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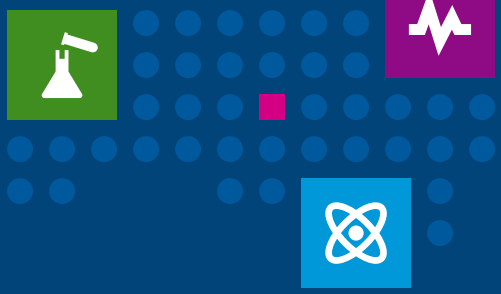
Australian Safeguards and Non-Proliferation Office



# ANNUAL REPORT

2019–2020

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**ISBN**

Book (softcover) – 978–1–74322–543–1
PDF document – 978–1–74322–544–8
Word document – 978–1–74322–545–5
Web page – 978–1–74322–546–2

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Australian Safeguards and Non-Proliferation Office

# ANNUAL REPORT

2019–2020

# 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 six parts:

- report by the Director General ASNO on key non-proliferation developments in 2019–20 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 2019–20
- 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.

# LETTER OF TRANSMITTAL

Australian Government

Australian Safeguards and Non-Proliferation Office

1 October 2020

The Hon Marise Payne
Minister for Foreign Affairs and Minister for Women
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 2020. 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

Rob Floyd

Dr Robert Floyd
Director General

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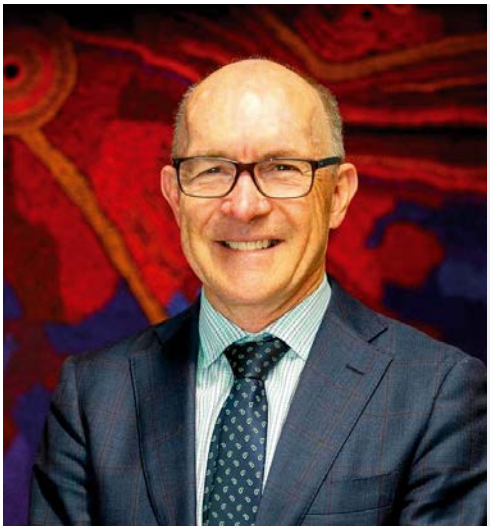


**Dr Robert Floyd**
Director General
Australian Safeguards and
Non-Proliferation Office

# THE YEAR IN REVIEW

## THE INTERNATIONAL NON-PROLIFERATION ENVIRONMENT

The 2019–20 reporting period was characterised by an increasingly challenging international security environment and accompanying strain on established arms control arrangements. Key developments in the non-proliferation sphere included the attribution of chemical weapons use in Syria by the Organisation for the Prohibition of Chemical Weapons (OPCW) and concerns regarding Iran's compliance with the Joint Comprehensive Plan of Action (JCPOA) and its international safeguards obligations. While the COVID–19 pandemic of 2020 has fundamentally changed the way we live and work, the International Atomic Energy Agency (IAEA) has continued to conduct nuclear safeguards inspections worldwide, including in Australia, despite experiencing some disruption due to travel restrictions.[1]

The impacts of COVID-19 are being felt in communities, industries and professional networks across the world. In the nuclear non-proliferation community, the pandemic has impacted on various international meetings and forums, including Australia's Presidency of the Conference on Disarmament and chairing of the UN Disarmament Commission. The 2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT RevCon) was planned to convene in April 2020, but has been postponed to a date in 2021. Many forums have adjusted and the non-proliferation community is finding new ways to work, cooperate and engage in these challenging times.

Australia has advocated at a high political level since the 1980s for a ban on nuclear weapons testing and has continued to support the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) Preparatory Commission. During the 2019–20 period, the CTBTO began discussions on an election process to decide on who will lead that body when the current

1 COVID-19: Latest IAEA Updates, IAEA.

term of Executive Secretary Lassina Zerbo ends in 2021. I am honoured to report the Government has decided that when nominations open in early 2020–21, I will be nominated for the role.

The OPCW concluded in April 2020 that there are reasonable grounds to believe the Syrian Arab Air Force used sarin in southern Ltamenah, Syria on 24 and 30 March 2017, and that the Syrian Arab Air Force used chlorine as a chemical weapon against the Ltamenah hospital on 25 March 2017.[2] Syria is a State Party to the Chemical Weapons Convention (CWC), and it is imperative that Syria uphold its obligations under the Convention. Additionally, in May 2020 Australia commenced a two-year term in the OPCW Executive Council.

The Islamic Republic of Iran has continued to reduce gradually its commitments under the JCPOA, and in January 2020 announced it would no longer be subject to any restrictions in the operational sphere. The IAEA has continued to implement the verification and monitoring provisions under the JCPOA and has reported where Iran exceeded the operational limitations in the JCPOA.[3] Australia urges Iran to return to compliance with the JCPOA and fully cooperate with the IAEA.

In December 2019, Amanda Gorely was appointed Australia's inaugural Ambassador for Arms Control and Counter-Proliferation.[4] This demonstrates Australia's intention to remain a leader and strong advocate for global arms control, non-proliferation and disarmament.

Despite ongoing challenges in the non-proliferation and disarmament environment, the overwhelming majority of States are compliant with their Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and CWC obligations, and the critically important roles of the IAEA and the OPCW continue to be demonstrated.

Dr Robert Floyd in discussions with Minister for Foreign Affairs and Minister for Women, Marise Payne.

2 Release of the first OPCW report attributing chemical weapons use in Syria, Media Release, Minister of Foreign Affairs and Minister for Women; OPCW Investigation and Identification Team.
3 Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231, IAEA, GOV/2020/26.
4 Ambassador of Australia for Arms Control and Counter-Proliferation, Media Release, Minister of Foreign Affairs and Minister for Women.

# NUCLEAR NON-PROLIFERATION AND SAFEGUARDS DEVELOPMENTS

## International Atomic Energy Agency Safeguards

ASNO assesses that the IAEA continues to effectively fulfil its objective of verifying that states uphold their respective nuclear non-proliferation commitments, using the tools available under safeguards agreements and under the Additional Protocol (where in place). The IAEA uses a combination of in-field inspections of nuclear material, facilities, and related activities, as well as its analysis of information at its headquarters in Vienna.

The IAEA has continued to draw soundly based safeguards conclusions for states with safeguards agreements. In 2019, the IAEA was unable to draw the conclusion (referred to as the 'broader conclusion') that all nuclear material remained in peaceful use activities for one state that had previously received that conclusion. This is an important reminder that the IAEA's conclusions are not automatic or permanent. They are based on a rigorous evaluation of all safeguards-relevant information available.

In March 2020, IAEA Director General Rafael Grossi vowed that safeguarding nuclear material 'will not stop for a single minute' during the COVID–19 pandemic. The IAEA has overcome travel disruptions to continue conducting safeguards inspections worldwide, including at the Australian Nuclear Science and Technology Organisation (ANSTO). Australia strongly supports the continued application of safeguards, as a cornerstone of the international nuclear non-proliferation regime, while fulfilling local health recommendations for the prevention of the spread of COVID–19.

The IAEA continues to devote considerable effort to implementing Iran's safeguards agreement and its Additional Protocol, in addition to the monitoring and verification under the JCPOA. The IAEA reported in March and June 2020 that Iran denied access to two locations specified by the IAEA under the Additional Protocol and failed to engage in substantive discussions to clarify IAEA questions related to possible undeclared nuclear material and activities in Iran.[5] In June, the IAEA Board of Governors adopted a resolution calling on Iran to fully cooperate and to provide prompt access to the locations.[6]

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 works with Member States to be adaptive and innovative with technology and analytical tools to help improve the efficiency and effectiveness of safeguards implementation.

Australia uses its expertise and resources to make tangible contributions to developing safeguards technology and approaches, delivering safeguards training, and providing technical services. In 2020, the Australian Safeguards Support Program (ASSP) to the IAEA celebrated its 40th anniversary. ASNO coordinates the ASSP, which comprises long-standing partnerships between the IAEA and Australian government agencies, ANSTO, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australian universities and private companies. These partnerships have helped keep the IAEA's safeguards approaches up to date with the latest developments in nuclear technology from the Hexapartite Safeguards Project of the 1980s for gas centrifuge enrichment,

5 Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015), GOV/2020/5, IAEA.
6 NPT safeguards agreement with the Islamic Republic of Iran Resolution adopted by the Board of Governors on 19 June 2020, GOV/2020/34, IAEA.

to the ongoing reviews of the IAEA's Physical Model of nuclear fuel cycle technologies. The ASSP has also helped the IAEA with training safeguards experts and analysing samples taken during IAEA inspections. Increasingly, the ASSP is also helping IAEA safeguards use work from technical fields that evolved for applications quite unrelated to safeguards, such as data analytics and robotics.

IAEA safeguards are fundamentally about maintaining international confidence of the compliance of States with non-proliferation commitments, so there is an important role for States to assist each other in maintaining effective domestic systems and promoting good practice. The IAEA continues to work with States to address specific issues and conduct outreach and awareness-raising activities through workshops and meetings. Australia plays a role in regional capacity building and experience sharing through the Asia-Pacific Safeguards Network (APSN), which celebrated its 10th anniversary in Bali in August 2019. As Director General of ASNO, I also contribute to reviews of approaches to safeguards implementation through my role as chair of the Standing Advisory Group on Safeguards Implementation (SAGSI). More details on ASNO's work in these areas are in Output 1.4.


IAEA Director General Rafael Grossi (left), Deputy Director General and Head of the Department of Safeguards Massimo Aparo (right), and Australian Ambassador to the IAEA Richard Sadleir (centre) celebrate the 40th anniversary of the Australian Safeguards Support Program (Credit: IAEA Flickr).

Australia's Ambassador for Arms Control and Counter-Proliferation, Amanda Gorely, and IAEA Director General, Rafael Grossi (Credit: IAEA Flickr).

## Domestic Developments

In 2020, 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 activities for Australia every year since 2000.

During the reporting period, the IAEA conducted various verification activities (i.e. inspections) in Australia under the Comprehensive Safeguards Agreement and the Additional Protocol.

In total, eleven separate IAEA inspections plus two technical visits were carried out at ANSTO. The IAEA generally combines several inspections together, so these eleven inspections were all conducted over three separate visits and the IAEA's findings (where available at the time of publication of this Annual Report) are in Output 1.1 and Appendix B.

ASNO worked with the IAEA and Commonwealth and NSW agencies to overcome challenges posed by COVID–19 restrictions to hold annual physical inventory verification (PIV) inspections at ANSTO in June 2020. The IAEA inspectors spent two weeks in quarantine in Sydney before carrying out the inspections. Additional health and safety measures were applied during the inspections. The inspectors were able to meet their inspection goals while fulfilling national and state health requirements for the prevention of the spread of COVID–19.

Another focus of ASNO's work was contributing to the Department of Industry, Science, Energy and Resources' (DISER) National Radioactive Waste Management Facility project. ASNO worked with ANSTO and DISER 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 and facility design.

## Nuclear Security Developments

As part of its regular inspection program, ASNO conducted five security inspections and visits including at ANSTO, CSIRO, the Ranger uranium mine and uranium ore concentrate (UOC) transporters. These are described in detail in Section 4 – Output 1.2.

The preparatory process for the Article 16 Conference of States Parties for the Amended Convention on the Physical Protection of Nuclear Material continued with myself (as DG ASNO) co-chairing with Argentina two meetings of legal and technical experts. A detailed account of the process can be found under Current Topics.

A summary of other international nuclear security developments can be found in the IAEA's 2020 nuclear security report.

## Bilateral Safeguards Developments

During 2019–20, all Australian Obligated Nuclear Material (AONM) was accounted for in accordance with the procedures and standards prescribed in Australia's network of 25 Nuclear Cooperation Agreements (NCAs) covering 43 countries, plus Taiwan.

All NCAs contain treaty level assurances that AONM will be used exclusively for peaceful purposes and be covered by IAEA safeguards. They also require that appropriate nuclear security measures are applied to AONM exported overseas, as well as a number of supplementary conditions.

The United Kingdom has formally left the European Union and entered into a transition period until 31 December 2020. A new Australia-United Kingdom NCA was signed in August 2018, which is ready to enter into force at the end of this transition period. Until then, nuclear cooperation between Australia and the United Kingdom will continue under the Australia-Euratom NCA, ensuring there will be no legal gaps in coverage of Australian nuclear material.

# CHEMICAL WEAPONS CONVENTION DEVELOPMENTS

## Domestic Developments

During the reporting year, 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 declarations 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.

The 21st Annual meeting of National Authorities to the Organisation for the Prohibition of Chemical Weapons – The Hague, November 2019 (Credit: OPCW Flickr).

ASNO facilitated routine OPCW inspections at three chemical facilities in Victoria. These inspections bring the total number of inspections in Australia to 60 since entry-into-force of the CWC in 1997. The OPCW inspection reports confirmed the veracity of Australia's declared information, including the absence of any undeclared CWC-Schedule 1 chemicals and/or their production.

ASNO has commenced its software development project to create a new database and industry portal to replace those currently in use. To this end, ASNO reached out to our industry stakeholders through a survey to determine what features they would like in the new system. We have incorporated their feedback into the design process with the aim to create a database that is intuitive, robust and simple to use. The new database will provide easy access to information for our stakeholders and allow ASNO staff greater capability in meeting our legislative and treaty obligations.

In November 2019, the Conference of the States Parties to the CWC took a decision to add four new classes of chemicals to Schedule 1 of the Annex of Chemicals of the CWC. This decision was taken in response to the use of Novichok chemical nerve agents in the United Kingdom in 2018. The chemical families being added to Schedule 1 represent the series of Novichok agents, and means such agents will be subject to formal OPCW declaration and verification processes.

ASNO coordinated the required amendment to Australia's *Chemical Weapons (Prohibition) Regulations 1997*. In preparation for the change to the Regulations, ASNO engaged with approximately 200 industry and government stakeholders to determine the impact of including these chemicals in the Australian regulations and determined that there was no current, or past, interest in the use of these chemicals in Australia, nor did any stakeholders object to their inclusion in Australian legislation. The amended regulations entered into force on 7 June 2020.

ASNO engaged with partner agencies to ensure that the additional chemical families were regulated by Australia's import and export control framework. As a result, the Australian Border Force amended the *Customs (Prohibited Imports) Regulation 1956* to include the additional families of chemicals with entry into force on the 7 June 2020. The Department of Defence verified that the 'Defence Strategic Goods List (DSGL)' already covered the exportation of these chemical families.

ASNO continued to help inform Australia's policy positions through the provision of technical advice on CWC and verification-related issues. Efforts to rid the world of chemical weapons, and to stop the proliferation of weapons of mass destruction more broadly, involve many domestic and international stakeholders. To this end, ASNO continues to work closely with key stakeholders in the fields of non-proliferation and counter-proliferation. ASNO has a close working relationship with the International Security Division of the Australian Department of Foreign Affairs and Trade as well as the Australian Embassy in The Hague, where the OPCW is based.

## International Developments

ASNO, as Australia's National Authority for the implementation of the Chemical Weapons Convention, also works closely with the OPCW. As the OPCW continues the core work of overseeing the implementation of the CWC worldwide, it has also been challenged by the use of chemical weapons; the use of VX in Malaysia in 2017, the use of Novichok nerve agents in the United Kingdom in 2018, and attributed and alleged use of chemical weapons in Syria. Throughout the 2019–20 year, the OPCW has worked to address these issues whilst continuing to support States Parties through essential training and capacity building.

As of May 2020, the CWC boasts membership of 193 States Parties, leaving only four countries yet to join; Israel (signed but not ratified), Egypt, the Democratic People's Republic of Korea (DPRK) and South Sudan.

Of the member States Parties, 123 (including Australia) have enacted comprehensive implementing legislation required to reduce the threat of the use of chemical weapons including by non-State actors.

The OPCW strives to ensure the elimination of chemical weapons whilst encouraging the use of chemicals for peaceful purposes. To achieve these goals, the OPCW conducts a number of activities.

The OPCW oversees the destruction of chemical weapons and related sites. The OPCW Inspectorate has conducted 3,256 inspections at chemical weapon related sites including of chemical stockpiles, old chemical weapons, manufacturing facilities and destruction facilities. Since the CWC entered into force in 1997, the OPCW has overseen the destruction of 97.51 per cent of the worlds' declared chemical weapons stockpiles and ensured that all 97 declared chemical weapons manufacturing facilities have either been destroyed or converted for peaceful purposes.

To facilitate the use of chemicals for peaceful purposes, the OPCW conducts regular inspections of industrial chemical facilities, ensuring that chemicals have not been diverted into the manufacture of chemical weapons. The OPCW inspectorate has conducted 4,046 inspections of industrial chemical facilities in 80 States Parties. These routine inspections ensure that the worlds' chemical industry operates within parameters agreed to by the CWC States Parties. In addition to the routine inspections, the OPCW has extended its resources by conducting investigations into allegations of chemical weapons use.

During 2019 and 2020, the OPCW's Fact-Finding Mission (FFM) continued its investigations into allegations of chemical weapons use in Syria. The FFM's final report on the alleged use of toxic chemicals as a weapon in Douma, Syria on 7 April 2018, released on 1 March 2019, assessed there were reasonable grounds to support that allegation, and that the toxic chemical was likely chlorine.

During the reporting period, the OPCW continued to operationalise the Investigation and Identification Team (IIT), which has the mandate to determine responsibility for chemical weapons attacks. The IIT released its first report on 8 April 2020 on three incidents of chemical weapons use in Ltamenah, Syria, on 24, 25 and 30 March 2017. The IIT based its assessment on interviews with witnesses, review of medical reports, analysis of samples collected from the sites of the incidents, examination of imagery including satellite imagery, and consultation with experts. The IIT concluded that there are reasonable grounds to believe that the Syrian Arab Air Force were responsible for these three chemical weapons attacks. In response to the release of the IIT report, the Minister for Foreign Affairs, Senator the Hon Marise Payne called on all CWC States Parties to take appropriate action and to ensure all users of chemical weapons, or those who command, enable or shield those who use chemical weapons, are held responsible.

At the November 2019 Conference of the States Parties to the CWC, decisions were made to support the amendment of the Annex on Chemicals of the CWC; this represents the first time that the Schedules have been amended since the CWC came into force in 1997. The decisions were based on two proposals to include the Novichok family of nerve agents in the Schedule 1 chemical list. A Novichok nerve agent was used in an attempted assassination in the United Kingdom in 2018. At the time of the attack, Novichok agents were not specifically listed in the CWC Annex of Scheduled Chemicals, although the CWC prohibits the use of any chemical as a weapon and therefore indirectly captured these chemicals. The first decision undertaken by the Conference was in response to a proposal put forward jointly by Canada, the Netherlands, and the United States of America; the second proposal was submitted by the Russian Federation. With both proposals accepted, four additional families of chemicals have been added to Schedule 1 of the Annex on Chemicals of the CWC,

with the amendment entering into force on 7 June 2020.

In 2017, it was recognised that the OPCW Laboratory and Equipment Store, built in 1966, required replacement if it is to continue to support OPCW core capabilities in the evolving chemical weapons threat environment. The OPCW Laboratory and Equipment Store was designed to support OPCW missions and verification activities, and to support international cooperation and assistance activities. More recently, there has been an increased demand to respond to the emergence of new chemical threats, which requires the development of new and improved verification tools and expanded capabilities to conduct non-routine missions. A plan to replace the current facility with a purpose built facility was announced in 2017. The new facility, to be known as the ChemTech Centre, has an estimated cost of AUD55 million to be met by donations from States Parties by July 2020, with Australia contributing AUD200,000 to the project in 2020. The new ChemTech Centre is due to become operational at the end of 2022.

## COMPREHENSIVE NUCLEAR-TEST-BAN TREATY (CTBT)

Although the CTBT is not yet in force, it is a uniquely valuable element of the international non-proliferation and disarmament architecture and has strong support in the great majority of countries. More than 90 per cent of International Monitoring System (IMS) facilities are operating, including all those that Australia has committed to host. The IMS and the International Data Centre, which provides IMS data and products to member states, have continued to function well in the face of disruptions caused by COVID–19. However, meetings of member states have been affected, as have various technical workshops. Planned on-site inspection field exercises have been delayed to 2021. Australian experts have continued to engage with the CTBTO using online tools.

Dr Robert Floyd at Geoscience Australia discussing Australia's seismic monitoring activities and the CTBT's International Monitoring System.

# OTHER NON-PROLIFERATION AND DISARMAMENT ACTIVITIES

## International Partnership for Nuclear Disarmament Verification (IPNDV)

The International Partnership for Nuclear Disarmament Verification (IPNDV) was formed in 2015 to bring 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 future nuclear disarmament. During the year, IPNDV concluded a second two-year work phase. In early 2020, IPNDV published on its website findings agreed by the Partnership on how an independent international entity could check nuclear weapon inventories declared by a state, and verify that some or all of these are dismantled. As DG ASNO, I have co-chaired one of IPNDV's three working groups in each work phase.

A highlight of IPNDV's work in 2019 was the conduct by Germany and France of an on-site exercise testing inspection procedures for confirming that there is no diversion of fissile material. ASNO's Malcolm Coxhead led a team evaluating the exercise which has recommended lessons that IPNDV can consider in its third work-phase.

Meetings of IPNDV partners planned for 2020 have been disrupted due to COVID–19 impacts. The third work phase is now underway using online tools. A key aim in the new phase will be to develop verification arrangements around a detailed fictional scenario, and to test these through practical activities.

IPNDV engages a wide range of states in its work, including three of the five NPT Nuclear Weapons States.

## 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 an FMCT, both to promote the commencement of negotiations, and to develop proposals that could assist negotiators. ASNO continues to support efforts by DFAT to advance these objectives.

# THE YEAR AHEAD

ASNO will continue its efforts to promote effective safeguards implementation internationally, through its leadership role in the Asia-Pacific Safeguards Network (APSN), and I, as DG ASNO, will continue serving as Chair of the IAEA Director General's Standing Advisory Group on Safeguards Implementation (SAGSI).

Improving the efficiency of regulatory activities is an ongoing element of ASNO's work and during the coming year this will include continuing development of the Nuclear Material Balance and Tracking (NUMBAT) database in order to connect related functions and improve the efficiency of ASNO and permit holder management of inventory records and reports.

ASNO will continue to work with the IAEA and ANSTO on the deployment of the IAEA's customised active well coincidence counter (AWCC) detector to measure the nuclear material content in solid waste from the ANSTO Nuclear Medicine (ANM) molybdenum–99 production plant. After the successful hot test of that detector in February 2019, the next step is to deploy the system for formal IAEA verification purposes, planned for the second half of 2020.


Permanent Representative of Australia to the OPCW, H.E. Ambassador Matthew Neuhaus (Credit: OPCW Flickr).

A key challenge for ASNO over the coming year will be assisting with the development and implementation of a new chemical database to support Australia's reporting obligations under the Chemical Weapons Convention. ASNO will continue to work with DFAT's Information Management and Technology Division to develop a new chemical database system with an industry access online portal to improve the end-user stakeholder experience and the efficiency of ASNO's regulatory functions.

Australia's resumption of a seat on the OPCW Executive Council for a two-year term from May 2020–22, will provide a focus for ASNO in terms of technical advice and support for Australian policy positions at the OPCW.

Regarding domestic nuclear security, ASNO will focus on reviewing ANSTO's security plans and the conduct of a Periodic Safety and Security Review of the OPAL reactor and also will continue oversight of associated technology and Uranium Ore Concentrate storage and transport. Internationally, ASNO will play a leading role in preparations for the 2021 Review Conference of the Amended Convention on the Physical Protection of Nuclear Material with myself, (as DG ASNO), co-chairing the preparatory process. We will continue to engage in the Nuclear Security Contact Group and the Nuclear Security Guidance Committee.

ASNO will continue to implement Australia's bilateral nuclear cooperation agreements (NCAs), and where appropriate, liaise with partners to streamline relevant accounting procedures and processes. This may also include updating several Administrative Arrangements (implementation documents pursuant to NCAs) to ensure these reflect current working practices. ASNO will continue to modernise security practices to facilitate the efficient and secure exchange of information between counterparts. While COVID–19 may prohibit face-to-face engagements and meetings with counterparts, we will seek to cooperate with overseas counterparts using alternative meeting methods.

Since the 1980s, Australia has advocated at a high political level for a ban on nuclear weapons tests and contributed actively in the negotiation of the CTBT. Australia regards the CTBT as a critical element of the multilateral non-proliferation and disarmament architecture and continues to provide significant political and practical support to promote entry into force of the treaty and to advance the work of the CTBTO. An article at page 21 of this report reviews the history of Australia's engagement with the CTBT, with a particular focus on specialist technical contributions.

Against this backdrop, the Minister for Foreign Affairs decided that Australia would nominate myself as a candidate in a selection process to succeed the CTBTO's present Executive Secretary (Dr Lassina Zerbo) at the end of Dr Zerbo's second four-year term.

International engagement to advance non-proliferation and disarmament has faced significant challenges since the global spread of the COVID–19 virus. This is likely to continue in 2020–21 while international travel is constrained. A number of important meetings or practical activities have been deferred.

Participants in the International Partnership for Nuclear Disarmament Verification are finding new ways to advance their work in light of COVID–19 impacts. Meetings in the coming year are likely to continue to be conducted online.

Each few years the CTBTO conducts field exercises to help to test equipment and procedures for conducting an on-site inspection, in order to refine preparedness for entry into force of the CTBT. ASNO's Malcolm Coxhead has contributed to a group of experts developing viable and technically sound scenarios for a further series of exercises. These were scheduled to take place in 2020, but have been deferred due to COVID–19. They should proceed in 2021, if the more than 100 participants are able to travel to the exercise site in Slovakia.

SECTION 2

# CURRENT TOPICS

# AMENDMENT OF THE CHEMICAL WEAPONS (PROHIBITION) REGULATIONS 1997

In November 2019, the Conference of the States Parties (CSP) to the Chemical Weapons Convention (CWC) considered two proposals, a joint proposal from the United States, Canada and The Netherlands and a proposal from the Russian Federation, to add additional chemicals to the CWC Schedule 1 Annex on Chemicals.

The CSP considered both proposals simultaneously, and both were adopted by consensus. This action represents the first time the Annex on Chemicals has been changed since the CWC entered into force in 1997. The decision to add four new classes of chemicals, was made in response to the use of Novichok chemical nerve agents in the United Kingdom in 2018. As Australia's National Authority for the implementation of the CWC, the Australian Safeguards and Non-Proliferation Office (ASNO) worked with partner agencies to ensure that changes made to the CWC are implemented fully through Australian regulations.

In 2018, there were two incidents of exposure in the United Kingdom to a chemical toxin that was later identified as a chemical nerve agent from the Novichok series.[1] The first incident occurred on 4 March 2018, in Salisbury. Father and daughter, Sergei and Yulia Skripal, the first two victims, were hospitalised and treated along with two police officers who were incidentally exposed to the chemical toxin whilst investigating the Skripal's exposure. The second incident occurred on 30 June 2018 in the nearby village of Amesbury. In this incident, two UK nationals were exposed to the same type of chemical agent that had affected the Skripals months earlier. Chemical analysis of environmental and biomedical samples revealed that all those hospitalised during these incidents were exposed to the same type of chemical, a Novichok series chemical nerve agent. One victim died from the exposure.

These incidents represented the first time a chemical nerve agent had been used in Europe since the Second World War. Its use drew condemnation from governments around the world. The Novichok series of nerve agents had not previously been specifically listed in the Annex on Chemicals, but were covered under catch-all definitions within the CWC. In order to subject this class of chemicals to the CWC's verification regime, it was proposed that they be specifically included in the Annex on Chemicals.

In November 2019, the OPCW Conference of States Parties adopted the two proposals to include the Novichok class of chemicals in Schedule 1 of the CWC Annex on Chemicals.[2] The OPCW announced the decisions in November and provided consolidated text of the amendments in December 2019 to enable States Parties to implement the changes, with effect on 7 June 2020.



1 Incident in Salisbury, OPCW.
2 Conference of the States Parties Adopts Decisions to Amend Chemical Weapons Convention Annex, OPCW 2019.

ASNO engaged with industry and government stakeholders and determined that there was no current, or past, interest in producing, processing or consuming these chemicals in Australia and therefore no negative economic impact of implementing these changes within Australia. ASNO coordinated the amendment of Australia's *Chemical Weapons (Prohibition) Regulations 1997* and the changes entered into force on 7 June 2020.[3] ASNO engaged with Australian Border Force which amended the *Customs (Prohibited Imports) Regulations 1956* to include the additional families of chemicals with entry into force on 7 June 2020.[4] ASNO further engaged with the Department of Defence and verified that the 'Defence Strategic Goods List' (DSGL) regulated the exportation of these chemicals.

Australia has a been a Party to the CWC since the CWC entered into force in 1997 and continues to support the OPCW in its role as the CWC's implementing body and its efforts to oversee the global endeavour to permanently and verifiably eliminate chemical weapons. ASNO, as Australia's National Authority for the implementation of the CWC, and with the assistance of DFAT and partner agencies, continues to ensure that the CWC is implemented fully through Australian legislation and regulations.

3 Chemical Weapons (Prohibition) Amendment (Annex on Chemicals) Regulations 2020, Federal Register of Legislation.
4 Australian Customs Notice No. 2020/23, Australian Border Force.

# THE REVIEW CONFERENCE FOR THE AMENDED CONVENTION ON THE PHYSICAL PROTECTION OF NUCLEAR MATERIAL

## The Original CPPNM – Limited in Scope

The Convention on the Physical Protection of Nuclear Material (CPPNM) was established to facilitate international cooperation between states on issues of common interest related to physical protection of nuclear material. After two years of negotiation, the CPPNM was opened for signature on 3 March 1980 and entered into force on 8 February 1987. On 22 September 1987, Australia was the 19th state to ratify the CPPNM. The scope of the CPPNM was limited to physical protection of nuclear material in international transport but also covered the criminalisation of offences, international cooperation and information exchange. To this day, it remains the only international legally binding undertaking on physical protection of nuclear material.

## The 2005 Amendment

Over time, there were calls to expand the scope of the CPPNM to apply to physical protection of nuclear material in domestic use and storage. Finally, in July 2005, a Diplomatic Conference adopted a detailed amendment. The amendment not only extended the remit of the original 1979 CPPNM to cover domestic use, storage and transport but also criminalised acts of sabotage against nuclear facilities and trafficking in nuclear materials. Further, it integrated the Fundamental Objectives and Principles of Physical Protection, which were developed by a legal and technical expert group and endorsed by the IAEA Board of Governors in 2001. While adopted in 2005, it took over ten years for the Amendment to enter-into-force in 2016, after significant outreach and lobbying during the course of the nuclear security summits over 2010–2016. Australia was the 17th state to ratify the Amendment, in 2008.

## Article 16 Review Conference

Both the original and amended Conventions provide for a mandated review conference (Article 16.1) to be held five years after entry into force of the respective Conventions but also for additional review conferences (Article 16.2) should a majority of States Parties desire to do so.

The CPPNM's article on review conferences is similarly worded to the corresponding article in the NPT. However, unlike the NPT, for which review conferences have been convened every five years and for which there is well established cycle of annual Preparatory Committee meetings (PrepComs), there has been only one review conference for the original CPPNM and there is no established preparatory process.[5] That single review conference took place 29 September 1992. The final statement of that review conference concluded flatly that the Convention was adequate. No additional Article 16 review conferences for the original Convention have been held.

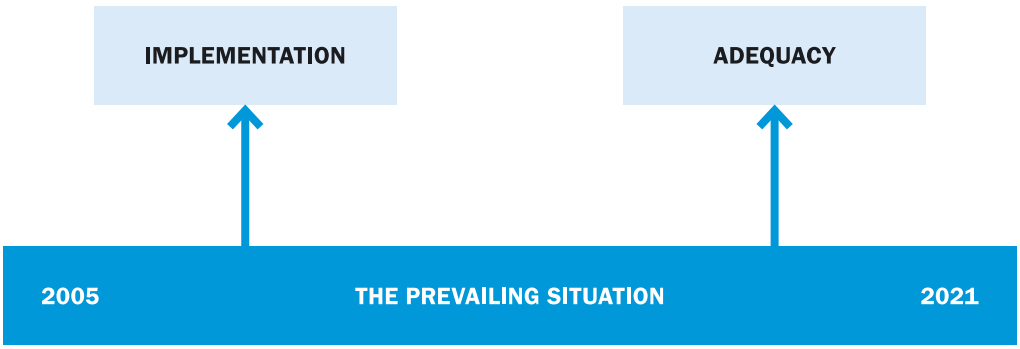
The entry into force of the 2005 amendment in 2016 set the stage for the amended CPPNM review conference to take place after 8 May 2021.

5 Other relatively modern nuclear-related treaties such as the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* have detailed provisions for preparatory and review meetings specified in the treaty text.

## Breaking Down Article 16.1

> "A *conference of States Parties shall be convened by the depositary five years after the entry into force of the Amendment adopted on 8 July 2005 to review the implementation of this Convention and its adequacy as concerns the preamble, the whole of the operative part and the annexes in the light of the then prevailing situation*".

Article 16.1 comprises three main elements that drives the conduct of the review conference:




*In light of the prevailing situation:* This sets the context for reviewing implementation and adequacy. Nuclear security technologies, nuclear technologies, international transport of fuel and the nature of threats to nuclear material and facilities have all changed since the Amendment was first agreed in 2005. It would also be prudent to examine whether the Convention is robust to the anticipated prevailing situation in the coming years.

*A review of implementation of the Convention*: Already during the negotiation of what would become the 2005 Amendment, a peer review mechanism was explicitly excluded from the Amendment. However, there is wide scope for individual Parties to share their experiences on implementation for the benefit of all and to discuss areas where international cooperation, criminalisation or extraditions have been successful or problematic. The ultimate goal is to achieve high standards of implementation which supports the purpose of the Convention (see below).

*A review of adequacy of the Convention*: A suitable basis to assess adequacy could be the stated purpose of Convention as set in Article 1A, i.e. '*to achieve and maintain worldwide effective physical protection of nuclear material used for peaceful purposes and of nuclear facilities used for peaceful purposes; to prevent and combat offences relating to such material and facilities worldwide; as well as to facilitate co-operation among States Parties to those ends*'. This purpose statement was absent in the original 1979 CPPNM. Any conclusion need not be binary as there will be a variety of views from States Parties on various aspects of Convention.

## The Road to the Review Conference

As noted above, there is no prescribed process for the holding of the mandated Article 16.1 Review Conference. In order to discuss the preparations the IAEA Secretariat held an informal meeting of CPPNM Parties on 10–11 December 2018. The meeting developed a provisional roadmap to the Conference, which included meetings of legal and technical experts and a preparatory committee (PrepCom) to establish thematic and procedural matters for the Conference.

In June 2019, Director General ASNO accepted an invitation to co-chair with Argentina the meetings of Legal and Technical Experts and to also co-chair with Hungary a Preparatory Committee in 2020. Switzerland and Nigeria agreed to co-chair the Review Conference.

Two meetings of legal and technical experts were held in July and December 2019. These meetings discussed the process for the review of the Convention and put together a draft agenda and program and a suggested outline for national statements. The meetings also discussed elements of the rules of procedure to apply during the review conference. There was also strong support to bring focus to universalisation of the ACPPNM in the lead-up to, and during, the Review Conference. As of 30 June 2020, 124 of 161 (77 per cent) of CPPNM Parties had the Amendment in force.

## PrepCom – COVID Interrupted

The PrepCom was to be held in June 2020 but due to the constraints placed on the holding of meetings at the IAEA's headquarters in Vienna and travel restrictions due to COVID–19, the meeting was postponed to December 2020. Given the continued uncertainty of the status of COVID–19 worldwide, this date remains tentative as is the date for the Review Conference.

Table 1: **Key data related to the CPPNM and its Amendment.**

| | CPPNM | ACPPNM |
|---|---|---|
| Treaty adopted | 26 October 1979 | 8 July 2005 |
| Treaty open for signature | 3 March 1980 | N/A |
| Australian signature | 22 February 1984 | N/A |
| Australian ratification | 22 September 1987 | 17 July 2008 |
| Treaty entry into force | 8 February 1987 | 8 May 2016 |
| Parties (as of 30 June 2020) | 161 | 124 |
| Article 16 Review Conference | 29 September 1992 | 2021 (Date TBD) |

# THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY – AUSTRALIA'S CONTRIBUTIONS OVER DECADES

The age of nuclear weapons began with a nuclear test explosion, and the twentieth century saw over 2000 more – symbols of the Cold War and the growth of nuclear arsenals. While nuclear weapons are still with us, only one country, the Democratic People's Republic of Korea (DPRK), is known to have carried out explosive nuclear tests in the last twenty years. The Comprehensive Nuclear-Test-Ban Treaty (CTBT) has been important to this shift in global norms – even though it is not yet in legal force. Australia's history and geography have made it a strong and active supporter of efforts to achieve a ban on nuclear testing, and forged a determination to continue that support through the difficult strategic environment emerging in this twenty-first century.

From 1952 to 1963, Australia hosted a number of nuclear weapon development tests by the United Kingdom. Although these were supported by the Australian Government at the time, this part of Australian history has come to be viewed more negatively. Reaction to nuclear testing in the South Pacific in the 1980s strengthened this trend further. This, together with broader concerns about the proliferation of nuclear weapons, has firmly shaped public opinion and government policy in Australia on nuclear weapons testing over several decades.

Since the 1980s, Australia has advocated at a high political level for efforts to negotiate a multilateral and comprehensive ban on nuclear weapons testing, and to put that ban into effect. Australia was instrumental in pushing for a comprehensive ban on nuclear tests and was a key force behind the drafting of the final text for the CTBT and for making possible its adoption by the United Nations General Assembly in 1996. Australia signed the Treaty on the day it opened for signature on 24 September 1996 and ratified it on 9 July 1998. In the years since, Australia has continued to support the Treaty and the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), co-chairing the Friends of the CTBT Ministerial process and leading the annual CTBT resolution in the United Nations General Assembly. Australia's diplomats and experts continue to work directly with many countries, especially those in our region, to encourage further signatures and ratifications of the CTBT.

Australia's history and geography has also influenced its role in relation to nuclear test monitoring and the CTBT. Seismic arrays near Alice Springs and Tennant Creek in the Northern Territory were built in the 1950s and 1960s to support allied monitoring of nuclear weapons testing. Those stations continue to operate today, and have now been incorporated in the CTBT's International Monitoring System (IMS). They are widely regarded as amongst the most useful in the IMS for very-long-distance detection of seismic events.

A Group of Scientific Experts (GSE) established in 1976 by the Conference of the Committee on Disarmament (precursor to the present Conference on Disarmament) began the important work that enabled negotiation of the CTBT. Australian technical experts contributed actively to the GSE, for example by coordinating the first large-scale test of the exchange and analysis of seismic data in 1984.

A further 21 Australian-hosted facilities have been added to the IMS since the 1990s, covering each of the technologies (seismic, infrasound, radionuclide and hydroacoustic) for detecting evidence of a possible nuclear test explosion. Australian IMS stations stretch from latitude 12° to 68° South and from longitude 63° to 159° East and monitor a significant part of the globe. The last of Australia's monitoring facilities was completed in 2018 – an infrasound monitoring array at Davis Station in Australian Antarctic Territory.

ASNO took on the role of Australia's National Authority for the CTBT in 1998 and has overseen the completion of Australia's IMS stations, working together with colleagues from Geoscience Australia (GA), the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), the Australian National University and, of course, from the CTBTO in Vienna.

Experts from ASNO and various Australian agencies have played leading roles in the broader technical work of the CTBTO, for example to establish and test its International Data Centre, and to assist the development of a capability to conduct on-site inspections to verify compliance after the Treaty has entered into force.

In the 1980s, a program was established to analyse data from seismic stations to identify events of concern and advise the Australian Government where it appeared that a nuclear test might have occurred. This program continues to be operated by GA and has been supplemented by ARPANSA's expert analysis of radionuclide detections. These capabilities enable Australia to draw on the IMS to detect and analyse any further nuclear testing, for example by the DPRK, but also provide good assurance that no other country may return to explosive nuclear testing without detection.

Warramanga IMS facility (Credit: The Australian National University).

# URANIUM EXPORTS AND PRODUCTION

Table 2: **UOC ($U_3O_8$) export and nuclear electricity statistics**

| Item | Data |
|---|---|
| Total Australian UOC exports 2019–20 | 7,195 tonnes |
| Value Australian UOC exports | $688 million |
| Australian exports as percentage of world uranium requirements[6] | 8.9% |
| Number of reactors (GWe) these exports could power[7] | 35.6 |
| Power generated by these exports | 243 TWh |
| Expressed as percentage of total Australian electricity production[8] | 92% |

Australia has around one third of the world's uranium resources, and remains the world's third ranking producer. There are currently three operating Australian uranium mines: Ranger in the Northern Territory, and Olympic Dam and Beverley Four Mile in South Australia. The Ranger uranium mine is scheduled to close in January 2021. In 2013, the Honeymoon uranium mine in South Australia was placed in care and maintenance, but has since been purchased by Boss Resources Limited, which has plans to restart and expand the operation.

Like most major global markets, the uranium industry has been impacted by the COVID–19 pandemic in 2020.

The Australian Government, alongside state and territory governments, announced wide-ranging measures in an effort to curb the virus.

Global production of uranium is likely to experience a decrease in 2019–2020. In April 2020, Kazakhstan's Kazatomprom announced that measures would be implemented for a three-month period to reduce the number of staff on mining sites and these measures were extended in July 2020.[9]

Additionally in April, Cameco announced similar temporary measures at its Port Hope Conversion Facility, the Blind River Refinery in Ontario and the Cigar Lake uranium mine in Saskatchewan. Production operations

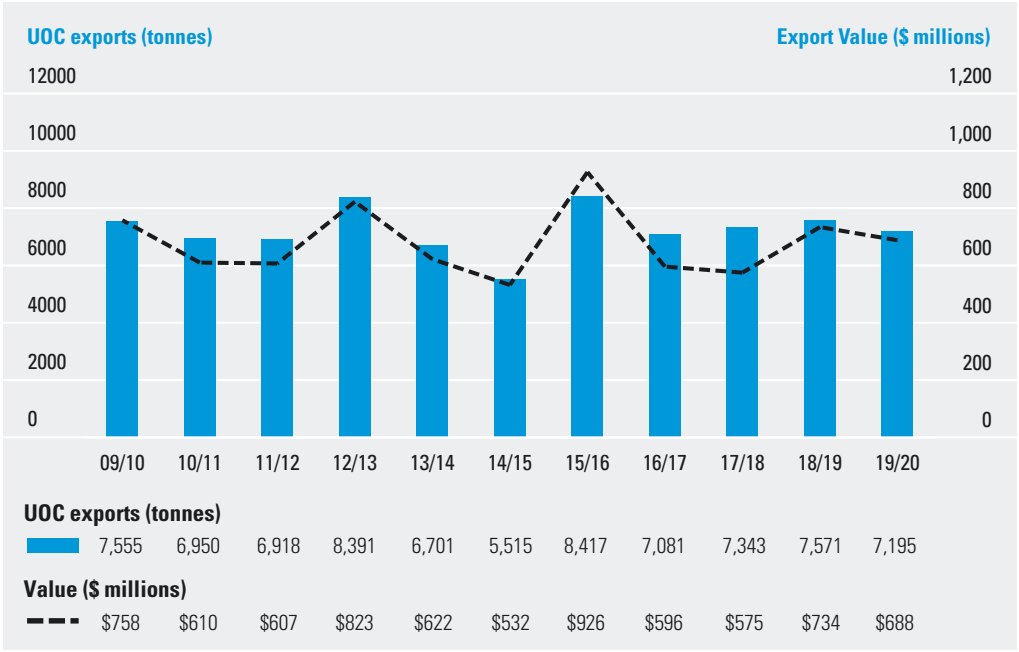
6 Based on August 2020 world requirements of 68,240 tonnes U, from the World Nuclear Association's World Nuclear Power Reactors & Uranium Requirements.
7 Based on a comparison of GWe of nuclear electricity capacity and uranium required, for countries eligible to use AONM, from the World Nuclear Association's World Nuclear Power Reactors & Uranium Requirements, August 2020.
8 Based on Australia's electricity generation in calendar year of 2019 of 265.117 TWh from the Department of Industry, Science, Energy and Resources, 2019 Australian Energy Statistics, May 2020.
9 COVID-19: Update on Kazatomprom Operations, Kazatomprom, 6 July 2020.

resumed at Port Hope and Blind River in May, and Cameco announced plans to restart Cigar Lake in September 2020.[10, 11]

The Rossing uranium mine in Namibia also announced a suspension of normal mining operations in March 2020.[12]

In 2019, the United States conducted an investigation into US imports of uranium, ultimately determining that uranium imports do not threaten US national security. Following on from the investigation, the United States Nuclear Fuel Working Group (NFWG) was established to develop recommendations for reviving and expanding the United States' domestic nuclear fuel production. The NFWG published a report entitled *Restoring America's Competitive Nuclear Energy Advantage* in April 2020.[13] The report recommends that the US Government take action to 'revive and strengthen the uranium mining industry, support uranium conversion services [and] end reliance on foreign uranium enrichment capabilities.'[14] In the 2019–20 period, Australia exported 7,195 tonnes of uranium ore concentrate (UOC) at a value of approximately $688 million (see Figure 1).

Figure 1: **Quantity and value of Australian UOC ($U_3O_8$) exports from 2009/10 to 2019/20**




10 Cameco Restarting Production at Ontario Operations, Cigar Lake Status Unchanged, Cameco, May 2020.
11 Cameco Reports Second Quarter Results, Well Positioned Financially, Supported by Cigar Lake Restart, Cameco, July 2020.
12 Rössing operations suspended in Namibian lockdown, World Nuclear News, March 2020.
13 Restoring America's Competitive Nuclear Energy Advantage, US Department of Energy.
14 Ibid.

# 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 Treaty on the Non-Proliferation of Nuclear Weapons (NPT);[15] 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 (Australian Obligated Nuclear Material) 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[16]
- 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 and
- 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.[17]

15 On 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.

16 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.

17 Euratom is the Atomic Energy Agency of the European Union. The Australia-Euratom NCA covers all 27 Member States of the European Union, and the United Kingdom until the end of the transition period.

## 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 and
- IAEA safeguards activities and IAEA conclusions on each country.

## AUSTRALIA'S URANIUM TRANSHIPMENT SECURITY POLICY

For States 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.[18] 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.

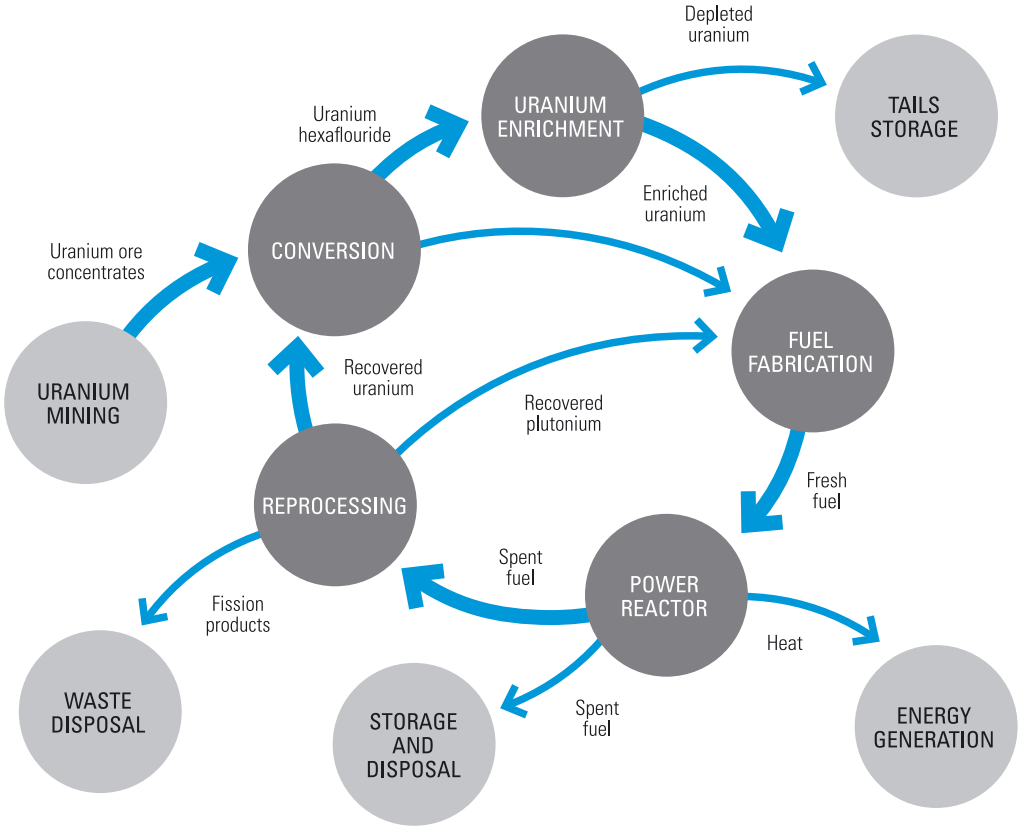
A characteristic of the nuclear fuel cycle is the international interdependence of facility operators and power utilities. It is unusual for a country to be entirely self-contained in the processing of uranium for civil use. Even in nuclear-weapon States, power utilities will often go to other countries 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.



18 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**




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 complies with its 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 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.[1] India, Israel, Pakistan and South Sudan have never joined the NPT. The Democratic People's Republic of Korea (DPRK) 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

1 According to the United Nations Office for Disarmament Affairs. This number includes the DPRK.

nuclear explosive devices, and not in any way to assist, encourage or induce an NNWS to manufacture or otherwise 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 and security 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
- 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 ASNO and the 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 monitoring 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 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. 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. Other provisions will come into effect with the entry into force of the CTBT. 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 Convention on the Development, Production, Stockpiling and Use of Chemical Weapons and their Destruction (or CWC) prohibits the development, production, acquisition, stockpiling, retention, transfer and use of chemical weapons. Its verification regime is based on declarations by States Parties of facilities and activities dealing with particular chemicals, and on confirmation of compliance through on-site inspections.

ASNO acts as the primary 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 under 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 carrying out inspections in Australia.

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, which enabled its entry into force. The Treaty has 13 parties: Australia, Cook Islands, Fiji, Kiribati, Nauru, New Zealand, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

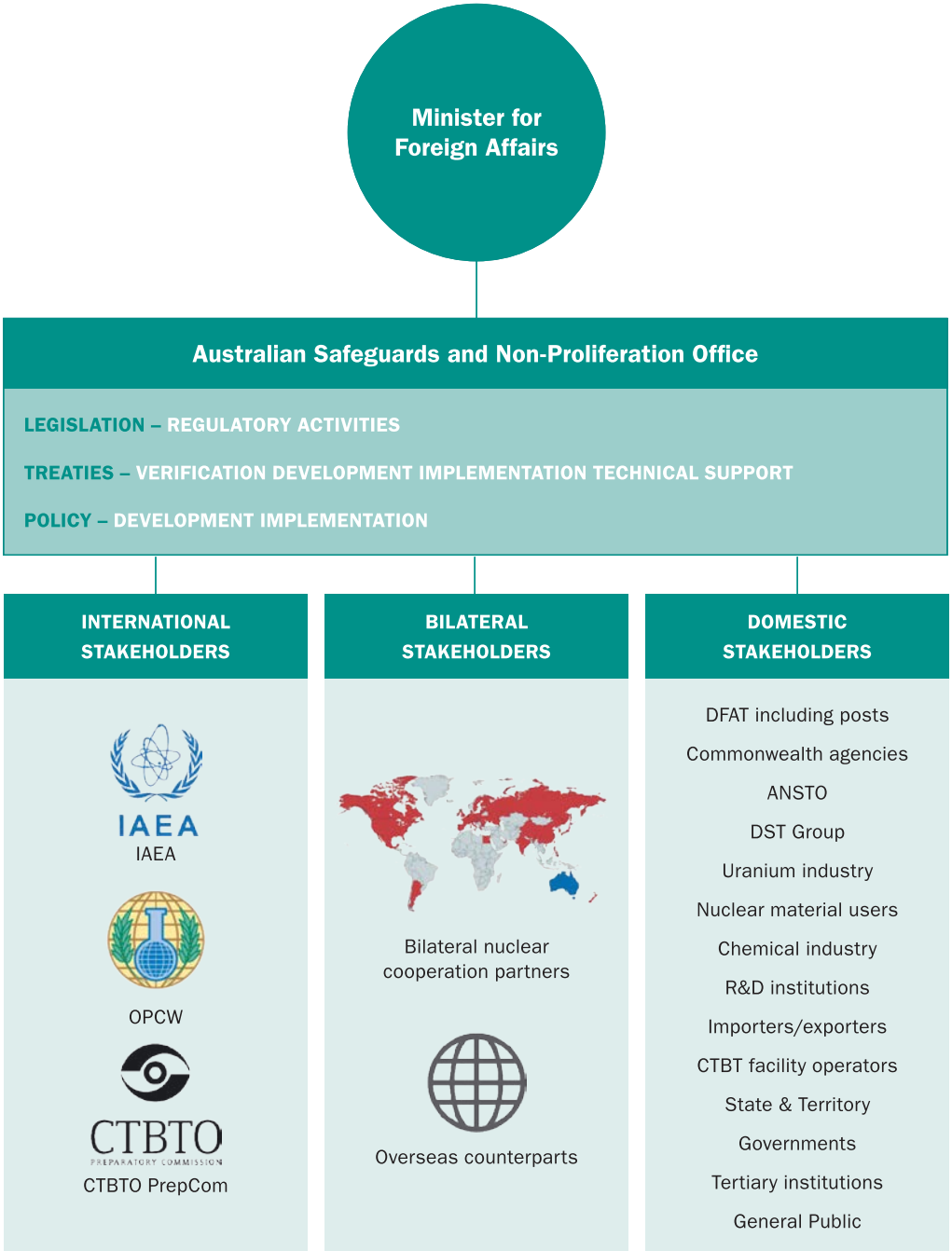
The SPNFZ Treaty has three protocols. Under Protocol 1, the US, UK and France are required to apply the basic provisions of the Treaty to their respective territories in the zone established by the Treaty. Under Protocol 2, the US, France, UK, Russia and China agree not to use or threaten to use nuclear 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) came into force in Australia on 11 December 1986 and 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. 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 3: **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 and obligations under nuclear cooperation agreements are effectively implemented |
| | 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 |

Nuclear Disarmament Verification (NuDiVe) exercise (Credit: Forschungszentrum Jülich and Sascha Kreklau).

SECTION 4

# PERFORMANCE

# OUTPUT 1.1: NATIONAL SAFEGUARDS SYSTEMS

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 4), ASNO provided reports to the IAEA as required by the Comprehensive Safeguards Agreement. Report statistics are summarised in Tables 5 and 6.

The high number of reports in Table 5 attributed to 'other locations' primarily relates to small holdings of uranium and thorium compounds at universities and research institutions.

IAEA measurement of uranium in target plates used for radiopharmaceutical production using an HM–5 detector (Credit: ANSTO).

Table 4: **Material Balance Areas (MBAs) in Australia for IAEA safeguards purposes**

| Location | Material balance area (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 |
| CSIRO (various sites) | AS-I | CSIRO |

Table 5: **Number of line entries in inventory and inventory change reports submitted by ASNO to the IAEA for each MBA**

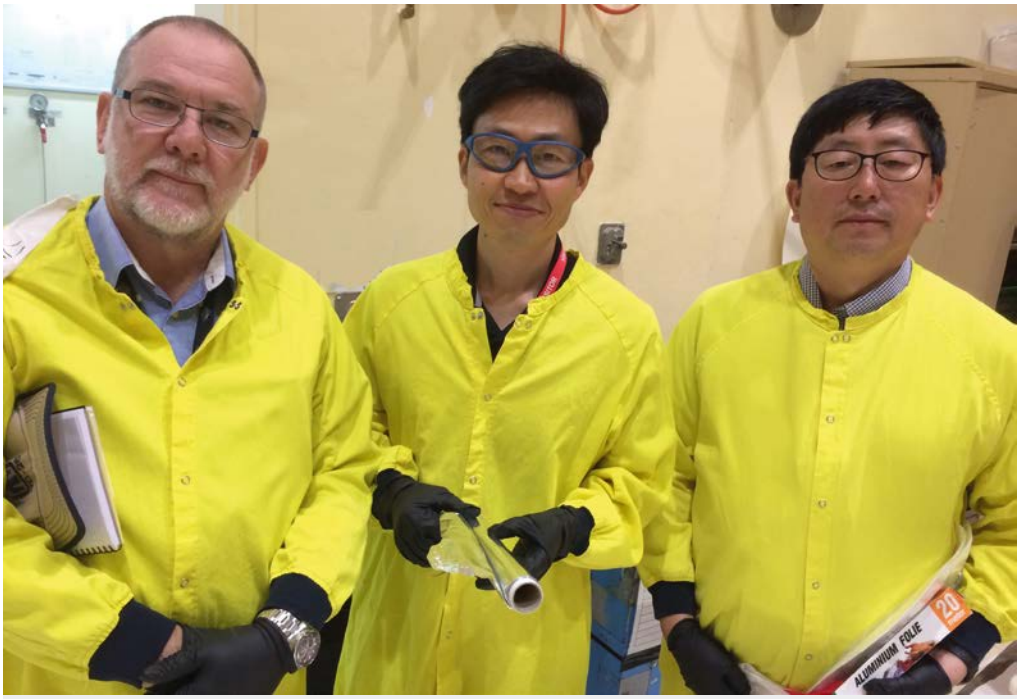
| Location/facility | MBA | 2017–18 | 2018–19 | 2019–20 |
|---|---|---|---|---|
| HIFAR (de-fuelled 2007) | AS-A | 0 | 0 | 0 |
| ANSTO research laboratories | AS-C | 958 | 997 | 494 |
| ANSTO vault storage | AS-D | 359 | 336 | 280 |
| Other locations | AS-E<br>ASE1<br>AS-I | 2737 | 2405 | 2315 |
| OPAL reactor | AS-F | 701 | 343[1] | 122 |
| **Total** | | **4755** | **4081** | **3211** |

1 The reduction in the number of line entries for the OPAL reactor primarily resulted from a change to the structure of ASNO's reports to the IAEA on the movements of target plates for the production of the radiopharmaceutical, molybdenum-99 and changes to batch naming conventions.

Table 6: **Number of line entries (by report type) submitted by ASNO to the IAEA across all MBAs**

| Type of data | 2017–18 | 2018–19 | 2019–20 |
|---|---|---|---|
| Inventory Change Report (monthly) | 2151 | 1449 | 605 |
| Physical Inventory Listing (annual) | 2341 | 2422 | 2447 |
| Material Balance Report (annual) | 263 | 210 | 159 |

Table 7 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.




ASNO inspector with IAEA inspectors during complementary access inspection in February 2020 (Credit: ANSTO).

Table 7: **Nuclear Material in Australia at 30 June 2020**

| Category | Quantity | Intended end-use |
|---|---|---|
| **Source Material** | | |
| Uranium Ore Concentrates (UOC) | 1125 tonnes | Export for energy use pursuant to bilateral agreements |
| | 3.5 tonnes | Storage |
| Natural Uranium (other than UOC) | 4,491 kg | Research, storage |
| Depleted Uranium | 28,029 kg | Research, shielding |
| Thorium Ore Residues | 59 tonnes | Storage/disposal |
| Thorium (other than Thorium Ore Residues) | 1,933 kg | Research, industry |
| **Special Fissionable Material** | | |
| $^{235}U$ – low enriched | 165,593 grams[2] | Research, radioisotope production, storage |
| $^{235}U$ – high enriched | 2,746 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.

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 8 lists the inventory of associated items in Australia.

2 The quantity of $^{235}U$ in low enriched uranium in Australia increased between 30 June 2019 and 30 June 2020 primarily due to the import of fresh fuel assemblies for the OPAL reactor.

Table 8: **Associated Items[3] in Australia at 30 June 2020**

| 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[4] | 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 safety rods | 3 | Reactor components |
| HIFAR fuel charging and discharging machines | 2 | Reactor components |
| OPAL reactor[5] | 1 | Reactor |
| OPAL control rods | 14 | Reactor components |
| OPAL control rod drives | 6 | Reactor components |
| Nuclear-grade zirconium tubes | <50 kgs | R&D and storage |

3 Not including associated technology.
4 The ANSTO Board decided to cease operation of HIFAR in January 2007. The reactor was de-fuelled in May 2007. It is awaiting decommissioning.
5 Includes, inter alia, the reactor reflector vessel and core grid.

### 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, also that states do not have any undeclared nuclear material or activities. Australia was the first country to sign and ratify an AP with the IAEA, which came into force for Australia on 12 December 1997.

ASNO prepares and provides annual declarations under a range of AP categories, as well as quarterly declarations on relevant exports. Table 9 lists the number of entries made under each category. An important aspect of the AP 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 to nuclear research and development.

IAEA inspector examining TN81 cask containing HIFAR radioactive waste during Complementary Access at ANSTO in June 2020 (Credit: ANSTO).

Table 9: **Number of Entries Made under the Additional Protocol**

| Type of Declaration under Article 2.a and 2.b of the Additional Protocol | | 2015–16 | 2016–17 | 2017–18 | 2018–19 | 2019–20 |
|---|---|---|---|---|---|---|
| 2.a.i | Government funded, authorised or controlled nuclear fuel cycle-related research and development activities not involving nuclear material | 3 | 8 | 10 | 13 | 16 |
| 2.a.ii | OPAL operational schedules | 1 | 2 | 1 | 1 | 1 |
| 2.a.iii | General description of each building on each site, e.g. ANSTO, universities | 156 | 289 | 274 | 273 | 267 |
| 2.a.iv | Manufacturing or construction of specified nuclear related equipment | 2 | 2 | 2 | 0 | 1 |
| 2.a.v | Location, operational status and production capacity of uranium or thorium mines or concentration plants | 4 | 4 | 6[6] | 6 | 6 |
| 2.a.vi | Information on source material that is not of a composition or purity that requires full IAEA safeguards requirements. | 8 | 7 | 7 | 7 | 7 |
| 2.a.vii | Information on nuclear material exempted from Safeguards | 4 | 4 | 4 | 4 | 4 |
| 2.a.viii | Information related to the further processing of intermediate or high-level waste containing plutonium | 2 | 2 | 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 | 4 | 4 | 5[7] | 5 |
| 2.b.i | Nuclear fuel cycle-related research and development activities not involving nuclear material and not funded, authorised or controlled by the Government | 2 | - | - | - | - |

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

7 The additional entry for 10-year plans relates to the Australian Government project to site, design and build a national radioactive waste management facility.

## Safeguards Developments in Australia

The IAEA implements safeguards in Australia in accordance with the provisions in a range of legal 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 4. The overarching framework the IAEA uses to prioritise and optimise various in-field verification and headquarters (i.e. at the IAEA) analysis activities under these instruments is the State-level Approach for Australia, which was updated in 2016.

In Australia, the IAEA and ASNO apply most of their respective safeguards efforts to the Australian Nuclear Science and Technology Organisation (ANSTO), particularly safeguards aspects of the ANSTO Nuclear Medicine (ANM) project. At full operation, ANM has the capacity to supply a significant proportion (up to 25 per cent) of the world's requirements for molybdenum–99 (Mo–99), the parent product of the world's most widely used nuclear medicine, technetium–99m. During the reporting period the IAEA conducted hot cell environmental sampling at the ANM plant.

All entities holding a permit to possess nuclear material (PN) are required to conduct an annual physical inventory taking (a stocktake of nuclear material held). ASNO adjusted procedures for the physical inventory taking at small permit holders (largely comprising radiographers, universities, laboratories, and state regulators) for 2020 to allow flexibility for COVID-impacted industries who could not readily conduct inventory-taking during June 2020. All permit holders completed their annual physical inventory takings between March and July 2020.

ASNO continues to engage with the Department of Industry, Science, Energy and Resources' (DISER) process to establish a facility for Australia's radioactive waste. During the reporting period, ASNO provided advice to DISER and ANSTO on IAEA safeguards requirements that may influence aspects of the engineering designs for the facility.

Table 10: **Status of Permits and Authorities under the Safeguards Act as at 30 June 2020**

| Permit or authority | Current total | Granted | Varied | Revoked | Expired |
|---|---|---|---|---|---|
| Possess nuclear material | 111 | 3 | 8 | 2 | 0 |
| Possess associated items | 10 | 0 | 1 | 0 | 0 |
| Transport nuclear material | 19 | 0 | 4 | 0 | 0 |
| Transport associated items | 0 | 0 | 0 | 0 | 0 |
| Establish a facility | 1 | 0 | 0 | 0 | 1 |
| Decommission a facility | 1 | 0 | 0 | 0 | 0 |
| Communicate information contained in associated technology | 7 | 0 | 1 | 0 | 0 |
| **Total** | **149** | **3** | **14** | **2** | **1** |

## Permits and Authorities System

ASNO continued to operate Australia's state system of accounting for and control of nuclear material (SSAC) in accordance with Australia's Comprehensive Safeguards Agreement with the IAEA and national legislation. Australia's SSAC is implemented through permits issued under the Safeguards Act. Notice of all permit changes were published in the Australia Government Gazette as required by subsection 20(1) of the Safeguards Act. A summary of all permits granted, varied, revoked and expired is in Table 10.

Table 11: **Main classes of Permits and Authorities**

| Class Code | Class Description | Number of Instruments Issued |
|---|---|---|
| R1 | Radiographers holding less than 500 kg of depleted uranium shielding | 39 |
| R2 | Radiographers holding between 500–5000 kg of depleted uranium shielding | 7 |
| L1 | Using and storing less than 10 kg source material and less than 1 g special fissional material | 29 |
| L2 | Using and storing less than 500 kg source material and less than 5 g special fissional material | 18 |
| L3 | Using and storing less than 5000 kg source material and less than 10 g special fissional material | 2 |
| U1 | Production of UOC at concentration plants | 4 |
| U2 | Transport UOC from mine to Australian port | 8 |
| U3 | Transport UOC from Australian port to overseas destination | 7 |
| U4 | Handling of UOC at ports and by stevedores | 4 |
| U5 | Transport and export of UOC from mine gate to overseas destination | 1 |
| U6 | Analysis of UOC samples | 4 |
| U7 | Establish a UOC concentration plant | 0 |
| U8 | Decommission a UOC concentration plant | 0 |
| T1 | Transport of nuclear material by road, sea or air | 3 |
| T2 | Transport of nuclear material by air | 1 |
| P1 | Patent attorney services for patents potentially containing associated technology | 5 |
| P2 | Storage and archiving of associated technology | 1 |
| S | Special series covering larger holders of nuclear material and associated items | 4 |

All but three permits issued under the Safeguards Act have now transitioned to the re-designed model[8]. A summary of these re-designed permits, sorted by class, is listed in Table 11.

Essential for the operation of the permit system is a fit-for-purpose database for managing permits and preparing routine reports on nuclear material inventory and transactions to the IAEA. ASNO continued to work with the database development team (under DFAT's Information Management Division) on the development of ASNO's NUMBAT database.

## 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. During the reporting period, all IAEA inspections were conducted at ANSTO's Lucas Heights site. The IAEA conducted its annual, scheduled physical inventory verification inspection in June 2020, and short notice random inspections in October 2019 and February 2020. Details on all inspections are provided in Table 12, and the IAEA's findings from these inspections (where available at the time of publishing this Annual Report) are listed in Appendix B.

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.

ASNO and ANSTO have been working closely with the IAEA toward using an active well coincidence counter (AWCC) that measures the uranium content in solid waste from molybdenum–99 (Mo–99) radiopharmaceutical production by counting multiple neutrons in coincidence produced by fission induced by a small, built-in neutron source. A successful hot commissioning test of the detector was completed at ANSTO in February 2019 and safety approvals for enduring use of the detector was finalised in time for the June 2020 PIV. The first use of the AWCC detector for a formal verification inspection is planned for August 2020 (see findings for material balance area AS-C in Appendix B).





8 Templates are available at: Template Permits and Compliance Codes, ASNO, DFAT.

Table 12: **IAEA Safeguards Inspections 2019–20**

| Date | Facility | Material balance area[9] | Type[10] |
|---|---|---|---|
| 8–10 October 2019 | ANSTO | AS-F | Short Notice Random Inspection |
| | | AS-F and AS-C | Complementary Access (4.a.i) |
| | | AS-C | Technical visit |
| 3–4 February 2020 | ANSTO | AS-F | Short Notice Random Inspection |
| | | AS-C | Complementary Access (4.a.i) |
| 1–12 June 2020 | ANSTO | AS-F | Design Information Verification & Physical Inventory Verification |
| | | AS-D | Design Information Verification & Physical Inventory Verification |
| | | AS-C | Design Information Verification including Hot Cell Environmental Sampling & Physical Inventory Verification |
| | | AS-C | Complementary Access (4.a.i) |
| | | AS-C | Technical visit |

Overall, the IAEA has maintained the broader conclusion for Australia that 'all nuclear material remained in peaceful activities' (see Appendix B).

### ASNO Inspections

During 2019–20, ASNO accompanied the IAEA on all of the inspections listed above. ASNO attended these inspections to ensure Australia's obligations are 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.

In addition to the IAEA inspections, ASNO continued to assist CSIRO with characterising legacy items of nuclear material and adding them to the inventory records. Some safeguards aspects were also included in some of the security inspections conducted by ASNO.

### Inventory balances

ASNO performed the annual material balance evaluation of the nuclear inventory accounts for each MBA with minor differences between book and physical inventory. These inventory differences were reported to the IAEA in conjunction with inventory change reports and physical inventory listings.

Details are provided in Table 13. These were due to re-measurement of batches by permit holders with small holdings of nuclear material (e.g. universities, radiography companies, research institutes).

9 See explanation of each material balance area in Table 4.
10 Details on different types of inspections are outlined in Appendix B.

Table 13: **Inventory Differences Recorded during 2019–20**

| Material Balance Area | Difference between book and physical inventory | Comment |
|---|---|---|
| Other locations (MBA AS-E & ASE1) | –11.35 kg depleted uranium | Due to one batch of industrial radiography shielding equipment, which was re-measured and found to be heavier than previous thought, and due to re-measurements of other batches. |
| | 0.03 kg natural uranium | |
| | 0.05 kg thorium | |
| CSIRO (MBA AS-I) | 2.29 kg natural uranium | Re-measurement of batches as part of CSIRO's campaign to characterise legacy inventory in storage, including removal of duplicate records. |
| | 9.08 kg thorium | |

ANSTO inspection – IAEA inspector using ICVD Cerenkov Device and Stephan Bayer (ASNO) (Credit: ANSTO).

# OUTPUT 1.2: NUCLEAR SECURITY

Protection of Australia's nuclear facilities, nuclear material and nuclear items against unauthorised access removal, 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 (A/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

### Australian Nuclear Material Categories

The table below lists the permit holders for which physical protection or information security is required, categorised according to the materials or items held.

Table 14: **Distribution of Permits Holders according to security category**

| Nuclear Material Category | Type of 'Facility' | Number of Permit Holders |
|---|---|---|
| Category II[11] | Research Reactor, Storage | 1 |
| Category III[12] | Storage, Scientific Research | 1 |
| Category IV[13] | Scientific Research | 1 |
| Uncategorised[14] | LOFs, Radiographers, Laboratories | 99 |
| Natural Uranium (UOC) | Uranium Mines and Concentration Plants | 4 |
| Transport of nuclear material | Transport Companies, Ports, Shipping Lines | 24 |

11 Nuclear material category is based on IAEA Nuclear Security Series No. 13.
12 Ibid.
13 Category IV limits are 15g≥Pu>10g; 15g ≥($^{235}$U≥20%)>10g; 1000g ≥($^{235}$U<20%-10%)>10g; 10 000g ≥($^{235}$U<10%)>10g; 15g ≥$^{233}$U>10g; Unirradiated Source Material ≤5000kg. (%-enrichment).
14 i.e. below Category IV quantities.

| Nuclear Material Category | Type of 'Facility' | Number of Permit Holders |
|---|---|---|
| **Associated Items** | | |
| Associated Equipment and Technology | Enrichment Research, Storage and Archives | 4 |
| Associated Technology | Patent Attorneys | 5 |

## 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.

## Exports of Australian Uranium

Australian uranium ore concentrate (UOC) continues to be exported as reported by relevant mining, transport and shipping permit holders and confirmed by overseas counterparts and converter facilities abroad. Australian uranium exports are subject to security procedures that include checking of the physical condition of, and verifying the integrity of the containers. At each port of unloading or transhipment, seals and locks are checked to detect any breach of integrity. There were no security incidents (malicious acts) involving the transport of UOC in Australia during the reporting period.

In December 2019, a trailer loaded with a container of UOC at an international transit point outside Australia was unsuccessfully coupled to a prime mover during routine activities. The operation was attempted in the dark and in subzero temperatures. Subsequently the trailer uncoupled from the prime mover as the vehicle was leaving the yard. There was no reported damage to the load and the trailer was re-coupled to the prime mover. Investigation into this incident lead to a review of procedures and verification of operational equipment to function effectively in dark and severe weather conditions.


ASNO confirms the separation of UOC storage from other mine activities.

## Nuclear Security of UOC at Australian Mines and in Transport

ASNO visited the uranium storage yard of Toll North, trading as NQX Freight Systems on 20 August 2019. NQX transports UOC from the Ranger mine to Darwin and provides storage facilities for UOC shipments prior to export from Darwin, or prior to transfer to rail for transport to Adelaide. ASNO inspectors verified the current security plans and arrangements including actions arising from previous inspections and inspected the UOC holdings and storage area.

On 21 August 2019, ASNO conducted a routine inspection at the Ranger uranium mine, evaluating security plans and procedures against ASNO's permit requirements and verifying that recommendations arising from previous inspections had been addressed. The inspection included a review of the security upgrades to the UOC storage yard perimeter, access control measures to the processing plant, the on-site laboratory and sample handling procedures. ASNO discussed general security arrangements and decommissioning arrangements at Ranger including predicted changes to key security personnel.

During this reporting period, both BHP (Olympic Dam) and Heathgate Resources (Beverley mines) have submitted updated security plans or arrangements for changes to their UOC extraction plant equipment.

ASNO inspections include physical protection measures for the storage of UOC.


Physical protection of UOC continues at ports and through approval of vessels.

DG ASNO has approved changes to the 2015 revised requirements to enable the transit of vessels carrying UOC through areas of high-risk piracy[15] and specifically to previous required risk mitigation measures. These measures limited vessels available for approval and led to significant cost impacts to conveyance of UOC. A review by ASNO of the current piracy situation highlighted changes in two areas since 2015; the nature of global piracy and the subsequent shipping industry response.

- Piracy has expanded from a geographically limited area (i.e. Gulf of Aden) occurrence to a more widely distributed problem. There were 78 incidents of piracy recorded[16] in the first six months of 2019, and all occurred outside the Gulf of Aden.
- The shipping industry approach to combat piracy has matured significantly to anticipate and mitigate acts of piracy and it has become more cohesive and coordinated in dealing with global problem.

ASNO sought advice from the Australian Maritime Safety Authority (AMSA), the International Maritime Organization (IMO) and other industry standards in its updated requirements. Vessels carrying Australian origin UOC in piracy high-risk areas must implement the latest AMSA[17] and Best Management Practice (BMP)[18] guidelines or updates thereof, to effectively manage the risk of piracy.

ASNO will continue to monitor piracy risk where it may affect shipments of Australian origin UOC and adjust requirements accordingly; this may entail suspension of UOC shipments should the piracy risk increase significantly.

15 Defined by the United Kingdom Marine Trade Operations and by the Listed Areas as published by the Joint War Committee.
16 ICC- Piracy and Armed Robbery against Ships - Report Period 1 January – 30 June 2019.
17 Marine Notice 07/2015 – Piracy and armed robbery against ships.
18 Currently BMP5, available from the International Maritime Organization.


UOC Shipments are inspected and location during transport verified.

## Nuclear Security at Lucas Heights

ASNO held several meetings with ANSTO over the financial year in order to monitor standards of safeguards and security for facilities at Lucas Heights including the OPAL research reactor, the ANSTO Nuclear Medicine (ANM) facility and areas where nuclear material is stored.

ANSTO is currently reviewing a number of security documents and procedures as part of permit conditions to possess nuclear material and in view of the ongoing conduct of a Periodic Safety and Security Review (PSSR). ANSTO is scheduled to provide a PSSR report, to the CEO ARPANSA and to the DG ASNO, by 30 November 2021.

## Other Holders of Nuclear Material

The consolidation of CSIRO's nuclear material holdings has required additional physical protection measures to be installed at an allocated storage facility. ASNO conducted an inspection of the protective security measures and found the storage arrangements to be satisfactory.

Research activities continue at the Silex Systems Limited (SSL) Lucas Heights site, although at a reduced level. SSL continues to hold a Permit to Possess Associated Technology with ASNO and regulatory activities, including inspections and monthly reporting, continue at SSL facilities.

Silex Systems Limited (SSL) and Canadian uranium producer Cameco Corporation announced on 16 December 2019, that they have signed a purchase agreement obtaining all interest in GE-Hitachi Global Laser Enrichment LLC (GLE). SSL is seeking United States Government approvals on matters that relate to the ongoing operation of GLE.

SSL announced on 10 February 2020 that it is partnering with UNSW Sydney and Silicon Quantum Computing Pty Ltd (SQC) in a project to develop a process for the commercial production of high-purity 'Zero-Spin Silicon' using a variant of the SILEX laser isotope separation technology. ASNO is satisfied that this program does not involve associated technology as defined by the Safeguards Act.

## Other Enrichment Technologies

ASNO continues to work closely with a permit holder that possesses associated technology for research into innovative uranium enrichment technology. In supporting the company to mature its security measures and culture, ASNO conducted an inspection on 21–22 November 2019, and collaboratively established a classification guide in keeping with international best practice.

## International Conference on Nuclear Security

The International Atomic Energy Agency hosted the International Conference on Nuclear Security (ICoNS) – 'Sustaining and Strengthening Efforts' during 10–14 February 2020. It was the third IAEA ministerial conference on nuclear security during which 140 countries adopted a ministerial declaration to enhance global nuclear security and counter the threat of nuclear terrorism and other malicious acts. ASNO, as part of a larger Australian contingent, actively participated through presentations and discussion forums. Director General ASNO delivered Australia's national statement to the conference.

## Nuclear Security Guidance Committee

The primary role of the Nuclear Security Guidance Committee (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. Australia (ASNO) has been a member since its inception in 2012. Dr Stephan Bayer, Director of ASNO's Nuclear Security Section, was appointed Chair of the NSGC in 2018.

The 15th and 16th meetings of the NSGC, held in July and November 2019, focussed on a review of the top-tier documents in the Nuclear Security Series and considered the merits of a Nuclear Security Series publication on the interface of nuclear safety and nuclear security. A subgroup was commissioned to examine the document roadmap in preparation for the next three-year term of the NSGC. The 17th NSGC meeting scheduled for June 2020 was cancelled due to the impact of COVID–19. The face-to-face meeting was replaced by a series of shorter video teleconferences.

## Post Nuclear Security Summit Activities

Australia is a member of the Nuclear Security Contact Group (NSCG), established following the Nuclear Security Summit meetings (2010 – 2016), whose Statement of Principles[19] includes advancing implementation of nuclear security commitments and building a strengthened, sustainable and comprehensive global nuclear security architecture. The NSCG, currently chaired by Hungary, met in Vienna during the reporting period to discuss the upcoming Amended CPPNM Review Conference, collective commitments, core messaging on nuclear security and work under the Global Initiative to Combat Nuclear Terrorism (GICNT). Director General ASNO is Australia's NSCG delegate and also co-chair of the preparatory process for the Amended CPPNM Review Conference which is scheduled to take place in 2021.

In further initiatives to promote nuclear security internationally, Dr Robert Floyd 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 the Nuclear Security Summits' goals and commitments and assisting in preparation for the Amended CPPNM Review Conference.



19 INFCIRC 899, November 2016, IAEA.

# OUTPUT 1.3: BILATERAL SAFEGUARDS

Nuclear material and associated items exported from Australia under bilateral agreements remain in exclusively peaceful use and obligations under nuclear cooperation agreements (NCAs) are effectively implemented.

## PERFORMANCE MEASURES

- AONM is accounted for in accordance with the procedures and standards prescribed under relevant bilateral agreements.
- NCAs are effectively implemented and administrative arrangements 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 15. 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 2019.

Table 15: **Summary of net accumulated AONM by category, quantity and location at 31 December 2019**[20]

| Category | Location | tonnes[21] |
|---|---|---|
| Depleted Uranium | Canada, China, European Union[22], Japan, Republic of Korea, Russia, United States | 137,959 |
| Natural Uranium | Canada, China, European Union, India, Japan, Republic of Korea, United States | 33,871 |
| Uranium in Enrichment Plants | China, European Union, Japan, United States | 27,044 |
| Low Enriched Uranium | Canada, China, European Union, Japan, Mexico, Republic of Korea, Switzerland, Taiwan, United States | 19,507 |
| Irradiated Plutonium | Canada, China, European Union, Japan, Mexico, Republic of Korea, Switzerland, Taiwan, United States | 208 |
| Separated Plutonium | European Union, Japan | 1.5 |
| Total | | 218,591 |

20 Figures are based on yearly reports to ASNO in accordance with Australia's bilateral agreements and other information held by ASNO.
21 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.
22 Euratom is the Atomic Energy Agency of the European Union. The Australia-Euratom NCA covers all 27 Member States of the European Union, and the United Kingdom until the end of the transition period.

Table 16: **Supply of Australian uranium by region during 2019**[23]

| Region | tonnes UOC ($U_3O_8$) | Percentage of Total |
|---|---|---|
| Asia | 0 | 0 |
| Europe | 1,234 | 15 |
| North America | 6,964 | 85 |
| Total | 8,198 | 100 |

Table 17: **Summary of AONM Transfers during 2019**[24]

| Fuel cycle Stage | Destination | U (tonnes) |
|---|---|---|
| Conversion | Canada | 5,080 |
| | European Union | 1,217 |
| | United States | 540 |
| Enrichment | European Union | 866 |
| | United States | 6 |
| Fuel fabrication | European Union | 19 |
| | Republic of Korea | 70 |
| | United States | 150 |
| Reactor | Switzerland | 10 |

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.

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.



23 Export destinations for Australian uranium are decided by commercial factors including the availability of conversion capacity and customer preferences.

24 Figures are for transfers completed between jurisdictions from 1 January to 31 December 2019.

## 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 Tables 16 and 17 are based on ASNO's analysis of all available information at the time of publication.

### Implications of Brexit

The United Kingdom has formally left the European Union and entered into a transition period until 31 December 2020. A new Australia-United Kingdom NCA was signed in August 2018, which is ready to enter into force at the end of this transition period.

The Australia-United Kingdom NCA will enter into force once the Australia-Euratom NCA ceases to apply to the United Kingdom, and after the entry into force of the new bilateral Safeguards Agreement and Additional Protocol concluded between the United Kingdom and the International Atomic Energy Agency (IAEA). The Australia-United Kingdom 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.

Until the Australia-United Kingdom NCA enters into force, nuclear cooperation between Australia and the United Kingdom will continue under the Australia-Euratom NCA. Cooperation between Australia and other Euratom member states continues unaffected under the Australia-Euratom NCA.

### Engagement on Nuclear Cooperation Agreements

ASNO representatives also participated in specialist meetings with regulatory authorities of like-minded nations to discuss common approaches to regulating and tracking obligated nuclear material. In September 2019, representatives from ASNO's Bilateral Safeguards Section participated in a Nuclear Cooperation Authorities Group meeting, hosted by the US Department of Energy in Washington DC.

# 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

ASNO continues its active role in international efforts in shaping and developing the effective implementation of nuclear safeguards, through engagement in a range of fora and projects. This includes working directly with the IAEA, as well as with other international fora, primarily through ASNO's membership of the Asia-Pacific Safeguards Network (APSN).

This engagement helps build and maintain specialist knowledge in ASNO on developments, emerging issues and trends in nuclear non-proliferation and how the IAEA verifies nuclear programs. This helps inform Australian Government policy on international security issues, and supports ASNO's monitoring and administration of the use of Australian uranium under Australia's many bilateral nuclear cooperation agreements. For example, ASNO continues its coordination of work on examining areas where Australia has technical capabilities that could potentially support an international verification effort in the DPRK. 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 Program (ASSP) projects. Developments in a range of IAEA approaches to different verification challenges can also change the regulatory impact on nuclear industrial and research activities in Australia. Maintaining specialist knowledge therefore also helps ensure changes in safeguards regulatory approaches can be managed with minimal disruption.

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 participated in the IAEA's Emerging Technologies Workshop (ETW) and its biennial Member State Support Programme (MSSP) Coordinators' Meeting in January 2020 presenting on aspects of Australia's contributions to developing safeguards technology and approaches, delivering safeguards training, and providing technical services. For the ETW, ASNO facilitated researchers from CSIRO to present on potential applications of robotics for safeguards inspection and artificial intelligence for analysing outputs from safeguards surveillance. In September 2019, ASNO was also part of the Australian delegation to the annual IAEA General Conference, contributing to the negotiation of the Safeguards Resolution ('Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards') which was adopted by consensus.

Ross Dungavell of CSIRO's Data61 business unit demonstrates a robot for inspecting drums of radioactive material in densely packed storage installations at the IAEA's Emerging Technologies Workshop in January 2020, Vienna.


Olivier Salvado of CSIRO's Data61 business unit leads a discussion on the applications of machine learning and artificial intelligence to automatically analyse safeguards surveillance feeds during the IAEA's Emerging Technologies Workshop in January 2020, Vienna.


The IAEA, ASNO and ANSTO showcase the IAEA's active well coincidence counter (AWCC) detector for measuring the uranium content of solid waste from molybdenum–99 (Mo–99) radiopharmaceutical production at ANSTO during the IAEA's General Conference in September 2019, Vienna.

## 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 for 40 years.

The ASSP contributes to projects supporting the IAEA's safeguards development and implementation needs, including by reviewing IAEA technical guidance documents, training materials and updates to the Physical Model.

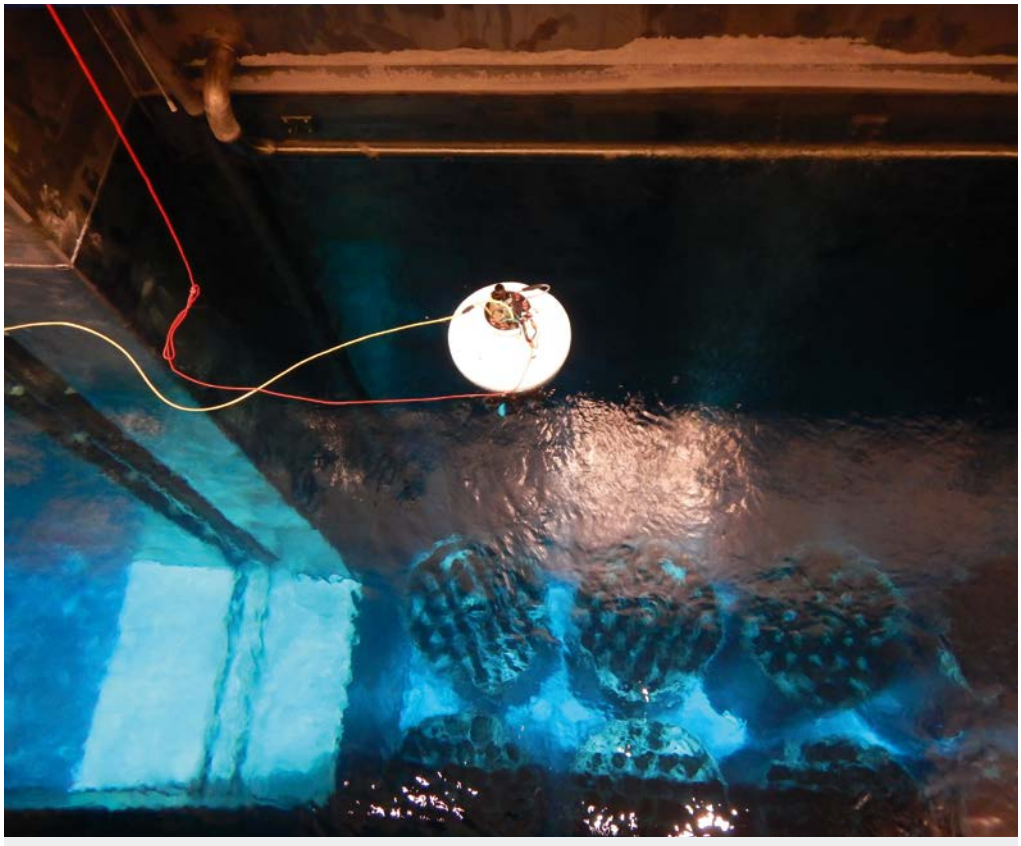
## Nuclear Inspection Robots and Other Emerging Technologies

In November 2017, CSIRO 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 nuclear facilities that may be difficult to access (see ASNO's Annual Report 2017–18). Based on the outcomes of the challenge in 2017 and subsequent testing, the IAEA selected a design produced by Datastart Ltd of Hungary, which autonomously propels itself across the surface of a spent fuel pond while holding a device for measuring radiation glow patterns (known as Cherenkov glow). The robot has the potential to automate time-consuming inspection tasks required to verify nuclear material in spent fuel. The IAEA is continuing discussions with Member States, nuclear facility operators and Datastart Ltd to further refine and test the design to ensure it is compliant with all applicable requirements and regulations. During 2020, CSIRO is assisting with upgrading the robot's autonomous features, user interface and broader system architecture.

Separate from the Robotics Challenge, ASNO, CSIRO and the IAEA are exploring how robotics for safeguards can be developed further. CSIRO is developing robots for surveying radioactive material in drums in

densely packed storage installations. These robots may have safeguards applications, including building maps of storage facilities, identifying the locations of nuclear material, characterising that material, and verifying seals in otherwise inaccessible locations.

In 2018, a team of researchers led by Dr Edward Obbard at the Faculty of Engineering, University of New South Wales (UNSW) developed a blockchain (shared ledger) platform to hold nuclear material accounting data based on ASNO's existing centralised Nuclear Material Balance and Tracking (NUMBAT) database. Their platform 'Shared-Ledger nUclear Material Balance and Tracking' (SLUMBAT) allowed testers to try out performing the roles of hypothetical nuclear operators, transporters and regulatory authorities and enter transactions involving hypothetical nuclear material into an encrypted blockchain through a simple user interface. It demonstrated potential advantages of blockchain platforms in terms of data integrity and efficiency in tracking complex chains of transactions for nuclear material accounting data held among nuclear operators and regulators. In March 2020, the Stimson Center, Finland's nuclear regulator (STUK) and UNSW launched a shared ledger version of the SAFKA nuclear material database used in Finland. This 'SLAFKA' nuclear accountancy prototype extends the focus to consider accountancy for Finland's deep geological spent fuel repository. SLAFKA uses hyperledger fabric running on dedicated nodes in the cloud and incorporates a graphical user interface allowing testers to record movements of hypothetical nuclear material through a web browser.



The robot designed by Datastart Ltd from the IAEA's Robotics Challenge undergoing testing at the Loviisa Nuclear Power Plant in Finland in November 2018 (Credit: 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. During 2019, extensive testing established that ANSTO successfully resolved issues with sources of background in the system that had required temporary suspension of routine analyses of swipe samples. ANSTO analysed quality control samples from the IAEA in 2019–2020 and it expects to resume routine analysis of samples from IAEA inspections during 2020.

The University of Western Australia's Centre for Microscopy, Characterisation and Analysis continues to participate in the NWAL. The Centre uses its large-geometry secondary ion mass spectrometer (LG-SIMS) for uranium isotopic characterisation of particles in environmental samples for nuclear safeguards. During 2019–2020, the Centre completed analysis of 22 samples for the IAEA, bringing it to a total of over 100 IAEA samples since joining the NWAL in 2012. In 2019, the Centre also participated in an inter-comparison exercise with other SIMS in the NWAL, achieving excellent results, comparable to other leading NWAL members.

Accelerator Mass Spectrometry System at ANSTO's Centre for Accelerator Science (Credit: ANSTO).

## Proliferation Analysis Training

Since 2009, Australia has provided annual proliferation analysis training to IAEA safeguards staff to enhance their ability to apply structured analytical techniques to complex proliferation issues. The Office of National Intelligence and the Australian Department of Defence planned to provide a proliferation analysis workshop to the IAEA in May 2020 but the workshop has been postponed due to travel restrictions associated with the COVID–19 pandemic. The content of the workshop is regularly updated and participant feedback from workshops in recent years has confirmed that the training continues to meet the needs of the IAEA Department of Safeguards.

## Information Collection and Analysis for Safeguards

The Department of Government and International Relations at University of Sydney has provided an expert consultant to assist the IAEA Department of Safeguards' Division of Information Management with optimising the collection and analysis of open-source information for safeguards. The project involves applying network analysis software to map safeguards-relevant transfers and relationships within strategic trade networks for states in East and Southeast Asia using open-source trade statistics and transaction-level data. The ultimate goal is to strengthen the Agency's ability to identify trade flows of safeguards-relevant commodities.

## Cooperation with other States

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. 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 10th annual meeting of APSN was held on 28–29 August 2019 in Bali, hosted by the Government of Indonesia and organised by Indonesia's Nuclear Energy Regulatory Agency, BAPETEN. The meeting was attended by 36 representatives from 16 countries and the IAEA and European Safeguards Research and Development Association (ESARDA).

This meeting commemorated the 10th anniversary since the establishment of APSN, and began with speeches and presentations highlighting the key achievements of APSN over this time. A recorded speech was delivered by Mr Massimo Aparo, the IAEA Deputy Director General and Head of the Department of Safeguards where he emphasised that the safeguards system is based on cooperation by all; and he stated the value of APSN in leading the way and supporting State safeguards authorities cooperating and supporting each other. Director General ASNO, Dr Robert Floyd, reflected on participation in APSN meetings over the past 10 years, where there have been 353 participants representing 205 different individuals. He observed there have been a number of key achievements in this time, although the most important achievement has been to establish a community of safeguards professionals who are friends, a trusted community that allows and promotes openness, frankness and mutual support.

Australia coordinates APSN Working Group 1 (safeguards infrastructure implementation and awareness), which during the 2019 plenary:

- delivered a presentation by the IAEA looking backwards and forwards 10 years on how safeguards has developed and possible future challenges; and
- facilitated an information-sharing session on challenges with managing safeguards for locations outside facilities (LOFs), including a presentation on nuclear material accountancy by the IAEA.


Dr Robert Floyd at the 10th Annual APSN Meeting, August 2019.


APSN, 10th Annual Meeting, 27-29 August 2019, Bali.


Dr Robert Floyd at the 10th annual APSN meeting, Bali 2019.

## IAEA Standing Advisory Group on Safeguards Implementation

Director General 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. SAGSI provides recommendations to the IAEA Director General on vital safeguards implementation issues. The Group currently comprises 17 international experts from 17 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. The working group meeting scheduled for March 2020 was postponed due to COVID–19 restrictions. 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 2019–2020 was mobilising partnerships on safeguards issues, following up from the Symposium on International Safeguards in November 2018.

SAGSI discussed opportunities for partnering with a wider set of stakeholders, including technical experts from non-nuclear sectors, NGOs, start-up companies and universities. These partnerships can support the IAEA in research and development for safeguards and in providing capacity building opportunities for member states.

Other core topics included: improvement of methods for implementation of safeguards at the state-level under the Department of Safeguards' State-Level Approaches (SLA) Project, reviewing training activities for Department staff, initiatives to work with member states to address difficulties in safeguards implementation, verification activities for safeguards-sensitive equipment from nuclear facilities during their decommissioning, application of business process modelling to manage safeguards equipment and services, and review of technology foresight activities and use of innovative technologies in data analysis and in-field measurements.

# 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 imports and exports of CWC-Scheduled chemicals and of past activities at 38 facilities with CWC-relevant chemical production, processing or consumption activities during 2019 (declared in March 2020)
- Article VI declaration of anticipated activities at seven CWC-Scheduled chemical facilities for 2020 (declared in September and October 2019)
- Article X, paragraph 4, declaration of Australia's national programs for protection against chemical weapons during 2019 (declared in April 2020)
- 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 60 routine inspections at declared chemical plants and a Defence protective purposes laboratory in Australia in accordance with the provisions of Article VI of the CWC.

In the current reporting period, ASNO facilitated three routine OPCW inspections. One inspection was of a declared Schedule 2 processing facility in Victoria, from 16 to 20 September 2019. The other two inspections were of declared 'Other Chemical Production Facilities' (OCPFs) in Victoria, from 10 to 12 September 2020. The inspections proceeded smoothly and received excellent support and cooperation from 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.

Online 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 CWC is included as a Schedule to the *Chemical Weapons (Prohibition) Act 1994* (the CWP Act). There are three Schedules of chemicals listed in an annex to the CWC known as the 'Annex on Chemicals'. Any changes to the CWC Annex on Chemicals accepted by Australia are regulated by amending the *Chemical Weapons (Prohibition) Regulations 1997*.

The 24th Conference of States Parties to the CWC, held on 25–29 November 2019, decided to list four additional Schedule 1 chemicals/chemical families in the Annex on Chemicals. The chemicals are highly toxic Novichok nerve agents, which have no known industrial use but could be used for chemical warfare or terrorism purposes. This the first time the Schedules of the Chemical Weapons Convention have been updated since the Convention's entry into force in 1997.

The *Chemical Weapons (Prohibition) Regulations 1997* were updated to include the new chemical families/chemicals, with the changes coming into effect on 7 June 2020.

ASNO consulted more than two hundred organisations before the Conference of States Parties; organisations were provided with an opportunity to comment on the proposed addition of new chemicals/chemical families to the Annex of Chemicals to the Convention. No organisation expressed concern about the potential regulation of these chemicals/chemical families.

The permit systems, under the CWP Act and Regulation 5J of the *Customs (Prohibited Imports) Regulations 1956*, continued to operate well.

Table 18 provides statistics for the permits issued to facilities producing, processing or consuming CWC-Scheduled chemicals during the current reporting period. Thirty-one facility permits were in effect at 30 June 2020.

During the 2019–20 period one permit was issued for the import of CWC-Schedule 1 chemicals and 69 permits were issued for the import of CWC-Schedule 2 and 3 chemicals.

Table 18: **Permits for CWC-Scheduled Chemical Facilities**

| CWC-Scheduled Chemicals | CWP Act 1994 | Permit type | Permits at 30 June 2020[25] | New permits 2019–20 | Re-issued permits 2019–20[26] | Permits cancelled 2019–20 |
|---|---|---|---|---|---|---|
| Schedule 1 | s19(4) | Production (Protective) | 1 | 0 | 1 | 0 |
| | s19(5) | Production (Research) | 9 | 0 | 2 | 0 |
| | s19(6) | Consumption | 10 | 1 | 2 | 0 |
| Schedule 2 | s18(1) | Processing | 8 | 1 | 0 | 1 |
| Schedule 3 | s18(1) | Production | 3 | 1 | 0 | 1 |

25 Permit numbers include new, existing and renewed permits.
26 Permits are valid for the year of application, and for a further four years if permit conditions are met.

ASNO is a member of the Australian Government Regulatory Science Network (RSN). Established in 2011, the RSN is a network of Australian Government agencies responsible for regulating chemical, biological or radiological materials. The RSN committee meets regularly to exchange information and conducts at least one major science-focused activity each year to promote regulatory science exchange among the member agencies. Other activities include joint agency seminars, interagency workshops, symposiums and conference presentations.

RSN membership includes:

- Australian Government Department of Agriculture, Water and the Environment
- Australian Pesticides and Veterinary Medicines Authority (APVMA)
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)
- Australian Safeguards and Non-Proliferation Office (ASNO)
- Defence Export Control (DEC)
- Food Standards Australia New Zealand (FSANZ)
- National Health and Medical Research Council (NHMRC)
- Australian Industrial Chemical Introduction Scheme (AICIS)
- Office of Chemical Safety, Department of Health (OCS)
- Office of the Gene Technology Regulator (OGTR)
- Safe Work Australia (SWA) and
- Therapeutic Goods Administration (TGA).

The RSN is a forum for scientific and technical staff from member agencies to discuss regulatory scientific issues and improve interagency cooperation. The objective of the RSN is to improve the performance of Australian government regulatory agencies by strengthening evidence-based decision-making by:

- improving the quality and consistency of regulatory science
- fostering collaboration and sharing scientific knowledge and experience between agencies and
- contributing to regulatory science issues.

Western Europe and Others Group (WEOG) Representatives at the Annual National Authorities meeting, 6 November 2019 (Credit: OPCW Flickr).

## 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.

On 17 June 2020, Australia contributed AUD200,000 to the OPCW's Centre for Chemical and Technology (ChemTech Centre) Project. According to the OPCW, the new ChemTech Centre "will be a recognised leader in research, analysis, training, and capacity-building. It will be a flagship for the OPCW and its broader community and will significantly enhance the capabilities and standing of the OPCW as the global leader in the effort to rid the world of chemical weapons."

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. ASNO attended the National Authorities for the CWC meeting from 5–7 November 2019 in The Hague.

## Domestic Outreach

ASNO continued its close cooperation on CWC implementation issues with relevant Australian Government agencies including the Department of Home Affairs, Defence Export Controls, Australian Border Force, Australian Bureau of Statistics, and the National Industrial and Chemicals Notification and Assessment Scheme.

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.

During the reporting period, ASNO has conducted three outreach presentations and two outreach site visits. As described in the Legislation and Regulation section above, ASNO also conducted outreach on four new listed Schedule 1 chemical families/ chemicals.

# 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

Australia hosts 23 facilities for the CTBT International Monitoring System (IMS). All are certified as operating to CTBTO technical specifications. The effective operation of Australia's IMS stations is a routine focus for ASNO.

Performance of Australian seismo-acoustic stations, operated by Geoscience Australia and the Australian National University, has been very good throughout the year with the exception of the auxiliary seismic station at Charters Towers. The station was damaged by a landslip in February 2019 and took some time to return to operation.

Some IMS data is also used for civil and scientific purposes. Data from seismic stations is used in the Australian National Earthquake Alert Centre for the detection and location of numerous Australian and overseas earthquakes and for tsunami warning. IMS infrasound data has even been used to confirm meteor sightings.

Performance of Australian radionuclide stations was excellent, with very high station data availability throughout the year. One major station upgrade was completed in Darwin (AUP09/AUX09) followed by a CTBTO revalidation visit in December 2019. ARPANSA, which operates the Australian RN stations, also supported the operation of stations in Fiji and Kiribati.

During the year, ASNO has continued to work 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 and to facilitate routine maintenance of the cable. 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.

### Nuclear-Test-Ban Verification

ASNO administers funding for Geoscience Australia to carry out nuclear test monitoring through its network of seismic stations as well as those of the CTBT's International Monitoring System. This arrangement, set out in a Letter of Understanding between Geoscience Australia and ASNO, is reviewed each year. ASNO is satisfied that Geoscience Australia has met its requirements under the Letter of Understanding during the reporting period.

Although the CTBT is not yet in force, its International Monitoring System is now substantially in place, with around 90 per cent of Treaty-designated stations in operation. The system detects and reports on many thousands of events each year.

Almost all of these can be clearly identified as natural in origin and in the twenty-first century only the DPRK appears to have conducted nuclear test explosions. The table below details nuclear tests conducted by the DPRK.

Table 19: **DPRK Nuclear Test Explosions**

| Date | Approximate seismic magnitude | Estimated explosive yield (kT) | Comment |
|---|---|---|---|
| 9 Oct 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 Feb 2013 | mb 4.93 | 3 – 13 | Seismic detection consistent with a simple fission device |
| 6 Jan 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 Sep 2016 | mb 5.06 | 4.4 – 19 | Seismic detection consistent with a simple fission device |
| 3 Sep 2017 | mb 6.05 | 150–240 | Seismic detection consistent with a more advanced weapon design – potentially thermonuclear as claimed by DPRK |

Since the 2017 declared nuclear explosion, Geoscience Australia has reported to ASNO on the detection of 47 tectonic events located in the vicinity of the DPRK test site at P'unggye-ri. The sizes of the events ranged from mb 2.5 to 4. Based on the signal characteristics, these appear to be a continuing series of aftershocks following the large September 2017 test explosion. Based on technical analysis of the detections, it seems unlikely that they indicate new human activity at the test site.

## Australian Participation in CTBTO verification development activities

The CTBTO Preparatory Commission, including its member states, continues 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 International Data Centre (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.

Each few years the CTBTO conducts field exercises to help to test equipment and procedures for conducting an on-site inspection, in order to refine preparedness for entry into force of the CTBT. Malcolm Coxhead has contributed, as part of a group of experts, to developing viable and technically sound scenarios for a further series of 'build-up exercises' (BUEs). These were scheduled to take place in 2020, but have been deferred due to COVID–19. They should proceed in 2021, if the more than 100 participants are able to travel to the exercise site in Slovakia.

ASNO coordinates the involvement of Australians in training aimed at supporting the operation of the IMS and IDC. While around 90 per cent of CTBT IMS stations are now in place worldwide, detailed preparatory work is continuing to bring the IMS and IDC to a satisfactory 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.

During the reporting period, three Australian experts participated in international workshops in support of CTBT verification and three Australians participated in CTBTO training activities in relation to their function as operators of IMS stations.

ANSTO's Alison Flynn, a specialist in the development of novel radiation detection systems, has participated in regular events as part of a three-year program to train future specialists to conduct OSI under the CTBT. Alison Flynn has completed training, subject to participation in the BUEs.

## Outreach

In September 2019, ASNO worked with the CTBTO to promote signatures and ratifications of the CTBT by states in Australia's region at a meeting of the International Parliamentary Union in Wellington. In 2019, Australia has also engaged with Timor-Leste on the CTBT as part of capacity-building assistance on nuclear non-proliferation.

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.


Dr Robert Floyd at the International Youth Nuclear Congress.

# 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, such as contribute to the 2019 Preparatory Committee for the 2020 Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

## PERFORMANCE ASSESSMENT

ASNO contributes routinely to Australia's efforts to strengthen international non-proliferation efforts by participating in a range of forums or by providing advice and input for briefing and papers prepared by DFAT, such as papers Australia co-authors with like-minded countries to help shape and influence multilateral processes.

### Fissile Material Cut-off Treaty

A ban on the production of fissile material for use in nuclear weapons has long been considered a companion to the CTBT in that it would work to impose a cap on the size of nuclear arsenals. An effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices, a 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.

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 confidence and momentum in the Conference on Disarmament (CD) towards the commencement of negotiations on an FMCT. A focus of this has been promoting the proposals and options for a future FMCT developed in 2017–18 by the High-Level Expert Preparatory Group. Director General ASNO led Australia's contribution to that group.

## 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. ASNO with DFAT and ANSTO continue Australia's active contribution to IPNDV's work.

During the reporting period, IPNDV completed its second two-year work phase with publication at www.ipndv.org of reports addressing verification of nuclear weapon declarations, verification of reductions, and technologies for verification. IPNDV's Working Group 5 (co-chaired by DG ASNO) has analysed and described the essential features of multilateral inspections to verify nuclear weapon dismantlement, beginning with monitoring the removal of weapons from delivery systems and ending with the recycling of nuclear material from the weapons for civilian use, or its disposal in proliferation-resistant forms.

A highlight of IPNDV's work in 2019 was the conduct by Germany and France of an on-site exercise testing inspection procedures for confirming that there is no diversion of fissile material. ASNO's Malcolm Coxhead led a team evaluating the exercise, which has recommended lessons that IPNDV can consider in its third work-phase.

Meetings of IPNDV partners planned for 2020 have been disrupted due to COVID–19 impacts. The third work phase is now continuing with experts meeting online.


ASNO's Dr Robert Floyd and Malcolm Coxhead participate in a Nuclear Disarmament Verification (NuDiVe) Exercise, Germany (Credit: Forschungszentrum Jülich and Sascha Kreklau).

# 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, Science, Energy and Resources, 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 section 43(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, Science, Energy and Resources' National Radioactive Waste Management Facility detailed business case; licensing process; design of a waste information management system; and, safeguards by design support to the work of ANSTO on the detailed engineering design for the facility.[27]

On 12 March 2020, Dr John Kalish, Assistant Secretary ASNO, appeared before the Victorian Government's Environment and Planning Committee to provide input to the Inquiry into Nuclear Prohibition.[28] The objective of the inquiry is to consider the potential benefits to Victoria in removing prohibitions enacted by the *Nuclear Activities (Prohibitions) Act 1983*. Presentation of the final report was scheduled for 14 August 2020, but has been extended to 20 November 2020 due to disruption resulting from COVID–19.

27 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.
28 Inquiry into Nuclear Prohibition, Parliament of Victoria.

The Australian Government's House of Representatives Standing Committee on the Environment and Energy completed an *Inquiry into the prerequisites for nuclear energy in Australia* in December 2019. ASNO provided a written submission[29] to the inquiry focussed on nuclear security and safeguards and their application to nuclear power plants. Dr John Kalish, Assistant Secretary ASNO appeared before the Committee on 18 October 2019 to answer questions on ASNO's current role and the likely implications of a nuclear power industry, in particular the deployment of Small Modular Reactors (SMR), on nuclear regulation in Australia.

Over the reporting period ASNO continued working closely with ARPANSA on best practices for the security of nuclear material, including:

- Spent fuel management
- Periodic Safety and Security Review of ANSTO's OPAL Research Reactor

ASNO has also provided advice to the Australian Government in relation to the DPRK's discussions with the United States on denuclearisation, including on how Australia might support international efforts to verify any new commitments by the DPRK.

Booster and degas station with wellfields in the distance, at the Beverley uranium mine (Credit: Heathgate Resources).



29 Inquiry into the prerequisites for nuclear energy in Australia, Australian Safeguards and Non-Proliferation Office, Submission No. 153.

# 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 understood in the public, private, non-government and academic sectors, through presentations, training and other outreach activities.

For example, during 2019–20 ASNO has attended peak industry forums, conducted on-site outreach visits, and given lectures and presentations in academic and other fora. ASNO delivered modules on safeguards for the course Nuclear Science and Its Application at the Australian National University (ANU) and the online Master of Nuclear Engineering course Nuclear Safety, Security and Safeguards at the University of New South Wales (UNSW).

ASNO also supported public information and outreach activities through attendance and discussions held at the Minerals Council of Australia.

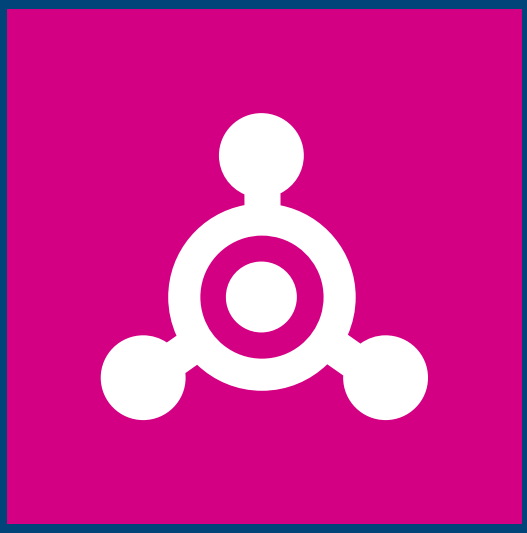
In March 2020, Director General ASNO contributed to a panel discussion at the 2019 International Youth Nuclear Congress on emerging threats to nuclear security.

During 2015–18, ASNO established a number of new template permits and compliance codes for ASNO's current permit and authority holders. In the interests of informing future potential permit holders and the general public on regulatory requirements, ASNO have made template permits and compliance codes publicly available online.[30]





30 Template Permits and Compliance Codes, ASNO, DFAT.



SECTION 5

# 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 20 and the DFAT Annual Report 2019–20.

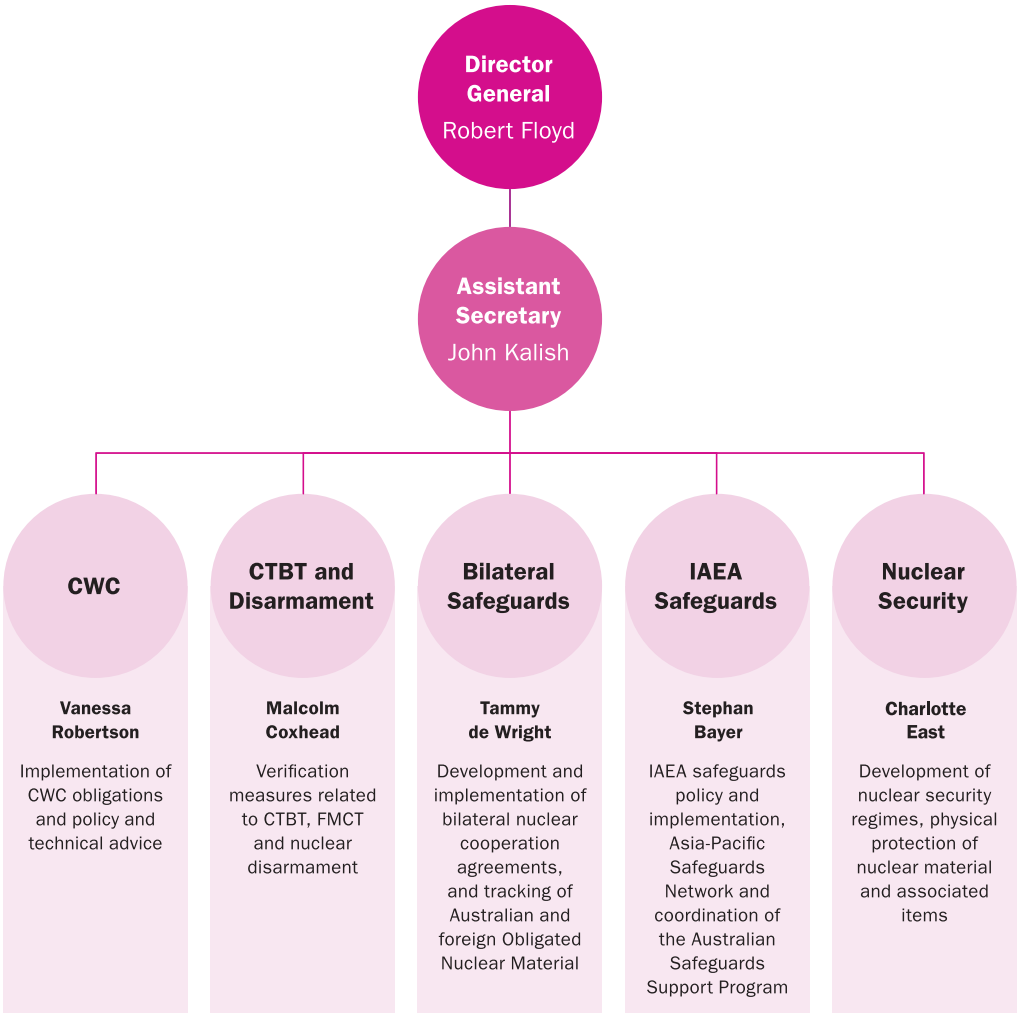
In 2019–20 ASNO had an allocated staff level of 16 FTE. Dr Craig Everton (formerly Director ISS) accepted a senior position in the International Atomic Energy Agency (IAEA).

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

Table 20: **ASNO Staff at 30 June 2020**

| | Male | Female | Total |
|---|---|---|---|
| SES B2 | 1 | 0 | 1 |
| SES B1 | 1 | 0 | 1 |
| Executive Level 2 | 2 | 3 | 5 |
| Executive Level 1 | 2 | 3 | 5 |
| APS Level 6 | 1 | 2 | 3 |
| APS Level 5 | | 1 | 1 |
| APS Level 4 | | | 0 |
| **TOTAL** | **7** | **9** | **16** |

Figure 4: **ASNO's Organisational Structure at 30 June 2020**




## 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 21.

Table 21: **Training and Development Activities during 2019–20**

| Training and development activity | Person days |
|---|---|
| Formal DFAT courses | 33.5 |
| Structured work unit and on-the-job training, including planning days | 13 |
| Seminars, workshops, conferences, overseas negotiations and IDCs | 25.5 |
| External formal courses | 15 |
| Academic study | 0 |
| IAEA Consultancy | 4 |
| **TOTAL** | **91** |

# 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

During the second half of the financial year a decision was taken to reduce ASNO's budget for running costs (general) by more than $140,000. This decision was taken in response to the reduced travel requirements for ASNO in response to COVID–19. The figure in Table 22 reflects the reduced amount.

Table 22: **ASNO Administrative Costs:**

| | | 2018–2019 | 2019–2020 |
|---|---|---|---|
| Salaries | | 2,683,352 | 2,509,272 |
| Running Costs | (General) | 521,892 | 379,447 |
| | Seismic monitoring[1] | 564,247 | 558,794 |
| | Sub-Total | 1,086,139 | 938,241 |
| **Total** | | **$3,769,491** | **$3,447,513** |

1 Undertaken by Geoscience Australia.

## REGULATORY REFORM

As a portfolio regulator with the Department of Foreign Affairs and Trade, in 2019–20 ASNO completed its fifth year of participation in the Government's Regulator Performance Framework.[2] The Government developed the Framework to measure the performance of regulators in regard to reducing the cost to business. 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 mandatory outcome-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. ASNO has devised a set of seven metrics against the six KPIs outlined in Table 23 below.

Table 23: **ASNO Regulatory Performance Framework Metrics 2019–20**

| |
|---|
| 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. |

## 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 2018 at 13.5502 cents per kilogram). The charge was not changed in 2019.

2 ASNO's full Regulator Performance Framework self-assessment reports can be found on the DFAT website.

SECTION 6

# APPENDICES

# APPENDIX A: AUSTRALIA'S NUCLEAR COOPERATION AGREEMENTS

Table 24: **Australia's Nuclear Cooperation Agreements at 30 June 2020**

| Country / Region | Date of Entry into Force |
|---|---|
| Republic of Korea (ROK) | 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[1] | 3 February 2007 |
| Russian Federation | 11 November 2010 |

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

| Country / Region | Date of Entry into Force |
|---|---|
| United States | 22 December 2010 |
| Euratom[2] | 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.

2 Euratom is the Atomic Energy Agency of the European Union. The Australia-Euratom NCA covers all 27 member states of the European Union, and the United Kingdom until the end of the transition period.

# APPENDIX B: IAEA STATEMENTS OF CONCLUSIONS AND OTHER INSPECTION FINDINGS FOR AUSTRALIA IN 2019–20

## IAEA INSPECTION REGIME IN AUSTRALIA

The IAEA conducts verification activities (under different names, but all essentially inspections) in Australia under the Comprehensive Safeguards Agreement[3] and under the Additional Protocol,[4] 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 inspection conducted in Australia each year under the Comprehensive Safeguards Agreement:

- **Physical inventory verification (PIV)**: a scheduled inspection in a selected material balance area (MBA)[5] 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,[6] 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 conjunction with DIVs (see below). For MBAs AS-E, ASE1 and AS-I, the IAEA schedules a PIV approximately once every four years for AS-E/ASE1 combined, selecting one location (usually a university) taken as a representative sample of all such locations; and once every four years for one of CSIRO's locations in MBA AS-I. 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)**: an 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.

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 79 complementary accesses in Australia since 1998.

3 See Schedule 3 of the *Nuclear Non-Proliferation (Safeguards) Act 1987*.
4 Published in IAEA document INFCIRC/540 (corrected).
5 Australia's material balance areas for IAEA safeguards are described in Table 4 in Output 1.1.
6 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.

Article 4.a.i complementary accesses are the most common. Since 1998 the IAEA has conducted 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 at least several days' notice. The IAEA typically conducts two to three complementary access activities in Australia each year, a few at ANSTO buildings, and one outside of ANSTO.

## 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 2019 (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, 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 2019. 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.[7]
- Statement of results of design information verification activities (DIVs).
- **Article 10.a** of the Additional Protocol: Statement on complementary access activities undertaken.
- **Article 10.b** of the Additional Protocol: Statement of results of activities in respect of any questions or inconsistencies the IAEA has raised with Australia
- **Article 10.c** of the Additional Protocol: Statement on the conclusions the IAEA has drawn from complementary access activities.

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

# IAEA CONCLUSIONS AND FINDINGS FOR EACH MATERIAL BALANCE AREA

Material balance area: AS-C (research and development laboratories)
Material balance period: 2 May 2018–7 May 2019

| Inspection activity | Date(s) of inspection | Inspection location | Statement of results | Date statement provided |
|---|---|---|---|---|
| Physical Inventory Verification | 8–9 May 2019 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of this inspection were satisfactory" | 18 July 2019 |
| Design Information Verification | 8–9 May 2019 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory" | 18 July 2019 |
| 91(b) Statement of Conclusions<br>(3 October 2019) | | | "The IAEA has concluded from its verification activities carried out at AS-C during the material balance period from 2 May 2018 to 7 May 2019, 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. The Agency continues to monitor the amount of material left unverified and notes the work being carried out jointly between the State, the Facility Operator and the Agency to develop specialty equipment which will remedy this situation. The Agency is hopeful that during the next year the equipment will become fully operational and allow the verification of irradiated material currently left unverified in AS-C." | |

## Material balance area: AS-C (research and development laboratories)
## Material balance period: 8 May 2019–3 June 2020

| Inspection activity | Date(s) of inspection | Inspection location | Statement of results | Date statement provided |
|---|---|---|---|---|
| Physical Inventory Verification | 4–10 June 2020 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results from this inspection were satisfactory" | 27 July 2020 |
| Design Information Verification | 4–10 June 2020 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory" | 27 July 2020 |
| 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: 4 May 2018–5 May 2019

| Inspection activity | Date(s) of inspection | Inspection location | Statement of results | Date statement provided |
|---|---|---|---|---|
| Physical Inventory Verification | 6 May 2019 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of this inspection were satisfactory" | 2 August 2019 |
| Design Information Verification | 6 May 2019 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory" | 2 August 2019 |
| 91(b) Statement of Conclusions<br>(28 October 2019) | "The IAEA has concluded from its verification activities carried out at AS-D during the material balance period from 4 May 2018 to 5 May 2019, 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: 6 May 2019–2 June 2020

| Inspection activity | Date(s) of inspection | Inspection location | Statement of results | Date statement provided |
|---|---|---|---|---|
| Physical Inventory Verification | 3 June 2020 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results from this inspection were satisfactory" | 27 July 2020 |
| Design Information Verification | 3 June 2020 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory" | 27 July 2020 |
| 91(b) Statement of Conclusions | Not available at time of publication of this Annual Report | | | |

## Material balance area: AS-F (OPAL)
## Material balance period: 1 May 2018–6 May 2019

| Inspection activity | Date(s) of inspection | Inspection location | Statement of results | Date statement provided |
|---|---|---|---|---|
| Short Notice Random Inspection | 9–10 October 2018 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results from this inspection were satisfactory" | 1 February 2019 |
| Physical Inventory Verification | 7 May 2019 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of this inspection were satisfactory" | 2 August 2019 |
| Design Information Verification | 7 May 2019 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory" | 2 August 2019 |

| Inspection activity | Date(s) of inspection | Inspection location | Statement of results | Date statement provided |
|---|---|---|---|---|
| 91(b) Statement of Conclusions<br>(3 October 2019) | | | "The IAEA has concluded from its verification activities carried out at AS-F during the material balance period from 1 May 2018 to 6 May 2019, 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: 7 May 2019–1 June 2020

| Inspection activity | Date(s) of inspection | Inspection location | Statement of results | Date statement provided |
|---|---|---|---|---|
| Short Notice Random Inspection | 8–9 October 2019 | 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 January 2020 |
| Short Notice Random Inspection | 3 February 2020 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results from this inspection were satisfactory" | 6 May 2020 |
| Physical Inventory Verification | 2 June 2020 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results from this inspection were satisfactory" | 27 July 2020 |
| Design Information Verification | 2 June 2020 | ANSTO | "Based on the activities conducted and the information available to date in connection with such activities, the results of the DIV were satisfactory" | 27 July 2020 |
| 91(b) Statement of Conclusions | | Not available at time of publication of this Annual Report | | |

## Material balance area: AS-I (CSIRO)
## Material balance period: 28 February 2018–30 June 2018

| Inspection activity | Date(s) of inspection | Inspection location | Statement of results | Date statement provided |
|---|---|---|---|---|
| Physical Inventory Verification | 3 May 2019 | CSIRO – Black Mountain, ACT | "Based on the activities conducted and the information available to date in connection with such activities, the results of this inspection were satisfactory" | 10 October 2019 |
| 91(b) Statement of Conclusions<br>(31 January 2020) | "The IAEA has concluded from its verification activities carried out at AS-I during the material balance period from 28 February 2018 to 30 June 2018, 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." | | | |

## 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 |
| 9 October 2018 | Lucas Heights Science and Technology Centre: Buildings 3 and 20B. | "The IAEA was able to carry out all planned activities during the CA" | 10 January 2019 |
| 11 October 2018 | Lucas Heights Science and Technology Centre: Buildings 54, 80 and 88. | "The IAEA was able to carry out all planned activities during the CA" | 28 January 2019 |
| 10(c) Statement of Conclusions (18 November 2019) | "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:<br>• PN210 – CSIRO Minerals<br>• LHSTC – Lucas Heights Science and Technology Centre<br>This statement is now inclusive of environmental sample analysis results and amends our statement dated 2019–03–20 under Article 10.c of the Protocol Additional." | | |

## Additional Protocol Assessment Period: 1 January 2019–31 December 2019

| Date of Complementary Access (CA) | Location | 10(a) Statement of activities | Date statement provided |
|---|---|---|---|
| 9 May 2019 | Lucas Heights Science and Technology Centre: Buildings 21B Ext, 21E and 21H | "The IAEA was able to carry out all planned activities during the CA" | 27 August 2019 |
| 20 May 2019 | Beverley and Four Mile uranium mines (Heathgate Resources) | "The IAEA was able to carry out all planned activities during the CA" | 27 August 2019 |
| 8 October 2019 | Lucas Heights Science and Technology Centre (PN001-ANSTO): Buildings 80, 41, 88, 54 | "The IAEA was able to carry out all planned activities during the CA" | 7 January 2020 |
| 10(c) Statement of Conclusions<br>(9 March 2020) | "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:<br>• LHSTC – Lucas Heights Science and Technology Centre<br>• Beverley<br>• PN001-ANSTO*<br>Note that conclusions marked with an asterisk (*) are pending the results and evaluation of environmental samples." | | |

## Additional Protocol Assessment Period: 1 January 2020–31 December 2020

| Date of Complementary Access (CA) | Location | 10(a) Statement of activities | Date statement provided |
|---|---|---|---|
| 4 February 2020 | Lucas Heights Science and Technology Centre: Buildings 88, 23A/B, 54 | "The IAEA was able to carry out all planned activities during the CA" | 5 March 2020 |
| 11 June 2020 | Lucas Heights Science and Technology Centre: Buildings 93, 91 | "The IAEA was able to carry out all planned activities during the CA" | 30 July 2020 |
| 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 2019[i, ii]

In 2019, safeguards were applied for 183 States[iii, iv] with safeguards agreements in force with the Agency. The Secretariat's findings and conclusions for 2019 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 thirty-one States had both comprehensive safeguards agreements and additional protocols in force[v]:
   a. For 69 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 62 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 44 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 2019, 10 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/20/06/statement-sir–2019.pdf. This statement is copied verbatim from the IAEA's publication, including footnotes.

# APPENDIX D: 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/about-us/corporate/freedom-of-information/Pages/information-publications-scheme.

## 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. Presentations include:

Michal Botha, Making Australian Security Regime Fit for Purpose, International Conference on Nuclear Security (ICoNS), 11 February 2020, Vienna, Austria.

Michal Botha, (on behalf of Kaitlyn Toole – ANSTO), Reflections on regional training efforts in support of nuclear forensic capability development in South-East Asia, International Conference on Nuclear Security (ICoNS), 13 February 2020, Vienna, Austria.

Malcolm Coxhead, CTBTO, 'The Comprehensive Nuclear-Test-Ban Treaty: Let's finish what we've started', Seminar for Parliaments of the Pacific on the implementation of United Nations Security Council resolution 1540, 19–20 September 2019, Wellington, New Zealand.

Lyndell Evans, Challenges of LOF Management – Australia, Accounting for DU Radiography Devices, paper prepared for Asia-Pacific Safeguards Network Annual Meeting, 28–29 August 2019, Bali.

Robert Floyd, Stephan Bayer, The first review Conference of the CPPNM Amended: Preparations and Possibilities, 2019 Annual Meeting of the Institute of Nuclear Materials Management, 14–18 July 2019, Palm Desert, USA.

Robert Floyd, 'Sustainable, strong and independent nuclear security regulatory framework' and 'Current and future trends and challenges facing nuclear security', presentations to panel discussions, Third International Regulators Conference on Nuclear Security, 1–4 October 2019, Marrakech, Morocco.

Robert Floyd, 'International Nuclear Cooperation: Developing Robust and Efficient

Legal Frameworks', Moscow Non-proliferation Conference 2019, 7–9 November 2019, Russia.

Robert Floyd, presentation to high-level panel on 'International Legally and Non-legally Binding Instruments for Nuclear Security', International Conference on Nuclear Security: Sustaining and Strengthening Efforts, Vienna 10–14 February 2020, Vienna, Austria.

Kalman Robertson, Nuclear Non-Proliferation and Safeguards, University of New South Wales School of Electrical Engineering and Telecommunications course on Nuclear Safety, Security and Safeguards, 9 August 2019, Sydney, Australia.

Kalman Robertson, Safeguards in a Nutshell, Australian National University Department of Nuclear Physics course on Nuclear Science and Its Applications, 7 November 2019, Canberra, Australia.

Kalman Robertson, The Australian Safeguards Support Program 1980–2020, Member State Support Programme (MSSP) Coordinators' Meeting, 29 January 2020, Vienna, Austria.

Tammy de Wright, Role of ASNO, Nuclear Regulators Roundtable, February 2020, Canberra, Australia.

# 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 (Corrected). |
| Asia-Pacific Safeguards Network (APSN) | A professional network that draws upon safeguards expertise in the Asia-Pacific to facilitate the exchange of safeguards information, knowledge, and practical experience among members in order to strengthen safeguards capabilities in the region. |
| Australian Nuclear Science and Technology Organisation (ANSTO) | ANSTO is the Australian public research organisation focused on nuclear science and technology with applications in health including radiopharmaceutical production, engineering, materials science, the environment and the nuclear fuel cycle. ANSTO's operations include the OPAL research reactor and ANSTO Nuclear Medicine (ANM). |
| Australian Obligated Nuclear Material (AONM) | Nuclear material exported from Australia and nuclear material derived therefrom, which is subject to obligations pursuant to Australia's bilateral nuclear cooperation agreements. |
| Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) | The Australian Government's primary authority on radiation protection and nuclear safety. ARPANSA regulates Commonwealth entities that use radiation with the objective of protecting people and the environment. |
| Australian Safeguards Support Program (ASSP) | ASSP is one of 21 programs established by member States and the European Commission to assist the IAEA in safeguards research and development and is coordinated by ASNO. |
| Central Nervous System-Acting chemicals (CNSACs) | Toxic (and potentially lethal) chemicals that target the central nervous system. |
| 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. |
| Chemical Weapon Production Facility (CWPF) | Provisions for dealing with chemical weapon production facilities are addressed in Article V of the CWC. |
| Chemical Weapons Convention (CWC) | Commonly used name given to the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction. |
| Complementary Access (CA) | The right of the IAEA, pursuant to the Additional Protocol, for access to a site or location to carry out verification activities. |

| Term | Description |
|---|---|
| Comprehensive Nuclear-Test-Ban Treaty (CTBT) | The CTBT bans all nuclear explosions – everywhere, by everyone. While there is almost universal adoption of the Treaty, it will not enter into force until the 44 States specified in Annex 2 have signed and ratified the Treaty. |
| Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) | The Vienna-based international organisation established at entry into force of the CTBT to ensure the implementation of its provisions. |
| 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). |
| Convention on the Physical Protection of Nuclear Material (CPPNM) | CPPNM establishes physical protection measures that must be applied to nuclear material in international transport, as well as measures related to criminal offenses related to nuclear material. |
| Convention on the Physical Protection of Nuclear Material Amended (CPPNM/A) | The amended CPPNM additionally requires physical protection measures for nuclear facilities and material in domestic use, storage and transport. It also requires states to criminalize malicious acts involving nuclear facilities and material and expands State-to-State cooperation in responding to such acts. |
| Conversion | Purification of uranium ore concentrates or recycled nuclear material and conversion to a chemical form suitable for isotopic enrichment or fuel fabrication. |
| 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. |
| Defence Science and Technology (DST) | The Australian Government's lead agency responsible for applying science and technology to defence and national security. |
| Democratic People's Republic of Korea (DPRK) | Also known as North Korea |
| Depleted Uranium (DU) | Uranium with a $^{235}U$ content less than that found in nature (e.g. the waste product of the uranium enrichment processes). |
| Direct-Use Material | Nuclear material defined for safeguards purposes as being usable for nuclear explosives without transmutation or further enrichment, e.g. plutonium, High Enriched Uranium (HEU) and $^{233}U$. |

| Term | Description |
|---|---|
| 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. |
| 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 Low Enriched Uranium (LEU) fuel used in a power reactor 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 (for this reporting period). |
| Facility | (For CWC purposes) a plant, plant site or production/ processing unit.<br><br>(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. |
| Fact-Finding Mission (FFM) | The United Nations can establish FFMs to discover facts, often in troubled areas, within clear legal and political parameters. |
| 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 triggered by a bombarding neutron.<br><br>In a nuclear reactor, a neutron collides with a fissile nuclide (e.g. $^{235}U$) that then splits, releasing energy and further neutrons. Some of these neutrons go on to collide with other fissile nuclei, setting up a nuclear chain reaction. |

| Term | Description |
|---|---|
| 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. |
| Geoscience Australia (GA) | Geoscience Australia is Australia's leading public sector geoscience organisation. GA conducts nuclear monitoring activities on behalf of the Australian Government agreed through a Letter of Understanding between ASNO and GA. GA is also involved in the installation and maintenance of some of the CTBT IMS stations in Australia and its territories. These activities play an important role in ensuring Australia fulfils its obligations under the CTBT. |
| 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. |
| High Flux Australian Reactor (HIFAR) | 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. |
| 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. https://www.iaea.org/publications/documents/infcircs |
| 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. |

| Term | Description |
|---|---|
| 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 IAEA's 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 Atomic Energy Agency (IAEA) | The IAEA is the international centre for cooperation in the nuclear field. The Agency works with its Member States and multiple partners worldwide to promote the safe, secure and peaceful use of nuclear technologies. |
| 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. |
| International Partnership of Nuclear Disarmament Verification (IPNDV) | IPNDV is an ongoing initiative of more than 25 countries with and without nuclear weapons. The Partners are identifying challenges associated with nuclear disarmament verification and developing potential approaches and technologies to address those challenges. |
| International Physical Protection Advisor Service (IPPAS) | The IAEA created IPPAS in 1995 to provides peer advice on implementing international instruments and Agency guidance on the protection of nuclear and other radioactive material, associated facilities and associated activities. |

| Term | Description |
|---|---|
| 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. |
| 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.<br><br>As the number of protons is the same, isotopes are different forms of the same chemical element. |
| Joint Investigative Mechanism (JIM) | The Security Council adopted resolutions for a joint UN-OPCW investigation into the use of chemical weapon weapons in the Syrian Arab Republic. |
| 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. |
| Material Unaccounted For (MUF) | 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. |
| 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. |

| Term | Description |
|---|---|
| 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. |
| MWe | Megawatts of electrical power |
| 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 | The NPT is the commonly used acronym for the Treaty on the Non-Proliferation of Nuclear Weapons, whose objective is to prevent the spread of nuclear weapons and weapons technology, promote cooperation in the peaceful uses of nuclear energy and to further the goal of nuclear disarmament. |
| 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. |
| NUMBAT | 'Nuclear Material Balances and Tracking' – ASNO's custom built nuclear database used to fulfil reporting requirements under Australia's safeguards agreements with the IAEA, track Australian Obligated Nuclear Material (AONM) overseas, and maintain a register of permit holders, as required under the *Nuclear Non-Proliferation (Safeguards) Act 1987*. |
| Old Chemical Weapons (OCW) | Defined under the Chemical Weapons Convention as:<br>• chemical weapons produced before 1925; or<br>• 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. |

| Term | Description |
|---|---|
| Open Pool Australian Light-Water reactor (OPAL) | 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. |
| Organisation for the Prohibition of Chemical Weapons (OPCW) | OPCW is an intergovernmental organisation and the implementing body for the Chemical Weapons Convention based in The Hague, Netherlands. It oversees the global endeavour for the permanent and verifiable elimination of chemical weapons. |
| Other Chemical Production Facility (OCPF) | Defined under the Chemical Weapons Convention as all plant sites that:<br>• produced by synthesis during the previous calendar year more than 200 tonnes of unscheduled discrete organic chemicals; or<br>• 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). |
| 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.<br>(For safeguards purposes) Nuclear Production is the generation of special fissionable material through irradiation of fertile material in a reactor. |
| Provisional Technical Secretariat (PTS) | The PTS assists the CTBTO Preparatory Commission in the establishment of a global verification regime to monitor compliance with the CTBT. |
| $^{239}$Pu | An isotope of plutonium with atomic mass 239 (94 protons and 145 neutrons). $^{239}$Pu is 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 is used to 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. |

| Term | Description |
|---|---|
| Reprocessing | Processing of spent nuclear fuel to separate uranium and plutonium from highly radioactive fission products. |
| Safeguards Inspector | For domestic purposes, a 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 IAEA inspections and complementary access in Australia. |
| Seismic | Referring to the movements of the earth and its crust that can be generated by, among other things, earthquakes, explosions and large impacts (e.g. meteors). The seismic component of the CTBT's IMS 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. |
| 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. |
| 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 (SFM) | $^{239}Pu$; $^{233}U$; 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. |
| Technical Assistance Visit (TAV) | The Technical Secretariat of the OPCW can, through a TAV, provide technical assistance and technical evaluation to States Parties in the implementation of the provisions of this Convention, including evaluation of scheduled and unscheduled chemicals. |
| Temporary Working Group (TWG) | The OPCW's Director-General may, in consultation with the members of the Scientific Advisory Board, establish temporary working groups of scientific experts to provide recommendations on specific issues within a specific time frame. |
| $^{232}Th$ | 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 $^{232}Th$. |

| Term | Description |
|---|---|
| $^{235}U$ | 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. |
| United Nations Security Council Resolution (UNSCR) | Formal expressions of the opinion or will of United Nations organs. |
| Uranium ore concentrate (UOC) | A commercial product of a uranium mining and milling operation 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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## D

## V



## Z

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