Australian Government
Australian Radiation Protection and Nuclear Safety Agency

In reply please quote

Mr Russell Chafer
A/g Committee Secretary
Joint Standing Committee on Treaties
PO Box 6021
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Canberra
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Dear Mr Chafer

INQUIRY INTO NUCLEAR NON-PROLIFERATION AND DISARMAMENT

I refer to your letter of 12 November advising of the above inquiry by the Joint Standing Committee on Treaties. Please find attached a submission made by the Chief Executive Officer of the Australian Radiation Protection and Nuclear Safety Agency to the Inquiry by the Joint Standing Committee on Treaties into Nuclear Non-proliferation and Disarmament.

Thank you for the opportunity to make a submission.

Yours sincerely

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30 January 2009

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Joint Standing Committee on Treaties
Inquiry into Nuclear Non-proliferation and Disarmament

Submission by Australian Radiation Protection and Nuclear Safety Agency

January 2009

Introduction

Following is a submission made by the Chief Executive Officer of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) to the Inquiry by the Joint Standing Committee on Treaties into Nuclear Non-proliferation and Disarmament (the Inquiry). ARPANSA's submission focuses principally on the first term of reference of the Inquiry, namely:

- The international treaties involving Australia which relate to nuclear non-proliferation and disarmament.

In September 1996, the Comprehensive Nuclear Test Ban Treaty (the CTBT) was adopted by the United Nations General Assembly. The CTBT will enter into force 180 days after it has been ratified by the 44 States listed in the Annex 2[1] to the CTBT. Once in force, the CTBT will prohibit nuclear explosions in any environment, for military or civil purposes.

Australia ratified the CTBT in 1998 which imposed obligations on the Australian Government relating to the global verification scheme to monitor compliance with the provisions of the CTBT and the establishment of an International Monitoring System.

ARPANSA manages Australia's obligations under the CTBT with respect to:

- Operation of Australia's Airborne Radionuclide Particulate Monitoring Stations,
- Operation of Australia's Noble Gas Monitoring Stations,
- The Australian Radionuclide Nuclide Laboratory,
- Radionuclide assessments for the Australian National Data Centre.

The submission contains further details about ARPANSA's management of these obligations. A brief history of fallout monitoring in Australia is given in Appendix 1.

CTBT Organisation and Preparatory Commission

Article II of the CTBT provides for a Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO) to *inter alia* ensure implementation of the treaty. Although formally the CTBTO does not come into being until entry-into-force (EIF), a resolution of States Signatory to the CTBT established a Preparatory Commission for the CTBT on 19 November 1996.

The purpose of the Preparatory Commission is to carry out the preparations to implement the

1. Annex 2 States are the 44 States are that participated in CTBT negotiations within the Conference on Disarmament prior to adoption of the CTBT in 1996, and that also possess nuclear power or research reactors. To date 35 Annex 2 states, including Australia, have ratified the CTBT.

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CTBT, leading to EIF. It is located in Vienna and consists of two parts: a plenary body composed of State Signatories and a Provisional Technical Secretariat (PTS). Subsidiary working groups to the plenary body provide proposals and recommendations on administrative, budgetary and technical issues relating to the CTBT and its implementation. The main function of the PTS is to carry out the technical and administrative functions necessary for the global verification regime to monitor compliance with the CTBT provisions. The regime consists of:

1. a global network of monitoring stations, the International Monitoring System supported by an International Data Centre at the PTS headquarters in Vienna;

2. provisions for on-site inspections by States Parties to clarify whether a nuclear test has been carried out;

3. a process for consultation and clarification to resolve matters concerning possible non-compliance with the CTBT; and

4. measures to resolve any compliance concerns arising from misinterpretation of verification data and to assist in the calibration of monitoring stations.

CTBT International Monitoring System

The CTBT establishes an International Monitoring System (IMS) for the purpose of ensuring rapid verification of a nuclear weapons test and identification of the site of the test. Under the terms of the CTBT, the global verification regime to monitor compliance must be capable of detecting nuclear explosions in all environments – underground, in water, and in the atmosphere.

The IMS consists of 321 monitoring stations and 16 radionuclide laboratories that monitor all environments for evidence of a nuclear explosion. The IMS uses four technologies. Seismic, hydroacoustic and infrasound monitoring techniques are used to detect acoustic signals from the explosion in underground, underwater and atmosphere environments, respectively. Radionuclide monitoring stations collect and analyse air samples to detect radioactive particulates and gases transported through the atmosphere from the source.

The seismic network consists of 50 primary stations that send data in real time to the International Data Centre (IDC) in Vienna and 120 auxiliary stations that provide data upon request from the IDC. The seismic network must have the ability to distinguish between an underground explosion and earthquakes that occur frequently round the globe.

Hydroacoustic monitoring network comprises 11 stations covering the world's oceans. The hydroacoustic network must be able to distinguish between an underwater explosion and acoustic noise from submarine volcanoes and earthquakes.

The infrasound network consists of 60 stations that use acoustic pressure sensors to detect very low frequency sound waves in the atmosphere. The infrasound network must be able to distinguish between atmospheric explosions and other events such as meteorite impacts,

volcanic explosions, meteorological phenomena, rocket launches and supersonic boom from aircraft.

Worldwide there will be 80 radionuclide particulate monitoring stations and 40 noble gas monitoring stations, of which seven radionuclide stations and two noble gas stations are managed by Australia. The radionuclide monitoring stations use high volume air sampling to detect radioactive particulates released from an atmospheric explosion or vented from an underground or underwater explosion. Noble gas stations are equipped with samplers to collect xenon isotopes, which are important in detecting releases from underground explosions.

The radionuclide monitoring network is supported by 16 national laboratories designated under the CTBT to provide further, more detailed, analysis of air samples from the stations suspected of containing radioactivity from nuclear explosions. The primary role of radionuclide monitoring for the CTBT is to provide unambiguous evidence of a nuclear explosion and uniquely identify materials released from other sources such as a nuclear reactor. The global distribution of IMS stations is shown in Appendix 2.

CTBT International Data Centre

Data from the monitoring networks is transmitted to the International Data Centre (IDC), which is located in the PTS headquarters in Vienna. Under the CTBT the IDC processes the raw data from the IMS stations on behalf of States Parties to produce various analytical products and data summaries. States Parties have access to all IMS data, raw and processed, under the CTBT. The IDC also provides assistance to States parties that wish to carry out further technical analysis of the data.

An additional role of the IDC is to monitor and report on the operational status of the IMS monitoring stations and notify those responsible for station operations in the event of problems or failure to meet the relevant performance standards.

National Data Centers (NDC) are designated by each States Party for data access and cooperation with the IDC for the provision of services. ARPANSA is the designated centre in Australia for radionuclides and its NDC is under development.

A global satellite communications network, termed the Global Communications Infrastructure (GCI), is being established to transmit data from the 337 IMS facilities to the IDC in Vienna for processing and analysis. Distribution of data and IDC reports are distributed to States Parties through the GCI.

CTBT roles and responsibilities in Australia

The responsibilities, technical and administrative, in Australia for the CTBT lie with several existing Federal Government agencies.

Each State Party to the CTBT is obliged to have a National Authority whose responsibilities are:

1. to liaise with the CTBTO and other States Parties on implementing the CTBT;
2. to coordinate the establishment and operation of IMS stations in the particular country;
3. to manage the national policy on CTBT obligations, including relevant legislation and regulations, negotiate and implement agreements between the country and the CTBTO and manage funding arrangements for CTBT activities within the country; and
4. to promote the development of CTBT verification.

In Australia, the Australian Safeguards and Non-Proliferation Office (ASNO) within the Department of Foreign Affairs and Trade undertakes the functions of the National Authority for the CTBT. Technical development of the Australian component of the IMS network is shared between Geoscience Australia (GA) and ARPANSA. GA, as part of its functions, operates a national network of seismic stations, and will have the responsibility to carry out the installation and operation of most of the IMS seismic and infrasound stations in Australia.

There will be seven IMS radionuclide monitoring stations in Australia, which are being installed, operated and maintained by ARPANSA under contract to the PTS. The stations are to be located at Melbourne, Perth, Townsville, Darwin, Cocos Islands, Macquarie Island and Mawson. To date, the Melbourne, Perth, Townsville, Darwin, Cocos Islands stations have been installed and certified for IMS operations. Additionally, the two noble gas analysers have also been installed in Darwin and Melbourne and are undergoing evaluation prior to formal certification from the PTS. ARPANSA also built and operated a station at Kavieng in Papua New Guinea from 2002 to 2006. A contract for the installation of a station on Macquarie Island has been finalised and work is expected to begin in 2009, with an anticipated completion date of mid-2011. Contracts to build a station at Mawson are yet to be finalized.

With the exception of the Melbourne station, these stations are co-located with the Australian Bureau of Meteorology (BoM) weather station sites. A memorandum of understanding has been developed between ARPANSA and the BoM for the daily operations and maintenance of the stations to be provided by the on-site Bureau staff. It is anticipated that similar arrangements will be put in place for the two remaining sites in the polar regions.

The radionuclide laboratory at the Yallambie premises of ARPANSA is designated in the CTBT as one of 16 laboratories worldwide to undertake more detailed analysis of suspect filters (in the Treaty it is designated as the Australian Radiation Laboratory). The ARPANSA laboratory was certified in 2004 following visits from National Association of Testing Authorities (NATA) and the PTS. The laboratory has successfully met the requirements of ISO 17025 and was NATA accredited and is subject to continuing quality assurance and calibration checks.

CTBT National Data Centre

The CTBT allows for the establishment of a National Data Centre in '*Preamble – Article IV Verification – B. The International Monitoring System':*

18. Each State Party shall have the right to participate in the international exchange

of data and to have access to all data made available to the International Data Centre. Each State Party shall cooperate with the International Data Centre through its National Authority.

Upon entry into force the Australian National Authority will co-ordinate two NDCs to provide advice on and technical expertise in the verification technologies; viz:

1. Australian Radiation Protection and Nuclear Safety Agency for radionuclide issues;
2. Geoscience Australia for the wave form technologies, seismology, hydroacoustic and infrasound.

The ARPANSA Radionuclide National Data Centre is under development. It will maintain the capability to forward and back track radiological releases into the atmosphere to determine the point of origin of a release and to assess radiation dose on the population.

The ARPANSA Radionuclide National Data Centre is to provide advice to ASNO on any event as follows:

1. event classed as level 5 on the scale set out by the CTBT that is detected by an Australian radionuclide station (except if the event is a probable result of equipment malfunction or other error);
2. any other level 5 event reported in a Standard Screened Radionuclide Event Bulletin issued by the International Data Centre where the event is unlikely to be explicable as a result of civil activities or a technical malfunction or error; and
3. any other event ARPANSA considers could be indicative of a nuclear weapon test explosion.

It should be noted that each day, IMS stations will transmit large amounts of data via satellite to the International Data Centre in Vienna, which will in turn distribute it to national data centres around the world. The IDC will process the raw data and the first automated products are released within two hours arrival of the raw data. Analysts will then review the processed data and send a daily quality controlled bulletin to Member States. In turn, National Data Centres will have the responsibility to make judgments about the true nature of any suspect events. These NDCs will have access to all raw data available at the IDC. Importantly, each nation will apply its own criteria for distinguishing between CTBT compliance and non-compliance.

Summary of ARPANSA's responsibilities with respect to the CTBT

ARPANSA has the responsibility to manage Australia's obligations under the CTBT with respect to the radionuclide monitoring provisions of the International Monitoring System. ARPANSA currently operates 5 and will eventually operate 7 of the 80 radionuclide particulate monitoring stations, 2 of the 40 noble gas monitoring stations and 1 of the 16 radionuclide laboratories which comprise the IMS. ARPANSA will also provide input into the Australian National Data Centre in relation to monitoring and assessment of radionuclides.

ARPANSA operates the Australian Radionuclide Laboratory which is certified and operational.

The Australian National Data Centre is currently under development. ARPANSA will also provide input from its IMS stations into the Australian National Data Centre in relation to monitoring and assessment of radionuclides. ARPANSA can interrogate the International Data Centre to provide reports with respect to radionuclides and will be able to do so on behalf of the Australian National Data Centre.

Appendix 1: History of fallout monitoring in Australia

By the mid 1950s it became apparent that radioactive fallout from the explosion of nuclear weapons in the atmosphere had the potential to raise radiation levels globally. This led the United Nations General Assembly to establish the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) in December 1955 to undertake a comprehensive study of the global effects of radioactive fallout. Australia was one of the fifteen original members of UNSCEAR.

At about the same time in October 1952 the United Kingdom tested a nuclear device at the Monte Bello Islands, Western Australia, and in October 1953 tested two more at Emu, a remote area of the Great Victoria Desert in South Australia. As a result of experience gained from these tests, the United Kingdom entered into an agreement with the Australian Government in August 1954 to establish a testing range in the western part of South Australia. The range was named Maralinga and the agreement became effective in May 1955. In July 1955 a Maralinga Safety Committee was formed and was reconstituted in March 1957 as the Atomic Weapons Test Safety Committee (AWTSC).

Major trials were held at Maralinga in September and October of 1956 and 1957. Some supplementary minor trials involving the use of radioactive materials were held at intervals until 1963. The Commonwealth X-ray and Radium Laboratory (CXRL, which became the Australian Radiation Laboratory and would later form part of ARPANSA) was associated with the Maralinga trials in two quite different ways: radiological safety at Maralinga; and surveillance of fallout over Australia.

With respect to surveillance of fallout over Australia the primary functions of the AWTSC were to ensure that nuclear trials in Australia would not adversely affect the health of the Australian population and would not cause damage to property outside the trial sites. The extent and amount of deposition of radioactive fallout over Australia was monitored so that the exposure of the Australian population could be estimated. The then Department of Supply, the Bureau of Meteorology and CXRL co-operated in the execution of this task on behalf of the AWTSC.

CXRL established a facility for measuring the very low levels of short-lived radioactivity expected in the fallout using specialised equipment that arrived in Australia in February 1956. Following each of the trials at Monte Bello Islands in 1956 and at Maralinga in 1956 and 1957, measurements were made on daily samples of fallout drawn from more than 10 centers throughout Australia. The measurements confirmed that the level of radiation to which the Australian population would be exposed from the nuclear tests held within the country would be of minor consequence compared with the exposure from the long-lived radionuclides (mainly strontium-90 and caesium-137) present in the global fallout from nuclear explosions being conducted elsewhere.

Because facilities for reliable measurement of strontium-90 and caesium-137 in the environment were not then available in Australia, arrangements were made for representative materials to be analysed in the U.K. and the U.S.A. It was with these matters in mind that the National Radiation Advisory Committee recommended in its

report of July 1959 that the Department of Health should consider establishing a radiochemical facility at CXRL. Arising from this recommendation, the Laboratory established a 'low level radiochemical facility' which was in operation by June 1961.

In the 1960s the monitoring of fallout in the Australian environment was modified to detect fresh fission products reaching Australia from the testing of atomic devices in the atmosphere by other countries and to monitor the on-going impact of long-lived radioactive material from global fallout. Arrangements were such that, should the need arise, sampling programs for the monitoring of fallout could be rapidly expanded.

Initially the results on radioactivity in the environment from fallout were published in the *Australian Journal of Science;* later, the results were included in reports made to the Commonwealth Government by the National Radiation Advisory Committee, the Atomic Weapons Tests Safety Committee and the Australian Ionising Radiation Advisory Council. The data also was made available to UNSCEAR, providing the greatest body of information on the subject for any country in the southern hemisphere.

Appendix 2: The International Monitoring System