's requirements.

The operation of a National Data Centre (NDC) to verify an in-force CTBT will require additional activities. ASNO, ARPANSA and Geoscience Australia, together with the Department of Defence, continue to hold the question of Australia's future NDC requirements under review.

Nuclear-Test-Ban Verification

On 3 September 2017, the DPRK announced that it had conducted its sixth nuclear test explosion, stating that it tested a thermonuclear weapon (hydrogen bomb). Seismic waves from the test were detected by the CTBT's nuclear test monitoring infrastructure, including in Australia.

Geoscience Australia identified and promptly notified ASNO of an explosive event occurring at approximately 1330 AEST on 3 September in the vicinity of the P'unggye-ri nuclear test site in north-eastern DPRK, the site

of all declared previous tests. Analysis by GA of the seismic event over the following few hours confirmed that this test was the largest test conducted to date. Using data from 39 seismic stations of the International Monitoring System (IMS), including 3 Australian stations and complemented by data from other non-IMS networks, GA derived an explosive yield estimated between 150 – 240 kT and a location estimated at some 550m SW of the September 2016 test location.

This estimated yield for this test is significantly larger than previous such tests, suggesting that a different weapon design was tested - as claimed by the DPRK. Despite the claim to have tested a Hydrogen bomb, it may have only been a boosted fission weapon rather than two-stage thermonuclear weapon design.

Previously, the DPRK announced in 2006, 2009, 2013, January and September 2016 that it had conducted nuclear tests. The table below sets out details. It is likely, that this series of tests has helped the DPRK to refine its warhead design and reduce its size, likely to enable delivery with a ballistic missile.

Table 16 DPRK nuclear test explosions

DATE	APPROXIMATE SEISMIC MAGNITUDE	ESTIMATED EXPLOSIVE YIELD (KT)	COMMENT
9 October 2006	mb 3.9	< 1	Likely partial failure
25 May 2009	mb 4.56	1 - 5	Seismic detection consistent with a simple fission device
12 February 2013	mb 4.93	3 - 13	Seismic detection consistent with a simple fission device
6 January 2016	mb 4.83	2.5 - 10	Claimed by DPRK to be test of a "hydrogen bomb". Seismic detection consistent with a simple fission device.
9 September 2016	mb 5.06	4.4 - 19	Seismic detection consistent with a simple fission device
3 September 2017	mb 6.05 (plus a series of aftershocks over the following few months)	150-240	Seismic detection consistent with a more advanced weapon design – potentially thermonuclear as claimed by DPRK

Australian Participation in CTBTO verification development activities

The CTBTO Preparatory Commission, including its member states, continue to carry out work to ensure the treaty's verification regime will be ready to meet requirements in the CTBT when the treaty enters into force. ASNO coordinates and contributes to Australia's specialist support for this work, which is focused mainly on meetings of the CTBTO's Working Group B. Experts from Geoscience Australia and ARPANSA contribute mainly in relation to ongoing development of the CTBT's IMS and IDC.

When the CTBT enters into force, it will provide for on-site inspections (OSI) to determine whether a nuclear explosion has taken place in a particular area. ASNO's Malcolm Coxhead, as Task Leader for the elaboration of an Operational Manual on the conduct of OSI, continued to chair discussions on this subject at the CTBTO Preparatory Commission's technical working group.

During the reporting period, four Australians participated in CTBTO training activities in relation to their function as operators of IMS stations. ANSTO's Alison Flynn is participating in regular events as part of a three-year program to train future specialists to conduct OSI under the CTBT. ASNO coordinates the involvement of Australians in this training.

While around 90 per cent of CTBT IMS stations are now in place worldwide, detailed preparatory work is continuing to bring the IMS and International Data Centre to a good level of readiness. ASNO coordinates Australia's contribution to the CTBTO's work in this area, working with technical specialists from Geoscience Australia and ARPANSA.

Outreach

ASNO's Malcolm Coxhead participated in the Japanese hosted Regional Conference for States in the South East Asia, the Pacific and the Far East (SEAPFE) Region for the CTBT in Tokyo on 27 July 2017. At the invitation of the Japanese Ministry of Foreign Affairs, Mr Coxhead led the first of the conference's two working sessions focusing on CTBT verification and civil and scientific uses of IMS data. The meeting was a valuable opportunity to encourage CTBT signature/ratifications by SEAPFE states yet to do so and discuss and inform CTBT-relevant issues.

A fundamental requirement for an effective CTBT will be the ability of States Parties to form sound technical judgements about the nature of events detected by the IMS. Australia continues to work with and alongside the CTBTO to promote relevant technical capacity in the National Data Centres of signatory states.

Engaging the next generation of nuclear specialists in the CTBT and nuclear disarmament. ASNO's Malcolm Coxhead speaks at a symposium on the CTBT at Tokyo Institute of Technology (28 July 2017).

Output 1.7: Other Non-Proliferation Regimes

Contribution to the development and strengthening of other weapons of mass destruction non-proliferation regimes.

Performance Measures

- Provide support and assistance to Australia's Permanent Mission to the Conference on Disarmament (CD) in Geneva in their efforts to advance Australia's non-proliferation and disarmament objectives, in particular, on seeking to commence the negotiation of an internationally verifiable Fissile Material Cut-off Treaty (FMCT).
- Support other developments in the field of non-proliferation and disarmament that are relevant to Australia's interests.

Performance Assessment

Fissile Material Cut-off Treaty

A ban on the production of fissile material for use in nuclear weapons would complement the CTBT and work to constrain the size of nuclear arsenals. An effectively verifiable Fissile Material Cut-Off Treaty (FMCT) has the potential to deliver substantial benefits for the security of all States, furthering the twin goals of nuclear disarmament and nuclear non-proliferation. The term "fissile material" refers to kinds of nuclear material that are capable of being used in a nuclear weapon.

Director General ASNO led Australia's contribution to a successful outcome of the High-Level Expert Preparatory Group (EPG) for an FMCT, which met in two two-week sessions in 2017–18 to consider and make recommendations on substantial elements of a future treaty. The EPG report builds on the report of the 2014-15 Group of Governmental Experts on an FMCT, in which Australia participated. Together, these reports lay out detailed proposals and options for a future FMCT and address related pros and cons. The consensus EPG outcome provides a practical compendium of possible treaty elements for when negotiations on a treaty may start.

Dr Robert Floyd (DG ASNO) led for Australia in the work of the High-Level Expert Preparatory Group on a Fissile Material Cut-Off Treaty.

Dr Robert Floyd (DG ASNO) co-chairs IPNDV's Working Group 5 – examining procedures to verify nuclear weapons reductions.

While there remain significant challenges before such negotiations can commence, a FMCT remains a next logical step in progressing global nuclear disarmament, and continues to be one of Australia's priority nuclear disarmament objectives.

ASNO continued during the year to provide expert support for Australia's efforts to build momentum in the Conference on Disarmament towards the commencement of negotiations on an FMCT.

International Partnership for Nuclear Disarmament Verifications (IPNDV)

Future steps in nuclear disarmament will pose significant verification challenges. Success in addressing these future challenges will require the development and application of new technologies or concepts, and all States have an interest in the success of these efforts.

In November 2017, IPNDV began its second two-year work phase, broadening its focus on verifying the physical dismantlement of a nuclear explosive device to encompass related steps, beginning with removal of a nuclear warhead from its delivery vehicle and ending with the processing of the removed fissile material to bring it under IAEA safeguards. DG ASNO co-chairs IPNDV's Working Group 5, which examines the related verification procedures.

In the current work phase, IPNDV's Working Group 4 is undertaking an examination of approaches for verifying declarations a state may make about its nuclear weapons as a precursor to their potential dismantlement. IPNDV's Working Group 6 continues to examine technology requirements to support the work of IPNDV. Australian experts have contributed to all three groups.

Because developing new monitoring and verification technologies and mechanisms will require sustained resources and commitment, the work initiated by the International Partnership will be a long-term effort.

Other

ASNO contributes routinely to Australia's efforts to strengthen international non-proliferation efforts by providing advice and input to DFAT to help shape the NPT PrepCom process.

Output 1.8: Advice to Government

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

Performance Measures

- Provide policy advice, analysis and briefings that meet the needs of Ministers and other key stakeholders.
- Contribute to the development of Australia's policies by DFAT in the area of WMD arms control, disarmament and non-proliferation.
- Cooperate on technical issues of common interest with departments and agencies such as ANSTO, ARPANSA, Department of Defence, Department of Industry, Innovation and Science and the Australian Intelligence Community.

Performance Assessment

ASNO's role in providing independent expert advice

ASNO continues to provide independent expert advice on various non-proliferation policy and regulatory issues. In this regard, ASNO's remit is supported by s43(d) of the *Nuclear Non-Proliferation (Safeguards) Act 1987*, which states that one of the functions of the Director General is "to undertake, co-ordinate and facilitate research and development in relation to nuclear safeguards."

ASNO continued its work on providing advice to the Department of Industry, Innovation and Science's national radioactive waste management project. This included advice on nuclear security and safeguards requirements for:

- the *National Radioactive Waste Management Framework, published April 2018*[42];
- National Radioactive Waste Management Facility factsheets[43];
- the Waste Acceptance Criteria Working Group; and
- safeguards by design support to the work of ANSTO on the detailed engineering design for the facility.[44]

ASNO also continued providing expert advice to the South Australian Environment Protection Authority UOC Steering Committee and Transport Working Group, providing industry leading best practice outcomes.

42 Available at: http://www.radioactivewaste.gov.au/site-selection-process/key-documents-and-faqs

43 Available at: http://www.radioactivewaste.gov.au/site-selection-process/key-documents-and-faqs

44 ASNO is working with ANSTO to ensure the engineering designs for the facility can meet requirements to facilitate ongoing IAEA verification while seeking to minimise costs associated with verification.

Output 2.1: Public Information

Provision of public information on the development, implementation and regulation of weapons of mass destruction in non-proliferation regimes, and Australia's role in these activities.

Performance Measures

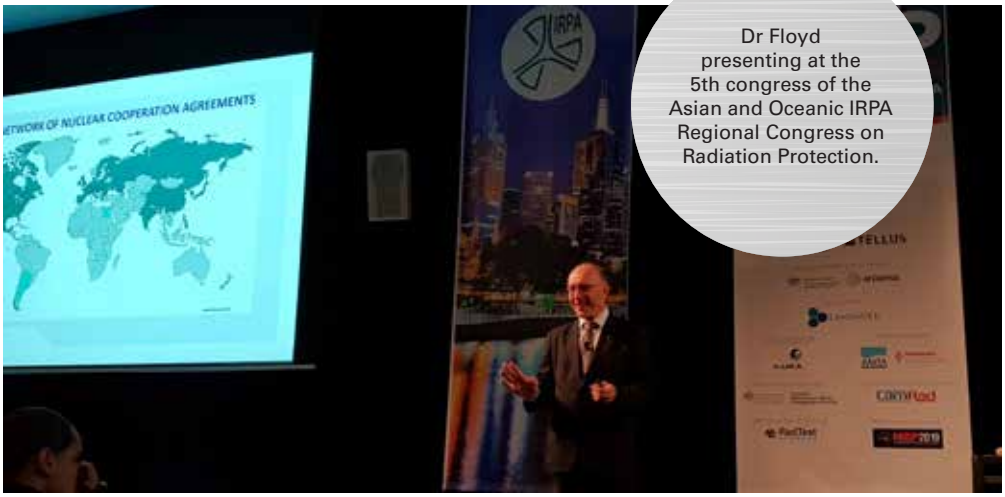
- Effective public education and outreach.

Performance Assessment

ASNO works to ensure Australia's WMD non-proliferation objectives are widely understood in the public, private, non-government and academic sectors. ASNO routinely provides different presentations and training activities as part of its outreach activities. ASNO also attends peak industry forums and conducts on-site outreach visits. In 2017–18, ASNO supported public information and outreach activities through attendance and discussions held at the:

- 5th congress of the Asian and Oceanic IRPA Regional Congress on Radiation Protection (AOCRP) held on 21–23 May 2018. DG ASNO delivered a presentation titled "Global Nuclear Non-Proliferation and Nuclear Security Regime - Implications for the Indo-Pacific Region". ASNO also gave presentations titled "IAEA Advisory Services - Australia's follow-up IPPAS mission" and "The IAEA Robotics Challenge – Developing Robots to Assist Safeguards Inspectors". The Congress also provided the opportunity for ASNO to make contact with a number of permit holders to discuss regulatory matters and those potentially requiring permits in the future; and
- Australasian Institute of Mining and Metallurgy (AusIMM) International Uranium conference in Adelaide, June 2018.

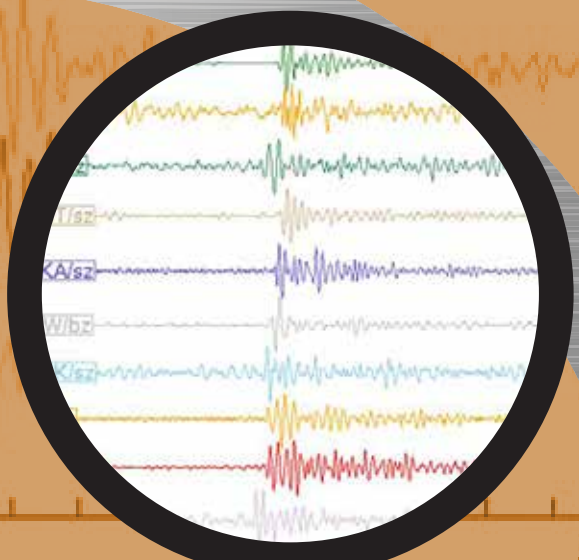
ASNO also organised a "Roundtable on Nuclear Disarmament Verification" on 22 February 2018 at the Australian National University, together with the Coral Bell School of International Relations and DFAT's Nuclear Policy Section. Presentations reviewed the work of the International Partnership for Nuclear Disarmament Verification and examined prospects for related initiatives such as the 2018-19 UN Group of Government Experts on Nuclear Disarmament Verification.



Dr Floyd presenting at the 5th congress of the Asian and Oceanic IRPA Regional Congress on Radiation Protection.

SECTION 5

Output Management and Accountability



Corporate Governance

Portfolio Minister

Responsibility for administration of the legislation under which ASNO operates – *the Nuclear Non-Proliferation (Safeguards) Act 1987*, *Chemical Weapons (Prohibition) Act 1994* and *Comprehensive Nuclear-Test-Ban Treaty Act 1998* – rests with the Minister for Foreign Affairs.

Director General ASNO

The Director General ASNO reports directly to the Minister for Foreign Affairs. The position combines the statutory offices of the:

- Director of the national authority for nuclear safeguards (formerly Director of Safeguards), as established by the *Nuclear Non-Proliferation (Safeguards) Act 1987;*
- Director of the national authority for the Chemical Weapons Convention, as established by the *Chemical Weapons (Prohibition) Act 1994; and*
- Director of the national authority for the Comprehensive Nuclear-Test-Ban Treaty, as established by the *Comprehensive Nuclear-Test-Ban Treaty Act 1998*.
- The Director General ASNO is a statutory position, appointed by the Governor-General. Remuneration for this position is determined by the Remuneration Tribunal.

Dr Robert Floyd was reappointed as the Director General ASNO on 6 December 2015 for a period of five years.

Assistant Secretary ASNO

The Assistant Secretary ASNO deputises for the Director General and is responsible for the day-to-day operations of the office. Dr John Kalish has held this position since 21 April 2010.

ASNO Staff

ASNO has a small core of staff whose day-to-day activities are overseen by the Director General. ASNO staff are employed under the *Public Service Act 1999* as a division within the Department of Foreign Affairs and Trade (DFAT). ASNO staff, other than the Director General, are also employed under the DFAT Enterprise Agreement. Further details can be found in Table 17 and the DFAT Annual Report 2017–18.

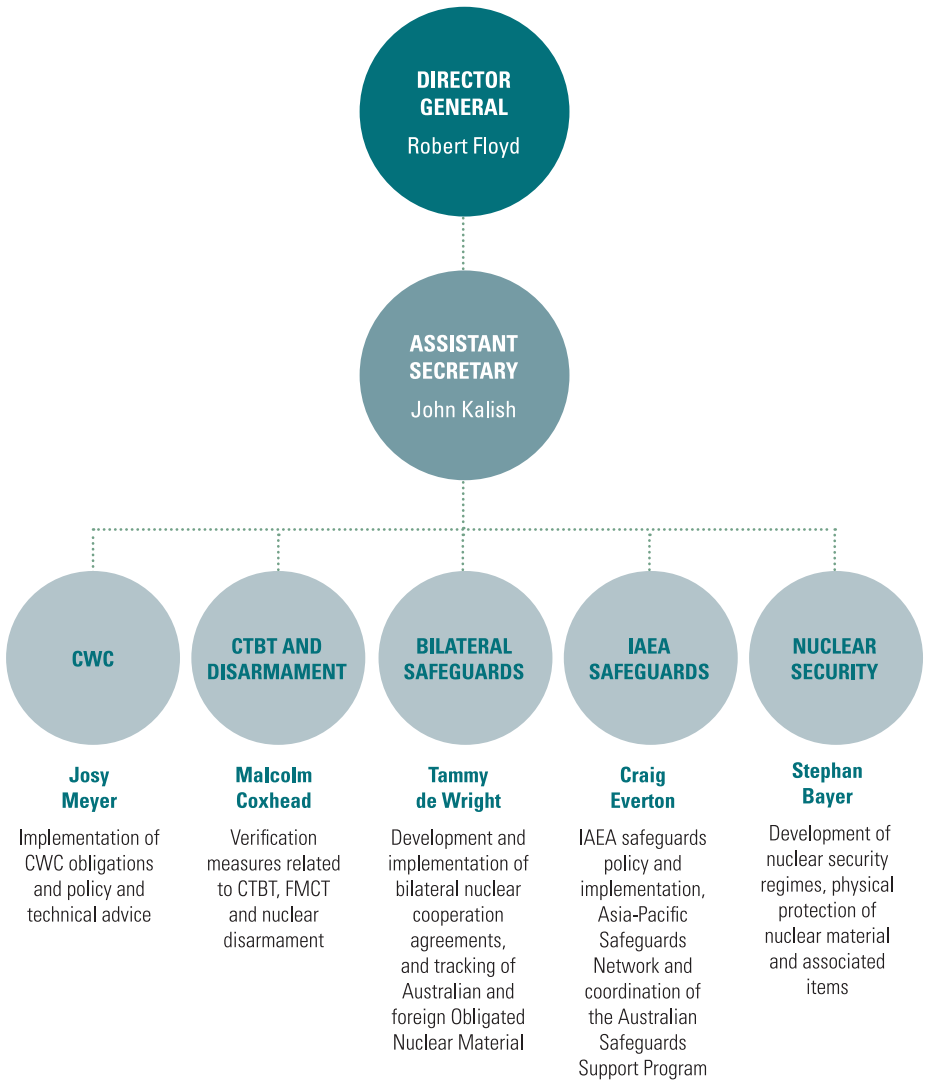
In 2017–18 ASNO had an allocated staff level of 18 FTE.

ASNO's organisational structure is closely aligned with the outputs and can be found in Figure 4.

TABLE 17 ASNO Staff at 30 June 2018

	MALE	FEMALE	TOTAL
SES B2	1	0	1
SES B1	1	0	1
Executive Level 2	3	2	5
Executive Level 1	3	2	5
APS Level 6	2	2	4
APS Level 5		2	2
APS Level 4			0
TOTAL	10	8	18

Figure 4 ASNO's Organisational Structure at 30 June 2018



Training and Development

ASNO's primary training requirements are professional development of specialist skills. ASNO is proactive in managing this training, in part through participation in IAEA and OPCW led training courses and participation in international conferences and negotiations. Further details are in Table 18.

Table 18 Training and Development Activities during 2017–18

TRAINING AND DEVELOPMENT ACTIVITY	PERSON DAYS
Formal DFAT courses	31
Structured work unit and on-the-job training, including planning days	43
Seminars, workshops, conferences, overseas negotiations and IDCs	96
External formal courses	50
Academic study	0
Other (IAEA Consultancy)	11
TOTAL	231

Financial Management

The *Audit Act 2001* requires ASNO to submit an annual Financial Statement to the Auditor-General. As ASNO is funded as a division of DFAT, this financial statement is published in the DFAT Annual Report. Further details of ASNO activities relating to financial management and performance are also contained in the DFAT Annual Report.

Administrative Budget

Table 19 ASNO Administrative Costs

		2016-17	2017–18
Salaries		2 301 536	2 209 755
Running Costs	General	703 073	676 094
	Seismic monitoring[45]	573 016	566 513
	Sub-Total	1 276 089	1 242 607
TOTAL		$3 577 625	$3 452 362

45 Undertaken by Geoscience Australia.

Regulatory reform

As a portfolio regulator with the Department of Foreign Affairs and Trade, in 2017–18 ASNO completed its third year of participation in the Government's Regulator Performance Framework.

The Government developed the Framework to measure the performance of regulators in regards to reducing the cost to business of managing regulatory requirements. The goal of the program is to measure and report performance that will give business, the community and individuals confidence that regulators effectively and flexibly manage risk.

The Framework consists of six outcomes-based key performance indicators (KPIs) covering the reduction in regulatory burden, communications, risk-based and proportionate approaches, efficient and coordinated monitoring, transparency, and continuous improvement. Within the Framework and mandatory KPIs, ASNO originally devised a set of 12 metrics against the six KPIs. However, lessons learned have allowed ASNO to refine metrics to the seven outlined in Table 20 below, that will not only enable effective reporting under the RPF, but also streamline our information collection and reporting process. The more concise set of metrics will lead to clearer, targeted reporting that will highlight the areas where ASNO believes regulatory reform success can be gained.

Table 20 ASNO Regulatory Performance Framework Metrics 2017–18

Timely processing of permit applications and approvals.
Regulations and permits conditions are reviewed for clarity and suitability.
Implement risk informed regulatory program.
Establish streamlined compliance and inspection processes.
Outreach activities conducted to communicate regulatory requirements to stakeholders and receive feedback.
Meetings attended to influence international policy.
Engagement with other regulators to explore opportunities for regulatory efficiencies.

A critical objective for ASNO is to enable strong and effective regimes against the proliferation of nuclear and chemical weapons. We achieve this with a committed focus on international engagement to influence the global frameworks under which Australian business must operate. With a high-level understanding of Australia's non-proliferation obligations, ASNO has progressed with implementing strategies for streamlining engagement with nuclear and chemical permit holders.

ASNO continues to take advantage of the redevelopment of the nuclear database and associated permit holder portal to streamline permit holder reporting requirements and eliminate any unnecessary regulatory burden. Roll out of stage 1 of the nuclear database was completed by the end of the reporting period. The database is supplemented by a new, secure, web-based portal through which the permit holders can update their inventory and complete their annual reporting obligations to ASNO. ASNO staff continue to actively support permit holders during this transition period via ASNO's group phone, emails, in person, and even through the portal itself.

ASNO has continued to collect against our metrics for the processing time for completed permit applications, as can be seen in Table 21. The number of permits processed is too low for a useful statistical comparison with 2016-17, particularly given the diverse nature of the businesses and organisations that hold or use nuclear material or scheduled chemicals. However, ASNO's timelines in processing permit applications and approvals are comparable to the previous year with slightly more permits being processed during 2017-18. ASNO's efficient turn-around supports business by allowing them to complete undertakings that involve controlled material, equipment and facilities.

Table 21 Processing of permits and approvals July 2017 – June 2018

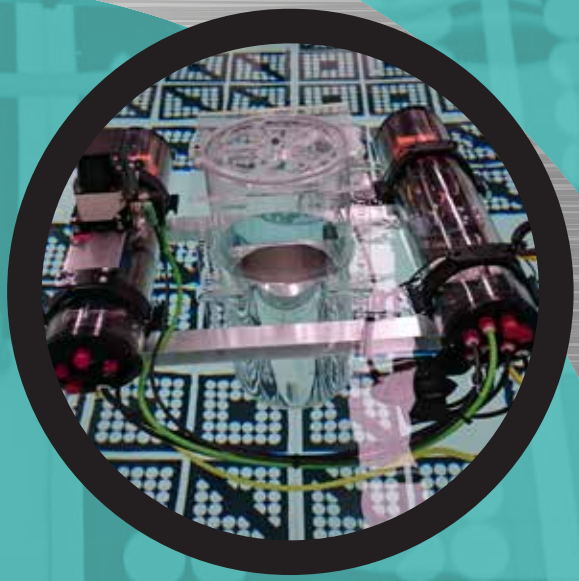
PROCESSING OF PERMITS AND APPROVALS JULY 2017 – JUNE 2018	
Number of nuclear permit applications processed	28
Average number of calendar days	12.8 days
Per cent of permits issued within 21 days of final application	86%
Number of chemical import permit applications processed (1)	10
Average number of calendar days	5.6 days
Per cent of import permits issued within 7 days of final application	70%
Number of chemical facility permit applications processed (2)	7
Average number of calendar days	11.9 days
Per cent of facility permits issued within 21 days of final application	86%
Number of approved applications to transport UOC internationally	54
Average number of days	1.2
Per cent of approvals issued within 7 days of final application	98%

(1) This excludes ~50 import permits which were renewed during the reporting period
(2) This includes two new permits and five 5-yearly renewed permits

Uranium Producers Charge

ASNO is responsible for the Uranium Producers Charge. This charge is payable to Consolidated Revenue on each kilogram of uranium ore concentrate production (set on 1 December 2017 at 13.1813 cents per kilogram).

SECTION 6
Appendices



Appendix A: Australia's Nuclear Cooperation Agreements

Table 22 Australia's Nuclear Cooperation Agreements at 30 June 2018

COUNTRY	ENTRY INTO FORCE
Republic of Korea	2 May 1979
United Kingdom	24 July 1979
Finland	9 February 1980
Canada	9 March 1981
Sweden	22 May 1981
France	12 September 1981
Philippines	11 May 1982
Japan	17 August 1982
Switzerland	27 July 1988
Egypt	2 June 1989
Mexico	17 July 1992
New Zealand	1 May 2000
United States (covering cooperation on Silex technology)	24 May 2000
Czech Republic	17 May 2002
United States (covering supply to Taiwan)	17 May 2002
Hungary	15 June 2002
Argentina	12 January 2005
People's Republic of China[46]	3 February 2007
Russian Federation	11 November 2010

46 Australia has two agreements with China, one covering nuclear material transfers and one covering nuclear cooperation.

47 Euratom is the atomic energy agency of the European Union. The Euratom agreement covers all 28 member states of the European Union.

COUNTRY	ENTRY INTO FORCE
United States	22 December 2010
Euratom[47]	1 January 2012
United Arab Emirates	14 April 2014
India	13 November 2015
Ukraine	15 June 2017

Note: The above list does not include Australia's NPT safeguards Agreement with the IAEA, concluded on 10 July 1974 or the Protocol Additional to that Safeguards Agreement concluded on 23 September 1997. In addition to the above 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.

Appendix B: IAEA Statements of Conclusions and Other Inspection Findings for Australia in 2017–18

IAEA inspection regime in Australia

The IAEA conducts various verification (under different names, but all essentially inspections) in Australia under the Comprehensive Safeguards Agreement[48] and under the Additional Protocol,[49] with the scope and focus differing between these two agreements.

Under the Comprehensive Safeguards Agreement the IAEA conducts inspections to verify nuclear material inventory and facility design features. There are three types of inspections conducted in Australia each year under the Comprehensive Safeguards Agreement:

- **Physical inventory verification (PIV):** a scheduled inspection in a selected material balance area (MBA)[50] to verify the stocktake of physical inventory (known as a physical inventory taking) from that MBA. PIVs involve a more complete verification of inventory than short notice random inspections (SNRI,[51] see below). The frequency of PIVs depends on the types and quantities of nuclear material held in each MBA. In Australia's case, PIVs are scheduled annually for the OPAL reactor (AS-F), ANSTO's R&D laboratories (AS-C), and ANSTO's storage areas (AS-D). PIVs for each MBA are scheduled together each year so the IAEA can complete all with one visit to Australia. In total these usually take five days to complete. In February 2018, Australia created a new MBA for CSIRO sites (AS-I). It is expected that the IAEA will conduct a PIV at a randomly selected CSIRO site approximately once every four years. Similarly, for MBAs AS-E and ASE1, the IAEA schedules a PIV approximately once every four years at one location (usually a university) taken as a representative sample of all such locations. These PIVs are usually conducted in one day.
- **Short notice random inspection (SNRI):** an inspection called by the IAEA at a random time with limited notice. The IAEA calls an SNRI once or twice each year at the OPAL reactor with three hours' notice to ASNO and ANSTO. These inspections usually last for one or two days.
- **Design Information Verification (DIV):** inspection to verify the correctness and completeness of the design features of a facility relevant to the application of safeguards. The IAEA typically conducts a few DIVs together with annual PIVs.

48 See Schedule 3 of the *Nuclear Non-Proliferation (Safeguards) Act 1987*

49 Published in IAEA document INFCIRC/540 (corrected)

50 Australia material balance areas for IAEA safeguards are described in Table 3 in Output 1.1.

51 ASNO uses the term "short notice random inspections" for these inspections because they are performed on short notice on a date chosen by the IAEA at random. These inspections may also be referred to as "random interim inspections" because they do not coincide with the ending date of a material balance period.

Under the Additional Protocol the IAEA has the right to conduct verification activities (essentially inspections) known as complementary access. A complementary access may have three purposes: assuring the absence of undeclared nuclear material or activities in Australia (Article 4.a.i); resolving any questions or inconsistencies related to the correctness and completeness of Australia's declarations under the Additional Protocol (Article 4.a.ii); or, confirming the decommissioned status of a facility (Article 4.a.iii). The IAEA has conducted a total of 73 complementary accesses in Australia since 1998. Article 4.a.i complementary accesses are the most common, with only two complementary accesses under article 4.a.ii, and one under Article 4.a.iii. Complementary access activities called while IAEA inspectors are already on the ANSTO site for other inspections can be conducted at any building on site with two hours' notice. Complementary access activities for locations outside ANSTO (e.g. universities, uranium mines) require a minimum of 24 hours' notice, but given the considerable distances in Australia are often issued with a few days' notice or more. The IAEA typically conducts two to three complementary access activities in Australia each year.

IAEA conclusions on Australia's compliance

The IAEA's conclusions for Australia are provided at two levels: the IAEA's overarching summary of findings and conclusions published in the IAEA's Safeguards Statement for 2017 (see Appendix C) for all States with safeguards agreements with the IAEA, including Australia; and the statements of conclusions of inspections in Australia.

The highest level conclusion the IAEA draws in the Safeguards Statement, known as the 'broader conclusion', is in paragraph 1(a) of the Safeguards Statement:

> 'the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities. On this basis, the Secretariat concluded that, for these States, all nuclear material remained in peaceful activities.'

Australia is on the list of countries covered by the IAEA's broader conclusion in the Safeguards Statement for 2017. Australia was the first country to receive the 'broader conclusion' in 2000 and has received it every year since.

The IAEA's statements of conclusions related to inspections in Australia are provided in several ways:

- **Article 91(a)** of Australia's Comprehensive Safeguards Agreement: the results of inspections at individual material balance areas (MBAs).
- **Article 91(b)** of Australia's Comprehensive Safeguards Agreement: the conclusions the IAEA has drawn from all its verification activities (headquarters analysis and inspections) in Australia for each individual MBA.[52]
- Statement of results of design information verification activities (DIVs).
- **Article 10.a** of the Additional Protocol: Statement on complementary access activities undertaken.
- **Article 10.c** of the Additional Protocol: Statement on the conclusions the IAEA has drawn from complementary access activities.

52 Note: under the standard Comprehensive Safeguards Agreement printed in IAEA document INFCIRC/153 these provisions are in paragraphs 90(a) and 90(b). Australia's Agreement has an additional paragraph that is not in INFCIRC/153.

IAEA conclusions and findings for each Material Balance Area

Material balance area: AS-A (HIFAR)

Material balance period: N/A (safeguards status: closed down)

INSPECTION ACTIVITY	DATE(S) OF INSPECTION	INSPECTION LOCATION	STATEMENT OF RESULTS	DATE STATEMENT PROVIDED
Design Information Verification	30 April 2018	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory"	10 July 2018

Material balance area: AS-C (research and development laboratories)

Material balance period: 1 June 2016–5 April 2017

INSPECTION ACTIVITY	DATE(S) OF INSPECTION	INSPECTION LOCATION	STATEMENT OF RESULTS	DATE STATEMENT PROVIDED
Physical Inventory Verification	5–6 April 2017	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results of this inspection were satisfactory"	13 November 2017
Design Information Verification	5–6 April 2017	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory"	13 November 2017
91(b) Statement of Conclusions (4 June 2018)	"The IAEA has concluded from its verification activities carried out at AS-C during the material balance period 1 June 2016 to 5 April 2017, and based on the information available to date in connection with such activities, that there were no indications of the undeclared presence, production or processing of nuclear material. The IAEA also concluded to the extent possible that declared nuclear material has been accounted for although it is noted that verification of much of the enriched uranium inventory is pending the implementation of a suitable method."			

The IAEA's statement that "verification of much of the enriched uranium inventory is pending the implementation of a suitable method" relates to the fact that the IAEA's detection system for quantifying the uranium in solid waste from ANSTO's molybdenum–99 radiopharmaceutical production process is not yet tested and deployed. ASNO and ANSTO have been working closely with the IAEA over the last few years on developing a solution to this challenge. The IAEA has now designed and built a prototype detection system, and plans are underway to conduct a hot test on site in late 2018. See Output 1.1 for further details.

Material balance area: AS-C (research and development laboratories)

Material balance period: 6 April 2017–1 May 2018

INSPECTION ACTIVITY	DATE(S) OF INSPECTION	INSPECTION LOCATION	STATEMENT OF RESULTS	DATE STATEMENT PROVIDED
Design Information Verification and scheduled environmental sampling	3–5 October 2017	ANSTO	"Based on the activities conducted and the information available to date in connection with such activi-ties, the results of the DIV were satisfactory"	19 February 2018
Physical Inventory Verification	2–3 May 2018	ANSTO	"Based on the activities conducted and the information available to date in connection with such activi-ties, the results from this inspection were satisfactory"	15 August 2018
Design Information Verification	2–3 May 2018	ANSTO	"Based on the activities conducted and the information available to date in connection with such activi-ties, the results of the DIV were satisfactory"	15 August 2018
91(b) Statement of Conclusions	Not available at time of publication of this Annual Report			

Material balance area: AS-D (vault storage)

Material balance period: 22 April 2015–2 April 2017

INSPECTION ACTIVITY	DATE(S) OF INSPECTION	INSPECTION LOCATION	STATEMENT OF RESULTS	DATE STATEMENT PROVIDED
Physical Inventory Verification	3 April 2017	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results of this inspection were satisfactory"	11 August 2017
Design Information Verification	3 April 2017	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory"	11 August 2017
91(b) Statement of Conclusions 13 December 2017	"The IAEA has concluded from its verification activities carried out at AS-D during the material balance period 22 April 2015 to 2 April 2017, and based on the information available to date in connection with such activities, that all declared nuclear material has been accounted for and that there were no indications of the undeclared presence, production or processing of nuclear material."			

Material balance area: AS-D (vault storage)

Material balance period: 3 April 2017–3 May 2018

INSPECTION ACTIVITY	DATE(S) OF INSPECTION	INSPECTION LOCATION	STATEMENT OF RESULTS	DATE STATEMENT PROVIDED
Physical Inventory Verification	4 May 2018	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results of this inspection were satisfactory"	1 August 2018
Design Information Verification	4 May 2018	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory"	1 August 2018
91(b) Statement of Conclusions	Not available at time of publication of this Annual Report			

Material balance area: AS-E and ASE1 (other locations)

Material balance period: 1 July 2013 – 30 June 2017

INSPECTION ACTIVITY	DATE(S) OF INSPECTION	INSPECTION LOCATION	STATEMENT OF RESULTS	DATE STATEMENT PROVIDED
Physical Inventory Verification	26 April 2018	Monash University	"Based on the activities conducted and the information available to date in connection with such activities, the results from this inspection were satisfactory"	1 August 2018
91(b) Statement of Conclusions	Not available at time of publication of this Annual Report			

Material balance area: AS-F (OPAL)

Material balance period: 31 May 2016–3 April 2017

INSPECTION ACTIVITY	DATE(S) OF INSPECTION	INSPECTION LOCATION	STATEMENT OF RESULTS	DATE STATEMENT PROVIDED
Physical Inventory Verification	4 April 2017	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results from this inspection were satisfactory"	11 August 2017
Design Information Verification	4 April 2017	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory"	11 August 2017
91(b) Statement of Conclusions (13 December 2017):	"The IAEA has concluded from its verification activities carried out at AS-F during the material balance period 31 May 2016 to 3 April 2017, and based on the information available to date in connection with such activities, that all declared nuclear material has been accounted for and that there were no indications of the undeclared presence, production or processing of nuclear material."			

Material balance area: AS-F (OPAL)

Material balance period: 4 April 2017–30 April 2018

INSPECTION ACTIVITY	DATE(S) OF INSPECTION	INSPECTION LOCATION	STATEMENT OF RESULTS	DATE STATEMENT PROVIDED
Short Notice Random Inspection	12–13 September 2017	ANSTO	"Based on the activities conducted and the information available to date in connection with such activities, the results from this inspection were satisfactory"	21 December 2017
Physical Inventory Verification	1 May 2018	ANSTO	"Based on the activities con-ducted and the information available to date in connection with such activities, the results from this inspection were satis-factory"	16 August 2018
Design Information Verification	1 May 2018	ANSTO	"Based on the activities con-ducted and the information available to date in connection with such activities, the results of the DIV were satisfactory"	16 August 2018
91(b) Statement of Conclusions	Not available at time of publication of this Annual Report			

Additional Protocol Assessment Period: 1 January 2017–31 December 2017

DATE OF COMPLEMENTARY ACCESS (CA)	LOCATION	10(A) STATEMENT OF ACTIVITIES	DATE STATEMENT PROVIDED
30 March 2017	Ranger uranium mine	"The IAEA was able to carry out all planned activities during the CA"	7 August 2018
31 March 2017	NQX Freight Systems, East Arm, NT	"The IAEA was able to carry out all planned activities during the CA"	7 August 2018
7 April 2017	Lucas Heights Science and Technology Centre: Buildings 3 and 20B	"The IAEA was able to carry out all planned activities during the CA"	7 August 2018
12 September 2017	Lucas Heights Science and Technology Centre: Buildings 80, 54 and 23	"The IAEA was able to carry out all planned activities during the CA"	13 December 2017
10(c) Statement of Conclusions (29 March 2018)	"The Agency has concluded from its activities carried out during this period, and based on the information available to date in connection with such activities that access pursuant to Article 4.a.(i) did not indicate the presence of undeclared nuclear material or activities at: • Ranger Uranium Mine, Northern Territory • LHSTC – Lucas Heights Science and Technology Centre • UOC staging location – NQX Freight Systems 31 O'Sullivan Circuit Fast Arm, Northern Territory		

Additional Protocol Assessment Period: 1 January 2018–31 December 2018

DATE OF COMPLEMENTARY ACCESS (CA)	LOCATION	10(A) STATEMENT OF ACTIVITIES	DATE STATEMENT PROVIDED
27 April 2018	CSIRO, Clayton, VIC	"The IAEA was able to carry out all planned activities during the CA"	28 August 2018
10(c) Statement of Conclusions	10(c) statements of conclusions are provided early in the year following the assessment period		

Appendix C: IAEA Safeguards Statement for 2017[i, ii]

In 2017, safeguards were applied for 181 States[iii, iv] with safeguards agreements in force with the Agency. The Secretariat's findings and conclusions for 2017 are reported below with regard to each type of safeguards agreement. These findings and conclusions are based upon an evaluation of all safeguards relevant information available to the Agency in exercising its rights and fulfilling its safeguards obligations for that year.

1. One hundred and twenty-seven States[iv] had both comprehensive safeguards agreements and additional protocols in force[v]:
   a. For 70 of these States[iv], the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities. On this basis, the Secretariat concluded that, for these States, all nuclear material remained in peaceful activities.
   b. For 57 of these States, the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities. Evaluations regarding the absence of undeclared nuclear material and activities for each of these States remained ongoing. On this basis, the Secretariat concluded that, for these States, declared nuclear material remained in peaceful activities.
2. Safeguards activities were implemented for 46 States with comprehensive safeguards agreements in force, but without additional protocols in force. For these States, the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities. On this basis, the Secretariat concluded that, for these States, declared nuclear material remained in peaceful activities.
3. As of the end of 2017, 12 States Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) had yet to bring into force comprehensive safeguards agreements with the Agency as required by Article III of that Treaty. For these States Parties, the Secretariat could not draw any safeguards conclusions.
4. Three States had safeguards agreements based on INFCIRC/66/Rev.2 in force, requiring the application of safeguards to nuclear material, facilities and other items specified in the relevant safeguards agreement. One of these States, India, had an additional protocol in force. For these States, the Secretariat found no indication of the diversion of nuclear material or of the misuse of the facilities or other items to which safeguards had been applied. On this basis, the Secretariat concluded that, for these States, nuclear material, facilities or other items to which safeguards had been applied remained in peaceful activities.

i The designations employed and the presentation of material in this report, including the numbers cited, do not imply the expression of any opinion whatsoever on the part of the Agency or its Member States concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers.
ii The referenced number of States Parties to the NPT is based on the number of instruments of ratification, accession or succession that have been deposited.
iii These States do not include the Democratic People's Republic of Korea (DPRK), where the Agency did not implement safeguards and, therefore, could not draw any conclusion.
iv And Taiwan, China.
v Or an additional protocol being provisionally applied, pending its entry into force.

5. Five nuclear-weapon States had voluntary offer agreements and additional protocols in force. Safeguards were implemented with regard to declared nuclear material in selected facilities in all five States. For these States, the Secretariat found no indication of the diversion of nuclear material to which safeguards had been applied. On this basis, the Secretariat concluded that, for these States, nuclear material in selected facilities to which safeguards had been applied remained in peaceful activities or had been withdrawn from safeguards as provided for in the agreements.

This statement plus further details on safeguards implementation is available at: https://www.iaea.org/sites/default/files/18/06/statement-sir-2017.pdf . This statement is copied verbatim from the IAEA's publication, including footnotes.

Appendix D: Australian Nuclear Security Profile

1. International Legal Framework

INSTRUMENT	STATUS	DATE
Convention on the Physical Protection of Nuclear Material	Ratified	22/09/1987
+ 2005 Amendment	Ratified	17/07/2008
+ Information pursuant to Article 14.1	Submitted	27/09/1991
	Updated	04/03/2014
International Convention for the Suppression of Acts of Nuclear Terrorism	Ratified	16/03/2012
UNSCR 1540 Committee Approved Matrix	Report submitted	30/12/2010
UNSCR 1540 (S/AC.44/2004/(02)/53)	Report submitted	28/10/2004
UNSCR 1540 (S/AC.44/2004/(02)/53/Add.1)	Report approved	09/11/2005
UNSCR 1540 (S/AC.44/2004/(02)/53/Add.2)	Report approved	23/12/2015

2. Nuclear Security related Initiatives, Partnerships and Groups

INITIATIVE, PARTNERSHIP OR GROUP	STATUS	YEAR JOINED
Global Initiative to Combat Nuclear Terrorism (GICNT)	Founding Member	2006
Global Partnership	Participant	2004
Proliferation Security Initiative	Participant	2003
INTERPOL	Member	1948

3. Domestic Nuclear Security

NUCLEAR REGULATORY AUTHORITIES	WEB-SITE
Australian Safeguards and Non-Proliferation Office (ASNO) (Nuclear material and nuclear facility security)	www.dfat.gov.au/asno
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) (Radioactive sources security, nuclear installation safety and security, and emergency preparedness and response for the Commonwealth)	www.arpansa.gov.au

KEY LEGISLATION (AVAILABLE ON WWW.LEGISLATION.GOV.AU)
Nuclear Non-Proliferation (Safeguards) Act 1987
Australian Radiation Protection and Nuclear Safety Act 1998
Weapons of Mass Destruction Act 1995
Customs Act 1901
Customs (Prohibited Imports) Regulations 1956 & Customs (Prohibited Exports) Regulations 1958

NUCLEAR SECURITY REQUIREMENTS	
IAEA Nuclear Security Series	Australia has committed to IAEA INFCIRC/869 in which States subscribe to the fundamental principles and meeting the intent of the recommendations
Design Basis Threat	Year of revisions: 2017, 2012, 2002, 1990.

4. Radioactive Sources

ITEM	STATUS
Support for Code of Conduct on the Safety and Security of Radioactive Sources	Australian support confirmed through political commitment pursuant to GC(47)/RES/7
Supplementary Guidance on the Import and Export of Radioactive Sources	Australian support confirmed through political commitment pursuant to GC(48)/RES/10
National Source Network	Jurisdiction-based network of source inventories: Category 1 and 2

5. Peer Review

TYPE	YEARS
International Physical Protection Advisory Service (IPPAS)	Nov 2013, Nov 2017
US Bilateral Security Visits pursuant to Australia-US Nuclear Cooperation Agreement	1976, 1987, 1991, 1997, 2003, 2005, 2013, 2018
Integrated Regulatory Review Service (IRRS)	2007, 2011

6. Nuclear Forensics and Detection

TYPE	STATUS	YEARS
GICNT Nuclear Forensics Working Group	Chair Participant	2010 – 2017 2010 – present
GICNT Response and Mitigation Working Group	Participant	2011 – present
GICNT Nuclear Detection Working Group	Participant	2010 – present
Nuclear Forensics International Technical Working Group (ITWG)	Participant	2003 – present

7. Major Support and Involvement with the IAEA

ACTIVITY	DETAIL	YEAR(S)
Advisory Group on Nuclear Security (AdSec)	Member	2013 – 2016
Nuclear Security Guidance Committee (NSGC)	Member Chair	2012 – present 2018 – present
Emergency Preparedness and Response Expert Group	Member	2012 – 2015
Emergency Preparedness and Response Standards Committee (EPReSC)	Member	2015 – present
IAEA Coordinated Research Project on the Identification of High Confidence Nuclear Forensic Signatures for the Development of Nuclear Forensics Libraries	Project agreement	2012 – 2016
IAEA Radioactive Source Security Working Group	Member	2012 – 2017
Development and review of Nuclear Security Series documents	Expert consultant	2003 – present
Incident and Trafficking Database	Member	1995 – present
Analytical Laboratories for the Measurement of Environmental RadioActivity (ALMERA)	Member	1995 – present
Nuclear Security Fund	Contributor	2002, 2006, 2007, 2009, 2013, 2014
International Physical Protection Advisory Service (IPPAS) Missions	Team members	2002 – present
IAEA Nuclear Security Training Courses and other courses led by the IAEA Division of Nuclear Security	Expert consultants & presenters	Ongoing

8. Contributions to Outreach and Capacity Building

ACTIVITY/EVENT	DATE
Events	
GICNT workshop "Destiny Elephant", Bangkok, Thailand	March 2018
IAEA Regional training course of nuclear forensics, Sydney	October 2017
GICNT 'Presenting nuclear forensics findings in court' workshop, Germany	June 2017
IAEA Regional Training Course on Safeguards and Nuclear Security for Small Quantities Protocol Countries	December 2016
EPREV Mission, Jakarta	October 2016
APEX GOLD: Ministerial Level Scenario-based Policy Discussion, San Francisco	February 2016
ANSTO-BATAN Knowledge exchange on nuclear forensics	November 2016
GICNT Nuclear Forensics Working Group Experts Meeting, Italy	November 2016
GICNT 10th Anniversary Meeting, the Netherlands	June 2016
GICNT "Kangaroo Harbour" workshop and exercise, Sydney GICNT Implementation and Assessment Group meeting	May 2016
Sponsored the Nuclear Security Summit Gift Basket Joint Statement on Forensics in Nuclear Security	March 2016

9. Voluntary Commitments referenced in IAEA Information Circulars

IAEA INFCIRC	JOINT STATEMENT TITLE	INFCIRC DATE
INFCIRC/869	Strengthening of Nuclear Security Implementation	02/10/14
INFCIRC/899	Nuclear Security Contact Group	02/11/16
INFCIRC/904	Supporting Nuclear and Radiological Terrorism Preparedness and Response Capabilities	14/12/16
INFCIRC/905	National Nuclear Detection Architectures	14/12/16
INFCIRC/908	Mitigating Insider Threats	09/01/17
INFCIRC/909	Transport Security of Nuclear Materials	10/01/17
INFCIRC/910	Strengthening the Security of High Activity Sealed Sources	30/12/16
INFCIRC/912	Minimising and Eliminating the use of Highly Enriched Uranium in Civilian Applications	16/02/17
INFCIRC/917	Forensics in Nuclear Security (Australia is sponsor)	20/04/17
INFCIRC/918	Countering Nuclear Smuggling	19/04/17

Appendix E: Information Publication Scheme Statement

Agencies subject to the *Freedom of Information Act 1982* (FOI Act) are required to publish information for the public as part of the Information Publication Scheme (IPS). This requirement is in Part II of the FOI Act and has replaced the former requirement to publish a section 8 statement in an annual report. Each agency must display on its website a plan showing what information it publishes in accordance with the IPs requirements.

An agency plan showing what information is published in accordance with IPS requirements is accessible from http://www.dfat.gov.au/foi/ips.html.

Agencies subject to the *Freedom of Information Act 1982* (FOI Act) are required to publish information to the public as part of the Information Publication Scheme (IPS). This requirement is in Part II of the FOPI Act and has replaced the former requirement to publish a section 8 statement in an annual report. Each agency must display on its website a plan showing what information it publishes In accordance with the IPs requirements.

An agency plan showing what information is published in accordance with IPS requirements is accessible from http://www.dfat.gov.au/foi/ips.html.

Presentations and Submissions

ASNO produced a range of publications and conducted various presentations to increase community awareness and understanding of ASNO responsibilities and issues for which it has expertise. ASNO also made a number of submissions to Parliamentary and other inquiries. These include:

Ian D'Souza, Enhancing Security, Promoting Trade: A Chemical Industry Focus, presentation for the OPCW-Thailand Regional Dialogue on Promoting Global Peace and Prosperity through Chemical Safety and Security – Celebrating 20th Anniversary of the CWC and OPCW, Bangkok, 20-21 July 2017

Malcolm Coxhead, Supporting the CTBT and its verification regime: Australia's perspective, CTBT Regional Conference for States in the South East Asia, the Pacific and the Far East Region, Tokyo, 27-28 July 2017

Malcolm Coxhead, CTBT: Civil and Scientific benefits for Australia, CTBT Regional Conference for States in the South East Asia, the Pacific and the Far East Region, Tokyo, 27-28 July 2017

Craig Everton, Nuclear Inspection Robots – and other Technologies used for IAEA Safeguards, presentation at the Australasian Radiation Protection Society (ARPS) conference, Wollongong, 7-9 August 2017

Rebecca Stohr, Nuclear Material Disposal – IAEA Safeguards Requirements, presentation at the Australasian Radiation Protection Society (ARPS) conference, Wollongong, 7-9 August 2017

Tammy de Wright, Australia's nuclear cooperation agreements, Workshop on Nuclear Cooperation Agreements for the Export of Greenland's uranium, Iceland, August 2017

Rob Floyd, Nuclear Security and Safeguards, keynote presentation at the East Asia Summit Seminar on Non-Proliferation in the Indo-Pacific, Melbourne, 16 October 2017

Craig Everton, Australia's Experiences with Nuclear Security and Safeguards, presentation at the East Asia Summit Seminar on Non-Proliferation in the Indo-Pacific, Melbourne, 16 October 2017

Stephen Marks (ARPANSA), Lyndell Evans, Australian Approach to Nuclear Forensics, Poster for Regional Training Course on Practical Introduction to Nuclear Forensics, Sydney, 16-20 October 2017

Josy Meyer, Australia and the Chemical Weapons Convention, presentation to Defence Export Controls, Department of Defence, Canberra, 8 November 2017

Alex Norris (Attorney General's Department), Australia: Lessons learnt for implementing national CWC legislation, presentation for the Stakeholders Forum for States Parties in Asia on the Adoption of National Implementing Legislation, The Hague, 13-15 November 2017 with support from Josy Meyer

Michal Botha, Regulating the Transport of UOC in Australia, International Conference on Physical Protection of Nuclear Materials and Nuclear Facilities, Vienna, 13-17 November 2017

Craig Everton, Australia's Experiences with Safeguards, presentation at the Regional Training Course on State Systems of Accounting for and Control of Nuclear Material, Tokai, Japan, 8 December 2017

Josy Meyer, The Role of Australia's National Authority in the Implementation of the Chemical Weapons Convention, presentation at the OPCW Analytical Skills Development Course, Defence Science and Technology Group and Melbourne University, Melbourne, 4-15 December 2017

Malcolm Coxhead, Exercises and development of the OSI Operational Manual, presentation at the Expert meeting on future OSI Build-Up Exercises, Vienna, January 2018

Kalman Robertson, IAEA Robotics Challenge 2017, presentation at the biennial Member State Support Programme Coordinators' Meeting, Vienna, 13-15 February 2018

Malcolm Coxhead, Broadening engagement in developing measures for nuclear disarmament verification, Roundtable on the International Partnership for Nuclear Disarmament Verification, Coral Bell School, ANU, Canberra, 22 February 2018

Harry Rose (Defence), Management of Highly Toxic Chemicals: Perspectives from Australia's Defence Science and Technology Group, presentation for the Seminar on the CWC and Chemical Safety and Security Management for Member States of the OPCW in the Asia Region, Doha, 26-28 February 2018 with support from Josy Meyer

Rebecca Stohr, Brad Cassels (Victorian Department of Health and Human Services), Geoff Williams (ARPANSA), Craig Everton, Optimising National WM [waste management] Strategies Through Early Consideration of Nuclear Safeguards, WM2018 Conference, Phoenix, Arizona, 18-22 March 2018

Josy Meyer, The CWC and Regulatory Requirements for Discrete Organic Chemical Production Facilities, presentation via teleconference to Discrete Organic Chemical production facility in NSW, 24 April 2018

Michael Lane, Australia's New Nuclear Material Database: NUMBAT 5, Ottawa, May 2018

Josy Meyer, Australia and the Chemical Weapons Convention, presentation to Department of Foreign Affairs and Trade Graduates, Canberra, 18 May 2018

Rob Floyd, Global Nuclear Non-Proliferation and Nuclear Security Regime - Implications for the Indo-Pacific Region, keynote presentation at the 5th Asian & Oceanic IRPA Congress on Radiation Protection, Melbourne, 20-23 May 2018

Stephan Bayer, IAEA Advisory Services - Australia's follow-up IPPAS mission, presentation at the 5th Asian & Oceanic IRPA Congress on Radiation Protection, Melbourne, 20-23 May 2018

Kalman Robertson, The IAEA Robotics Challenge, presentation at the 5th Asian & Oceanic IRPA Congress on Radiation Protection, Melbourne, 20-23 May 2018

Michal Botha, Australia's Experiences in Ratification and Implementation of the Amended CPPNM and Australia's Application of Physical Protection under the Amended CPPNM, Regional Workshop to Promote the Universalisation of the Amendment to the Convention on Physical Protection of Nuclear Material (CPPNM), Tokai, Japan, 28-31 May 2018

List of Requirements

PGPA RULE REFERENCE	PART OF REPORT	DESCRIPTION	REQUIREMENT
17AD(g)	LETTER OF TRANSMITTAL		
17AI	p3	A copy of the letter of transmittal signed and dated by accountable authority on date final text approved, with statement that the report has been prepared in accordance with section 46 of the Act and any enabling legislation that specifies additional requirements in relation to the annual report.	Mandatory
17AD(h)	AIDS TO ACCESS		
17AJ(a)	piv, v	Table of contents.	Mandatory
17AJ(b)	p119	Alphabetical index.	Mandatory
17AJ(c)	p111	Glossary of abbreviations and acronyms.	Mandatory
17AJ(d)	p106	List of requirements.	Mandatory
17AJ(e)	Inside cover	Details of contact officer.	Mandatory
17AJ(f)	Inside cover	Entity's website address.	Mandatory
17AJ(g)	Inside cover	Electronic address of report.	Mandatory
17AD(a)	Review by accountable authority		
17AD(a)	p3	A review by the accountable authority of the entity.	Mandatory
17AD(b)	OVERVIEW OF THE ENTITY		
17AE(1)(a)(i)	Section 3	A description of the role and functions of the entity.	Mandatory
17AE(1)(a)(ii)	Section 5	A description of the organisational structure of the entity.	Mandatory
17AE(1)(a)(iii)	Section 3	A description of the outcomes and programmes administered by the entity.	Mandatory
17AE(1)(a)(iv)	Section 3	A description of the purposes of the entity as included in corporate plan.	Mandatory
17AE(1)(b)	DFAT	An outline of the structure of the portfolio of the entity.	Portfolio departments mandatory
17AE(2)	DFAT	Where the outcomes and programmes administered by the entity differ from any Portfolio Budget Statement, Portfolio Additional Estimates Statement or other portfolio estimates statement that was prepared for the entity for the period, include details of variation and reasons for change.	If applicable, Mandatory
17AD(c)	REPORT ON THE PERFORMANCE OF THE ENTITY		
	ANNUAL PERFORMANCE STATEMENTS		
17AD(c)(i); 16F	DFAT	Annual performance statement in accordance with paragraph 39(1)(b) of the Act and section 16F of the Rule.	Mandatory
17AD(c)(ii)	Report on Financial Performance		

PGPA RULE REFERENCE	PART OF REPORT	DESCRIPTION	REQUIREMENT
17AF(1)(a)	DFAT	A discussion and analysis of the entity's financial performance.	Mandatory
17AF(1)(b)	DFAT	A table summarising the total resources and total payments of the entity.	Mandatory
17AF(2)	DFAT	If there may be significant changes in the financial results during or after the previous or current reporting period, information on those changes, including: the cause of any operating loss of the entity; how the entity has responded to the loss and the actions that have been taken in relation to the loss; and any matter or circumstances that it can reasonably be anticipated will have a significant impact on the entity's future operation or financial results.	If applicable, Mandatory.
17AD(d)	MANAGEMENT AND ACCOUNTABILITY		
	CORPORATE GOVERNANCE		
17AG(2)(a)	DFAT	Information on compliance with section 10 (fraud systems)	Mandatory
17AG(2)(b)(i)	DFAT	A certification by accountable authority that fraud risk assessments and fraud control plans have been prepared.	Mandatory
17AG(2)(b)(ii)	DFAT	A certification by accountable authority that appropriate mechanisms for preventing, detecting incidents of, investigating or otherwise dealing with, and recording or reporting fraud that meet the specific needs of the entity are in place.	Mandatory
17AG(2)(b)(iii)	DFAT	A certification by accountable authority that all reasonable measures have been taken to deal appropriately with fraud relating to the entity.	Mandatory
17AG(2)(c)	DFAT	An outline of structures and processes in place for the entity to implement principles and objectives of corporate governance.	Mandatory
17AG(2)(d) – (e)	DFAT	A statement of significant issues reported to Minister under paragraph 19(1)(e) of the Act that relates to noncompliance with Finance law and action taken to remedy noncompliance.	If applicable, Mandatory
	EXTERNAL SCRUTINY		
17AG(3)	DFAT	Information on the most significant developments in external scrutiny and the entity's response to the scrutiny.	Mandatory
17AG(3)(a)	n/a	Information on judicial decisions and decisions of administrative tribunals and by the Australian Information Commissioner that may have a significant effect on the operations of the entity.	If applicable, Mandatory
17AG(3)(b)	n/a	Information on any reports on operations of the entity by the AuditorGeneral (other than report under section 43 of the Act), a Parliamentary Committee, or the Commonwealth Ombudsman.	If applicable, Mandatory

PGPA RULE REFERENCE	PART OF REPORT	DESCRIPTION	REQUIREMENT
17AG(3)(c)	*n/a*	Information on any capability reviews on the entity that were released during the period.	If applicable, Mandatory
	MANAGEMENT OF HUMAN RESOURCES		
17AG(4)(a)	DFAT	An assessment of the entity's effectiveness in managing and developing employees to achieve entity objectives.	Mandatory
17AG(4)(b)	DFAT	Statistics on the entity's APS employees on an ongoing and nonongoing basis; including the following: • Statistics on staffing classification level; • Statistics on fulltime employees; • Statistics on parttime employees; • Statistics on gender; • Statistics on staff location; • Statistics on employees who identify as Indigenous.	Mandatory
17AG(4)(c)	DFAT	Information on any enterprise agreements, individual flexibility arrangements, Australian workplace agreements, common law contracts and determinations under subsection 24(1) of the *Public Service Act 1999*.	Mandatory
17AG(4)(c)(i)	DFAT	Information on the number of SES and nonSES employees covered by agreements etc identified in paragraph 17AD(4)(c).	Mandatory
17AG(4)(c)(ii)	DFAT	The salary ranges available for APS employees by classification level.	Mandatory
17AG(4)(c)(iii)	DFAT	A description of nonsalary benefits provided to employees.	Mandatory
17AG(4)(d)(i)	DFAT	Information on the number of employees at each classification level who received performance pay.	If applicable, Mandatory
17AG(4)(d)(ii)	DFAT	Information on aggregate amounts of performance pay at each classification level.	If applicable, Mandatory
17AG(4)(d)(iii)	DFAT	Information on the average amount of performance payment, and range of such payments, at each classification level.	If applicable, Mandatory
17AG(4)(d)(iv)	DFAT	Information on aggregate amount of performance payments.	If applicable, Mandatory
	ASSETS MANAGEMENT		
17AG(5)	DFAT	An assessment of effectiveness of assets management where asset management is a significant part of the entity's activities.	If applicable, mandatory
	PURCHASING		
17AG(6)	DFAT	An assessment of entity performance against the *Commonwealth Procurement Rules*.	Mandatory

PGPA RULE REFERENCE	PART OF REPORT	DESCRIPTION	REQUIREMENT
		CONSULTANTS	
17AG(7)(a)	DFAT	A summary statement detailing the number of new contracts engaging consultants entered into during the period; the total actual expenditure on all new consultancy contracts entered into during the period (inclusive of GST); the number of ongoing consultancy contracts that were entered into during a previous reporting period; and the total actual expenditure in the reporting year on the ongoing consultancy contracts (inclusive of GST).	Mandatory
17AG(7)(b)	DFAT	A statement that *"During [reporting period], [specified number] new consultancy contracts were entered into involving total actual expenditure of $[specified million]. In addition, [specified number] ongoing consultancy contracts were active during the period, involving total actual expenditure of $[specified million]"*.	Mandatory
17AG(7)(c)	DFAT	A summary of the policies and procedures for selecting and engaging consultants and the main categories of purposes for which consultants were selected and engaged.	Mandatory
17AG(7)(d)	DFAT	A statement that *"Annual reports contain information about actual expenditure on contracts for consultancies. Information on the value of contracts and consultancies is available on the AusTender website."*	Mandatory
		AUSTRALIAN NATIONAL AUDIT OFFICE ACCESS CLAUSES	
17AG(8)	DFAT	If an entity entered into a contract with a value of more than $100 000 (inclusive of GST) and the contract did not provide the AuditorGeneral with access to the contractor's premises, the report must include the name of the contractor, purpose and value of the contract, and the reason why a clause allowing access was not included in the contract.	If applicable, Mandatory
		EXEMPT CONTRACTS	
17AG(9)	DFAT	If an entity entered into a contract or there is a standing offer with a value greater than $10 000 (inclusive of GST) which has been exempted from being published in AusTender because it would disclose exempt matters under the FOI Act, the annual report must include a statement that the contract or standing offer has been exempted, and the value of the contract or standing offer, to the extent that doing so does not disclose the exempt matters.	If applicable, Mandatory
		SMALL BUSINESS	
17AG(10)(a)	DFAT	A statement that *"[Name of entity] supports small business participation in the Commonwealth Government procurement market. Small and Medium Enterprises (SME) and Small Enterprise participation statistics are available on the Department of Finance's website."*	Mandatory
17AG(10)(b)	DFAT	An outline of the ways in which the procurement practices of the entity support small and medium enterprises.	Mandatory
17AG(10)(c)	DFAT	If the entity is considered by the Department administered by the Finance Minister as material in nature—a statement that *"[Name of entity] recognises the importance of ensuring that small businesses are paid on time. The results of the Survey of Australian Government Payments to Small Business are available on the Treasury's website."*	If applicable, Mandatory

PGPA RULE REFERENCE	PART OF REPORT	DESCRIPTION	REQUIREMENT
	FINANCIAL STATEMENTS		
17AD(e)	DFAT	Inclusion of the annual financial statements in accordance with subsection 43(4) of the Act.	Mandatory
17AD(f)	OTHER MANDATORY INFORMATION		
17AH(1)(a)(i)	DFAT	If the entity conducted advertising campaigns, a statement that *"During [reporting period], the [name of entity] conducted the following advertising campaigns: [name of advertising campaigns undertaken]. Further information on those advertising campaigns is available at [address of entity's website] and in the reports on Australian Government advertising prepared by the Department of Finance. Those reports are available on the Department of Finance's website."*	If applicable, Mandatory
17AH(1)(a)(ii)	DFAT	If the entity did not conduct advertising campaigns, a statement to that effect.	If applicable, Mandatory
17AH(1)(b)	DFAT	A statement that *"Information on grants awarded to [name of entity] during [reporting period] is available at [address of entity's website]."*	If applicable, Mandatory
17AH(1)(c)	DFAT	Outline of mechanisms of disability reporting, including reference to website for further information.	Mandatory
17AH(1)(d)	DFAT	Website reference to where the entity's Information Publication Scheme statement pursuant to Part II of FOI Act can be found.	Mandatory
17AH(1)(e)	n/a	Correction of material errors in previous annual report	If applicable, mandatory
17AH(2)	Section 4	Information required by other legislation	Mandatory

Glossary

TERM	DESCRIPTION
Additional Protocol (AP)	An agreement 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. The model text of the Additional Protocol is set out in IAEA document INFCIRC/540.
ANSTO	Australian Nuclear Science and Technology Organisation
APSN	Asia-Pacific Safeguards Network
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASSP	Australian Safeguards Support Program
Australian Obligated Nuclear Material (AONM)	Australian uranium and nuclear material derived therefrom, which is subject to obligations pursuant to Australia's bilateral safeguards agreements.
BWC	Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction. Also known as the Biological Weapons Convention.
Challenge Inspection	(For CWC purposes) an inspection, requested by a CWC State Party, of any facility or location in the territory or in any other place under the jurisdiction or control of another State Party.
CNSACs	Central Nervous System-Acting chemicals
Complementary Access	The right of the IAEA, pursuant to the Additional Protocol, for access to a site or location to carry out verification activities.
Comprehensive Safeguards Agreement (CSA)	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 IAEA document INFCIRC/153 (corrected).
Concise Note	Supplementary explanatory notes on formal reports from a national safeguards authority to the IAEA.
Conversion	Purification of uranium ore concentrates or recycled nuclear material and conversion to a chemical form suitable for isotopic enrichment or fuel fabrication.
CPPNM	Convention on the Physical Protection of Nuclear Material
CTBT	Comprehensive Nuclear-Test-Ban Treaty
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization. The Vienna-based international organisation established at entry into force of the CTBT to ensure the implementation of its provisions.
Customs	Australian Customs & Border Protection Service

TERM	DESCRIPTION
CWC	Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction. Also known as the Chemical Weapons Convention.
CWC-Scheduled Chemicals	Chemicals listed in the three Schedules to the Chemical Weapons Convention. Some are chemical warfare agents and others are dual-use chemicals (that can be used in industry or in the manufacture of chemical warfare agents).
CWPF	Chemical Weapon Production Facility
Department of Defence	Australian Department of Defence
Depleted Uranium (DU)	Uranium with a ^{235}U 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, HEU and ^{233}U.
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 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, also known as North Korea
DST Group	Defence Science and Technology Group
Enrichment	A physical or chemical process for increasing the proportion of a particular isotope. Uranium enrichment involves increasing the proportion of ^{235}U from its level in natural uranium, 0.711%. For LEU fuel the proportion of ^{235}U (the enrichment level) is typically increased to between 3% and 5%.
Euratom	Atomic Energy Agency of the European Union. Euratom's safeguards office, called the Directorate-General of Energy E – Nuclear Safeguards, is responsible for the application of safeguards to all nuclear material in Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden; and to all nuclear material in civil facilities in France and the United Kingdom.

TERM	DESCRIPTION
Facility	(For CWC purposes) a plant, plant site or production/processing unit. (For safeguards purposes) a reactor, critical facility, conversion plant, fabrication plant, reprocessing plant, isotope separation plant, separate storage location, or any location where safeguards-significant amounts of nuclear material are customarily used.
FFM	Fact-Finding Mission
Fissile	Referring to a nuclide capable of undergoing fission by neutrons of any energy, including 'thermal' neutrons (e.g. ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu).
Fissile Material Cut-off Treaty (FMCT)	A proposed international treaty to prohibit production of fissile material for nuclear weapons.
Fission	The splitting of an atomic nucleus into roughly equal parts, often by a neutron. In a fission reaction, a neutron collides with a fissile nuclide (e.g. ^{235}U) that then splits, releasing energy and further neutrons. Some 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. ^{233}U, ^{235}U, ^{238}U, ^{239}Pu, ^{240}Pu, ^{241}Pu and ^{242}Pu).
Full-Scope Safeguards	The application of IAEA safeguards to all of a state's present and future nuclear activities. Now more commonly referred to as comprehensive safeguards.
GA	Geoscience Australia
GW	Gigawatt (Giga = billion, 10^9)
GWe	Gigawatts of electrical power
GWt	Gigawatts of thermal power
Heavy Water (D_2O)	Water enriched in the 'heavy' hydrogen isotope deuterium (^2H) 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 the use of natural uranium in a nuclear reactor.
HIFAR	High Flux Australian Reactor. The 10 MWt research reactor located at ANSTO, Lucas Heights. Undergoing decommissioning.
High enriched uranium (HEU)	Uranium enriched to 20% or more in ^{235}U. Weapons-grade HEU is enriched to over 90% ^{235}U.
Hydroacoustic	Term referring to underwater propagation of pressure waves (sounds). One category of CTBT IMS station monitoring changes in water pressure generated by sound waves in the water.
IAEA	International Atomic Energy Agency

TERM	DESCRIPTION
Indirect-Use Material	Nuclear material that cannot be used for a nuclear explosive without transmutation or further enrichment (e.g. depleted uranium, natural uranium, LEU and thorium).
INFCIRC	IAEA Information Circular. A series of documents published by the IAEA setting out, inter alia, safeguards, physical protection and export control arrangements.
INFCIRC/153 (Corrected)	The model agreement used by the IAEA as a basis for comprehensive safeguards agreements with non-nuclear-weapon states party to the NPT.
INFCIRC/225 Rev.5 (Corrected)	IAEA document entitled 'Nuclear Security Recommendations on Physical Protection of Nuclear Materials 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.
INFCIRC/540 (Corrected)	The model text of the Additional Protocol.
INFCIRC/66 Rev.2	The model safeguards agreement used by the IAEA since 1965. Essentially, this agreement is facility-specific. For NNWS party to the NPT it has been replaced by INFCIRC/153.
Infrasound	Sound in the frequency range of about 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.
Integrated safeguards	The optimum combination of all safeguards measures under comprehensive safeguards agreements and the Additional Protocol to achieve maximum effectiveness and efficiency.
International Data Centre (IDC)	Data gathered by monitoring stations in the CTBT IMS network are compiled, analysed to identify events and archived by the Vienna-based IDC. IDC products giving the data about events are made available to CTBT signatories.
International Framework for Nuclear Energy Cooperation (IFNEC)	An international forum for cooperation on the use of nuclear energy for peaceful purposes that is efficient, safe and secure and does not aid proliferation.
International Monitoring System (IMS)	A network of 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 nuclear explosion.
IPPAS	IAEA's International Physical Protection Advisor Service
IPNDV	International Partnership of Nuclear Disarmament Verification
Inventory Change Report (ICR)	A formal report from a national safeguards authority to the IAEA on changes to nuclear materials inventories in a given period.

TERM	DESCRIPTION
Isotopes	Nuclides with the same number of protons, but different numbers of neutrons, e.g. ^{235}U (92 protons and 143 neutrons) and ^{238}U (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. As the number of protons is the same, isotopes are different forms of the same chemical element.
JIM	The OPCW-UN Joint Investigative Mechanism
Light water	H_2O. Ordinary water.
Light water reactor (LWR)	A power reactor which is both moderated and cooled by ordinary (light) water. In this type of reactor, the uranium fuel must be slightly enriched (that is, LEU).
Low Enriched Uranium (LEU)	Low Enriched Uranium. Uranium enriched to less than 20% ^{235}U. Commonly, LEU used as fuel in light water reactors is enriched to between 3% and 5% ^{235}U.
Material Balance Area (MBA)	A delineation for nuclear accounting purposes as required under comprehensive safeguards agreements. It is a defined and delineated area in or outside of a facility such that: (a) the quantity of nuclear material in each transfer into or out of the material balance area can be determined; and (b) The physical inventory of nuclear material in the material balance area can be determined, in order that the nuclear material balance can be established for IAEA safeguards purposes.
Material Balance Report (MBR)	A formal report from a national safeguards authority to the IAEA comparing consolidated inventory changes in a given period with the verified inventories at the start and end of that period.
Mixed oxide fuel (MOX)	Mixed oxide reactor fuel, consisting of a mixture of uranium and plutonium oxides. The plutonium content of fresh MOX fuel for an LWR is typically around 5–7%.
Moata	Small training reactor previously located at Lucas Heights.
Moderator	A material used to slow fast neutrons to thermal speeds where they can readily be absorbed by ^{235}U or plutonium nuclei and initiate a fission reaction. The most commonly used moderator materials are light water, heavy water or graphite.
MUF	Material Unaccounted For. A term used in nuclear materials accountancy to mean the difference between operator records and the verified physical inventory. A certain level of MUF is expected due to measurement processes. MUF does not usually indicate 'missing' material – because it is a difference due to measurement, MUF can have either a negative or a positive value.
MWe	Megawatts of electrical power

TERM	DESCRIPTION
MWt	Megawatts of thermal power
Natural uranium	In nature, uranium consists predominantly of the isotope ^{238}U (approx. 99.3%), with the fissile isotope ^{235}U comprising only 0.711%.
Non-nuclear-weapon state(s) (NNWS)	States not recognised by the NPT as having nuclear weapons at 1 January 1967 when the Treaty was negotiated.
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
Nuclear material	Any source material or special fissionable material as defined in Article XX of the IAEA Statute (in practice, this means uranium, thorium and plutonium).
Nuclear-weapon state(s) (NWS)	States recognised by the NPT as having nuclear weapons at 1 January 1967 when the Treaty was negotiated, namely the United States, Russia, the United Kingdom, France and China.
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.
Old Chemical Weapons (OCW)	Defined under the Chemical Weapons Convention as: a. chemical weapons produced before 1925; or b. chemical weapons produced between 1925 and 1946 that have deteriorated to such extent that they can no longer be used as chemical weapons.
On-Site Inspection (OSI)	A short-notice, challenge-type inspection provided for in the CTBT as a means for investigating concerns about non-compliance with the prohibition on nuclear explosions.
OPAL	Open Pool Australian Light-Water reactor. The 20 MWt research reactor located at ANSTO, Lucas Heights, reached full power on 3 November 2006 and was officially opened on 20 April 2007.
OPCW	Organisation for the Prohibition of Chemical Weapons
Other Chemical Production Facility (OCPF)	Defined under the Chemical Weapons Convention as all plant sites that: a. produced by synthesis during the previous calendar year more than 200 tonnes of unscheduled discrete organic chemicals; or b. comprised one or more plants which produced by synthesis during the previous calendar year more than 30 tonnes of an unscheduled discrete organic chemical containing the elements phosphorus, sulphur or fluorine.
Physical Inventory Listing (PIL)	A formal report from a national safeguards authority to the IAEA on nuclear materials inventories at a given time (generally the end of a Material Balance Report period).

TERM	DESCRIPTION
PrepCom	Preparatory Commission. In this report the term is used for the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization.
Production	(For CWC purposes) 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.
PTS	Provisional Technical Secretariat for the CTBTO Preparatory Commission
^{239}Pu	An isotope of plutonium with atomic mass 239 (94 protons and 145 neutrons). The fissile isotope of plutonium most suitable for nuclear weapons.
R&D	Research and Development
Radionuclide	An isotope with an unstable nucleus that disintegrates and emits energy in the process. Radionuclides may occur naturally, but they can also be artificially produced, and are often called radioisotopes. One category of CTBT IMS stations will detect radionuclide particles in the air. Other IMS stations are equipped with radionuclide noble gas technology to detect the abundance of the noble gas xenon in the air.
Reprocessing	Processing of spent nuclear fuel to separate uranium and plutonium from highly radioactive fission products.
SAB	Scientific Advisory Board of the OPCW
Safeguards Inspector	For domestic purposes, person declared under section 57 of the Safeguards Act to undertake inspections to ensure compliance with provisions of the Act and to assist IAEA Inspectors in the conduct of Agency inspections and complementary access in Australia.
Schedule 2A/2A*	These are toxic Part A Schedule 2 chemicals (2A: Amiton and PFIB, 2A*: BZ) listed under the CWC.
Seismic	Referring to the movements of the ground that can be generated by earthquakes, explosions etc. The seismic element of the CTBT monitoring system is a network of 50 primary stations and 120 auxiliary stations. Analysis of seismic waves can be used to distinguish between earthquakes and explosive events.
SLC	State-level concept
Small Quantities Protocol (SQP)	A protocol to a state's safeguards agreement with the IAEA, for states with small quantities of nuclear material and no nuclear facilities. The protocol holds in abeyance most of the provisions of the state's safeguards agreement.

TERM	DESCRIPTION
Source Material	Uranium containing the mixture of isotopes occurring in nature; uranium depleted In the isotope ^{235}U; thorium; or any of the foregoing in the form of metal, alloy, chemical compound, or concentrates.
Special Fissionable Material	^{239}Pu; ^{233}U; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing. The term special fissionable material does not include source material.
Standing Advisory Group on Safeguard Implementation (SAGSI)	An international group of experts appointed by, and advising, the IAEA Director General on safeguards implementation matters.
TAV	Technical Assistance Visit
TWG	Temporary Working Group of the OPCW's Scientific Adviory Board
^{232}Th	The only naturally occurring isotope of thorium, having an atomic mass of 232 (90 protons and 142 neutrons).
^{233}U	An isotope of uranium containing 233 nucleons, usually produced through neutron irradiation of 232Th.
^{235}U	An isotope of uranium containing 235 nucleons (92 protons and 143 neutrons) which occurs as 0.711% of natural uranium.
^{238}U	An isotope of uranium containing 238 nucleons (92 protons and 146 neutrons) which occurs as about 99.3% of natural uranium.
UNSCR	United Nations Security Council Resolution
Uranium ore concentrate (UOC)	A commercial product of a uranium mill usually containing a high proportion (greater than 90%) of uranium oxide.
Weapons of Mass Destruction (WMD)	Refers to nuclear, chemical, biological and occasionally radiological weapons.

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