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# The global non-proliferation regime

*The non-proliferation regime has been remarkably successful, but has had to respond to challenges over the years, and must continue to do so to remain effective. If such challenges are not met, the expansion of nuclear energy will come to be seen, by governments and the public alike, not as a benefit, but as a risk to international security.*[1]

*If we, the global community, accept that the benefits of peaceful nuclear technology are essential to our health, our environment, and our social and economic development, then we owe it to ourselves to ensure that we have a framework in place that can effectively prevent the military applications of this technology from leading to our self-destruction.*[2]

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1 The Hon Alexander Downer MP, *Submission no. 33*, p. 3.

2 Dr Mohamed ElBaradei (IAEA Director General), *Treaty on the Non-Proliferation of Nuclear Weapons*, Address at the 2005 Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons, 2 May 2005, United Nations, New York, viewed 12 February 2006, <http://www.iaea.org/NewsCenter/Statements/2005/ebsp2005n006.html>.

## *Key messages —*

- **The political commitment of an overwhelming majority of states against proliferation, combined with the institutional and technical safeguards that have been developed over time, have been highly successful in limiting the spread of nuclear weapons to date.**
- **Today, in addition to the five nuclear-armed states that existed prior to the entry into force of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1970, there are only four states that have or are believed to have nuclear weapons: the three non-NPT parties—Israel, India and Pakistan—and North Korea. This is clearly a tremendous achievement, particularly in light of predictions that by the end of the 20th century there would be some 25 to 30 nuclear armed states.**
- **Safeguards are the technical measures used to verify that countries are honouring their commitments under the NPT and other agreements not to use nuclear materials and facilities for nuclear-weapons purposes.**
- **A strengthened safeguards system has now been developed, which is based on Comprehensive Safeguards Agreements entered into by states with the International Atomic Energy Agency (IAEA) and an Additional Protocol (AP) to those agreements, which provides a higher standard for verification of states' nuclear undertakings. The strengthened safeguards system helps to provide assurance not only that declared nuclear material is not diverted for military purposes, but also that there are no undeclared nuclear activities in a state with an AP in force.**
- **Australia played a prominent role in the negotiation of the AP and was the first country to sign and ratify a Protocol. Furthermore, the Australian Government has made the AP a pre-condition for the supply of Australian uranium to non-nuclear weapons states (NNWS).**
- **The IAEA's verification efforts may not be judged fully effective until its access rights, which have been significantly widened under the AP, are evenly applied across states. The AP must become the universal standard for verifying states' nuclear non-prolifertion commitments and the slow adoption of APs to date is disappointing.**

- **Challenges to the non-proliferation regime must be met so that the public can be confident that an expansion of nuclear power and of uranium exports will not represent a risk to international security.**
- **Among these challenges is a weakening of political support for the NPT. Contributing to this situation are two arguments, advanced by some states, that: the NPT guarantees the right of any country to establish the entire nuclear fuel cycle, including the proliferation-sensitive technologies of uranium enrichment and reprocessing; and the argument that the nuclear weapon states (NWS) are not meeting their disarmament obligations under the NPT.**
- **The non-prolifertion core of the NPT may have been neglected as some states have sought to use non-proliferation as a bargaining chip in this false argument between disarmament and nuclear technology acquisition. This is a regrettable political development and the Committee encourages the Australian Government to impress on other countries the central importance of the non-proliferation aspects of the Treaty. Only a stable non-proliferation environment and a firm commitment by all NNWS to non-proliferation will provide the conditions for further reductions in nuclear arsenals. At the same time, the Committee acknowledges the significant reductions in NWS arsenals to date.**
- **Several proposals have recently been made to control the further spread of proliferation-sensitive technologies and to enhance the effectivness of the nuclear verification regime. These include mutilateral approaches to the nuclear fuel cycle, such as multination or regional operation of nuclear facilities and assurances of fuel supply for those countries that forgo development of proliferation-sensitive technologies.**
- **The Committee notes with interest the still nascent proposal by the US Government for a Global Nuclear Energy Partnership (GNEP). GNEP hopes to enable expanded use of nuclear power through the deployment of a fuel cycle that does not require production of separated plutonium, and the use of advanced nuclear reactors in fuel supplier nations which can consume plutonium and much of the waste material.**
- **Australia continues to make a significant contribution to the development of the non-proliferation regime through its advocacy in a wide range of fora.**

## Introduction

7.1 In this and the following chapter the Committee addresses the third objection to the use of nuclear power—nuclear proliferation and the effectiveness of safeguards regimes.

7.2 The chapter first introduces the concept of proliferation and explains how some technologies required in the civil nuclear fuel cycle also have military uses. The Committee describes the current global non-proliferation regime, the key elements of which are the Treaty on the Non-Proliferation of Nuclear Weapons and the safeguards activities of the International Atomic Energy Agency (IAEA).

7.3 While submitters acknowledged that improvements have been made to IAEA safeguards in recent years, it was argued that a number of deficiencies remain. These alleged deficiencies and a response to each claim from the Australian Safeguards and Non-Proliferation Office are summarised in turn.

7.4 Finally, the chapter presents an overview of measures recently proposed to address perceived vulnerabilities in the non-proliferation regime. Australia's extensive contribution to the development of the regime is summarised.

7.5 The Committee considers Australia's bilateral safeguards arrangements, which are superimposed on the IAEA safeguards system, and related issues in the following chapter.

## Proliferation

7.6 Nuclear proliferation may be understood as the spread of technologies, expertise and materials, that may assist in the production of nuclear weapons, to countries that do not already have such capabilities. 'Horizontal' proliferation refers to an increase in the number of countries that have nuclear weapons production technology, while 'vertical' proliferation refers to an increase in the size or destructive capacity of the nuclear arsenals of those countries that already possess nuclear weapons.[3]

7.7 The requirements to construct nuclear weapons are a sufficient quantity of fissile material of suitable quality, combined with the necessary technical

3 Australian Science and Technology Council (ASTEC), *Australia's Role in the Nuclear Fuel Cycle*, AGPS, Canberra, 1984, p. 98.

capability. The fissile material required to construct nuclear weapons would need to be either very highly enriched uranium, or plutonium (Pu) with a suitable isotopic composition (plutonium relatively rich in the isotope Pu-239).[4] Other technologies are also required for weapon components and the necessary weapon delivery system.

7.8 The Hon Alexander Downer MP, Minister for Foreign Affairs, explained that two technologies used in the civil nuclear fuel cycle are capable of producing weapons useable material, and are thus considered proliferation-sensitive technologies:

> … the technologies used to produce nuclear reactor fuel—uranium enrichment or plutonium separation [for reprocessing of used reactor fuel]—can also be used to produce fissile material for nuclear weapons. The diversion of nuclear material from peaceful uses could also contribute to development of nuclear weapons, although in most cases enrichment or reprocessing capabilities would also be required.[5]

7.9 While most nuclear reactors require uranium enriched to no more than five per cent U-235, or low enriched uranium (LEU), nuclear weapons must have uranium enriched to 90 per cent or more U-235 (the category of highly enriched uranium (HEU) starts at 20 per cent U-235).[6] However, the proliferation risk associated with enrichment is that the same technology used to produce LEU can also be used to produce HEU for use in nuclear weapons.[7]

7.10 In relation to reprocessing, plutonium is formed during normal reactor operations and is contained within the used reactor fuel in a mixture with uranium and fission products. The unused uranium and plutonium can be separated out in a reprocessing plant and then recycled into new reactor fuel. Separated plutonium could be diverted for use in a nuclear weapon. The weapons useability of so-called reactor-grade plutonium is discussed in the following chapter.

7.11 It is thus a principal aim of global non-proliferation efforts to limit the spread of these proliferation-sensitive technologies that could be used to produce fissile material for nuclear weapons—enrichment and reprocessing (plutonium separation):

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4 Australian Safeguards and Non-Proliferation Office, *Exhibit no. 93, Informal briefing concerning the Global Nuclear Energy Partnership*, p. 7.

5 The Hon Alexander Downer MP, *Submission no. 33*, pp. 2–3.

6 Australian Safeguards and Non-Proliferation Office, *Annual Report 2003–2004,* Commonwealth of Australia, Canberra, 2004, p. 107.

7 Medical Association for the Prevention of War (Victorian Branch), *Submission no. 30*, p. 5.

> …because enrichment or reprocessing are indispensable for the production of weapons material, the earliest institutional barrier against proliferation was control over the supply of enrichment and reprocessing technologies, and this remains a key element in the non-proliferation regime. Most States with nuclear power programs have neither enrichment nor reprocessing facilities, instead contracting with others for these services.[8]

## The global non-proliferation regime

7.12 Given that technologies used to produce nuclear reactor fuel can also be used to produce fissile material for nuclear weapons, the international community has long recognised that the use of nuclear energy needs to be accompanied by measures to counter proliferation. This has been recognised through 'the ongoing development and refinement of the nuclear non-proliferation regime.'[9]

7.13 The global nuclear non-proliferation regime has evolved into a complex blend of mutually reinforcing elements designed to provide assurance that the peaceful use of nuclear energy does not contribute to the proliferation of nuclear weapons. The key treaty and institutional elements of the regime are the Treaty on the Non-Proliferation of Nuclear Weapons (NPT or 'the Treaty') and the safeguards measures of the International Atomic Energy Agency (IAEA, or 'the Agency').

### The Treaty on the Non-Proliferation of Nuclear Weapons

7.14 The Treaty on the Non-Proliferation of Nuclear Weapons, which entered into force in March 1970, is the principal international legal instrument underpinning the global non-proliferation regime. The NPT has three objectives which are 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 achieving nuclear disarmament, and general and complete disarmament.[10]

7.15 The Treaty currently has some 189 states as parties—the most widely adhered to multilateral disarmament and non-proliferation agreement. States parties include the five nuclear-weapon states (NWS), which were those recognised by the NPT as having nuclear weapons at 1 January 1967

8 Australian Safeguards and Non-Proliferation Office, *Exhibit no. 93, op. cit., p. 8.*

9 The Hon Alexander Downer MP, *op. cit.*, p. 3.

10 IAEA, *International Conventions & Agreements*, IAEA, Vienna, 2006, viewed 1 August 2006, <http://www.iaea.org/Publications/Documents/Treaties/npt.html>.

when the Treaty was negotiated; namely, the United States, Russia, the United Kingdom, France and China. At the NPT Review and Extension Conference held in May 1995, 25 years after the Treaty's entry into force, states parties made the NPT permanent and decided that review conferences should continue to be held every five years. The most recent review conference was held in May 2005.[11]

7.16 Under the Treaty, the NWS parties have undertaken not to transfer nuclear weapons or nuclear explosive devices to any recipient (Article I) and non-nuclear-weapon states (NNWS) have agreed to forego acquiring or developing nuclear weapons (Article II). The NPT establishes a safeguards system under the responsibility of the IAEA (Article III), described further below, to verify the fulfillment of the NNWS obligations under Article II. The Treaty affirms the right of all parties to use nuclear energy for peaceful purposes and to participate in the exchange of equipment, materials and information for the peaceful uses of nuclear energy (Article IV). All parties are committed to pursue nuclear and general disarmament (Article VI).[12]

7.17 Other treaties and agreements that contribute to achieving non-proliferation objectives include:

- nuclear-weapon-free zone treaties in Latin America (Tlatelolco Treaty), the South Pacific (Rarotonga Treaty), Southeast Asia (Bangkok Treaty) and Africa (Pelindaba Treaty);
- the treaty establishing the European Atomic Energy Community (Euratom); and
- the Agreement between the Republic of Argentina and the Federative Republic of Brazil for the Exclusively Peaceful Use of Nuclear Energy (Guadalajara Declaration).[13]

## International Atomic Energy Agency

7.18 The key institutional element of the global non-proliferation regime is the IAEA and its technical measures, or safeguards activities, for verifying that countries are honouring their commitments under the NPT and other

11 IAEA, *Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons*, IAEA, Vienna, 2004, p. 1, viewed 1 August 2006, <http://www.un.org/events/npt2005/presskit.pdf>.

12 IAEA, *Treaty on the Non-Proliferation of Nuclear Weapons,* IAEA Information Circular 140 (INFCIRC/140), viewed 1 August 2006, <http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc140.pdf>.

13 IAEA, *IAEA Safeguards Glossary*, IAEA, Vienna, 2001, pp. 2–5, viewed 1 August 2006, <http://www-pub.iaea.org/MTCD/publications/PDF/nvs-3-cd/Start.pdf>.

treaties not to use nuclear materials and facilities for nuclear-weapons purposes.[14]

7.19 The Statute of the IAEA, which came into force in July 1957, states that the objective of the IAEA is:

> … to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.[15]

7.20 Established as an autonomous organistion under the aegis of the United Nations, the IAEA seeks to achieve its objective through three areas of work:

- promoting nuclear science and technology, particularly for the benefit of developing countries, through research and development (R&D) into practical applications of atomic energy for peaceful uses, promoting the exchange of scientific and technical information between member states, and transferring nuclear science and technology through technical cooperation programs;
- verifying, through its safeguards program, that nuclear materials subject to safeguards are not diverted to nuclear weapons; and
- enhancing the safety and security of nuclear material and facilities as well as of other radioactive materials.[16]

7.21 The objective of safeguards is to detect, in a timely manner, diversion of 'significant quantities' of nuclear material from peaceful nuclear activities to the manufacture of weapons or other explosive devices, and to deter such diversions by the risk of early detection.[17]

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14 ASTEC, *op. cit.*, p. 108. In addition to the IAEA, Areva also pointed to the existence of other regional safeguards and verfication organisations such as EURATOM and ABACC. Areva, *Submission no. 39*, p. 8. EURATOM is organisation comprised of the European Atomic Energy Community. ABACC is the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials. ABACC is a binational agency created by the governments of Brazil and Argentina, responsible for verifying the pacific use of nuclear materials that could be used, either directly or indirectly, for the manufacture of weapons of mass destruction.

15 IAEA, *Statute of the IAEA*, IAEA, Vienna, 1956, viewed 13 July 2006, <http://www.iaea.org/About/statute_text.html#A1.3>.

16 See: IAEA, *Annual Report 2004*, IAEA, Vienna, 2005, viewed 3 August 2006, <http://www.iaea.org/Publications/Reports/Anrep2004/index.html>. The functions of the IAEA are listed in Article III of the IAEA's Statute.

17 A 'significant quantity' (SQ) is the approximate quantity of any given type of nuclear material, which, taking into account any conversion process involved is required for the manufacture of a nuclear explosive device. For example, the SQ for plutonium is 8 kg of Pu containing less than 80 per cent Pu-238. See: IAEA, *IAEA Safeguards Glossary*, *op. cit.*, p. 23; ASNO, *Submission no. 33.2*, p. 6.

7.22 The IAEA safeguards system is based on assessment of the correctness and completeness of a state's declared nuclear material and activities. Currently, 156 states have safeguards agreements in force with the IAEA and more than 900 nuclear facilities in 71 countries are under routine safeguards inspection.[18]

7.23 The NPT requires NNWS parties to conclude comprehensive safeguards agreements (CSAs) with the IAEA, and thus allow for the application of safeguards to all of their nuclear material ('source or special fissionable material') in all nuclear activities.[19] CSAs are also required by the nuclear-weapon-free zone treaties listed in the preceding section. Article III of the NPT provides that all of the NNWS must:

> … accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency for the exclusive pupose of verification of the fulfillment of its obligations assumed under [the NPT] with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other explosive devices.[20]

7.24 The five NPT NWS parties have concluded a second type of safeguards agreement, referred to as Voluntary Offer Agreements (VOAs), covering some or all of their peaceful nuclear activities. Under VOAs, facilities or nuclear materials in facilities notified to the IAEA are offered for the application of safeguards.[21]

7.25 A third type of safeguards agreement is known as Item-Specific safeguards agreements. The three non-NPT parties, India, Pakistan and Israel, have entered into these agreements which cover only specified material, facilities and other items of equipment or non-nuclear material. States parties to these agreements undertake not to use the material or

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18 IAEA, *IAEA Safeguards: Stemming the Spread of Nuclear Weapons*, IAEA, Vienna, 2002, p. 1, viewed 2 August 2005, <http://www.iaea.org/Publications/Factsheets/English/S1_Safeguards.pdf>; IAEA, *Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons*, IAEA, Vienna, 2005, p. 3, viewed 3 August 2006, <http://www.un.org/events/npt2005/presskit.pdf>.

19 Source material is defined in the IAEA's Statute as uranium containing the mixture of isotopes occurring in nature, uranium depleted in the isotope 235 and thorium. Special fissionable material is defined as plutonium-239, uranium-233, and uranium enriched in the isotopes 235 or 233. See: IAEA, *Statute of the IAEA,* Article XX: Definitions*, loc. cit.*

20 IAEA, *Treaty on the Non-Proliferation of Nuclear Weapons, loc. cit.* For an overview of the safeguards system see: IAEA, *The Safeguards System of the International Atomic Energy Agency*, IAEA, Vienna, viewed 1 August 2006, <http://www.iaea.org/OurWork/SV/Safeguards/safeg_system.pdf>.

21 IAEA, *Annual Report 2004*, *op. cit.*, p. 62, viewed 2 August 2006, <http://www.iaea.org/Publications/Reports/Anrep2004/safeguards.pdf>.

facilities under safeguards in such a way as to further any military purpose.[22]

7.26 Once a safeguards agreement has entered into force, the state concerned has an obligation to declare to the IAEA all nuclear material and facilities subject to safeguards under the agreement, and to update this information as circumstances change. The IAEA's basic measures for safeguarding the declared nuclear material and facilities are:

- nuclear material accounting, through which, on the basis of information provided primarily by the state concerned, the IAEA establishes an initial inventory of nuclear material in the state, and records subsequent changes to it;
- containment and surveillance measures to monitor access to and movement of nuclear material; and
- on-site inspections (which are of three types: ad hoc, routine or special) and safeguards visits during which IAEA inspectors have the right to carry out a variety of measures (such as verifying facility design information, examining records, taking measurements and samples of nuclear material for IAEA analysis, verifying the functioning and calibration of instruments and installing surveillance equipment) for the purpose of verifying the correctness and completeness of states' declarations concerning nuclear materials accountancy and their nuclear programs.[23]

7.27 The IAEA notes that although safeguards developed progressively since their inception, until recently the IAEA system focussed mainly on nuclear material and activities declared by the state concerned. However, the discovery of Iraq's clandestine nuclear weapons program, despite an existing CSA between the IAEA and Iraq, and subsequent events in the Democratic People's Republic of Korea (DPRK, or North Korea), demonstrated that an effective verification regime must also focus on possible *undeclared* materials and activities.

7.28 Following the Iraqi revelations, the IAEA's Board of Governors agreed that the traditional safeguards system would henceforth have to provide assurance not only of the non-diversion of declared nuclear material, but also of the absence of any undeclared nuclear material and activities. Consequently, in 1992, the IAEA began to introduce safeguards strengthening measures which provided extended mechanisms for

22 IAEA, *Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, op. cit.*, p. 2.

23 *ibid*. See also: IAEA, *IAEA Safeguards Overview: Comprehensive Safeguards Agreements and Additional Protocols*, IAEA, Vienna, 2004, viewed 29 September 2005, <http://www.iaea.org/Publications/Factsheets/English/sg_overview.html>.

verification. These measures focussed on obtaining more information from states about their nuclear material, facilities and plans, on gaining more access to locations at which nuclear material is or could be present, and on using new verification technology.[24]

7.29 It was found that some measures to strengthen the safeguards system required additional legal authority and in May 1997 the IAEA Board of Governors approved a Model Additional Protocol to Safeguards Agreements which contains a number of provisions conferring upon the IAEA the legal authority to implement further strengthening measures.

7.30 Under an Additional Protocol (AP), a state is required to provide the IAEA with broader information covering all aspects of its nuclear fuel cycle-related activities, including R&D and uranium mining. States must also grant the Agency broader access rights ('complementary access') and enable it to use the most advanced verification technologies. Specific measures provided for in an AP include:

- information about, and access to, all aspects of states' nuclear fuel cycle, from uranium mines to nuclear waste and any other locations where nuclear material intended for non-nuclear uses is present;
- short-notice inspector access to all buildings on a nuclear site;
- information on the manufacture and export of sensitive nuclear-related technologies and inspection mechanisms for manufacturing and import locations;
- access to other nuclear-related locations; and
- collection of environmental samples beyond declared locations when deemed necessary by the IAEA.[25]

7.31 The IAEA maintains that with wider access, broader information and better use of technology, the Agency's capability to detect and deter undeclared nuclear material or activities is now significantly improved.[26]

7.32 Each country has been asked by the IAEA to conclude an AP to complement its existing safeguards agreement and the IAEA believes that CSAs and an AP are fast becoming the contemporary standard for NPT safeguards worldwide. However, the Australian Safeguards and Non-Proliferation Office (ASNO) noted that uptake of APs remains disappointing. As of January 2006, some 60 per cent of NPT parties had ratified or signed a Protocol. However, in terms of actual safeguards

24 IAEA, *Non-Proliferation of Nuclear Weapons and Nuclear Security*, IAEA, Vienna, May 2005, p. 6, viewed 2 August 2006, <http://www.iaea.org/Publications/Booklets/engl_nuke.pdf>.

25 IAEA, *IAEA Safeguards: Stemming the Spread of Nuclear Weapons*, *op. cit*., p. 3; IAEA, *IAEA Safeguards Overview: Comprehensive Safeguards Agreements and Additional Protocols*, *loc. cit*.

26 *ibid*.

implementation, the situation is more positive. More than 85 per cent of the NNWS that are party to the NPT and have significant nuclear activities (55 out of 63 states) have ratified or signed an AP.[27] As of 14 July 2006, 110 states and other parties had signed APs and 77 had APs in force.[28]

7.33 Minister Downer noted that Australia played a prominent role in the negotiation of the AP and Australia was the first country to sign and ratify a Protocol. Furthermore, at the 2005 NPT Review Conference the Minister announced that Australia would make the AP a pre-condition for the supply of Australian uranium to NNWS.[29]

7.34 In terms of the scope of IAEA safeguards, under CSAs the starting point in the nuclear fuel cycle for the application of safeguards begins when nuclear material suitable for enrichment leaves conversion plants. However, when a state exports to a NNWS they are also required to report exports, or imports, of any material containing uranium or thorium, unless it is transferred for specifically non-nuclear purposes. Furthermore, under APs, states are required to provide the IAEA with information on uranium and thorium prior to conversion and this information is to be provided both on such material present in the state, whether in nuclear or non-nuclear use, and on exports and imports of such material for specifically non-nuclear purposes. Safeguards terminate when nuclear material has been consumed or has been diluted in such a way as to be no longer usable for weapons purposes, or has become practically irrecoverable.[30]

7.35 The IAEA reports annually on safeguards implementation to the Agency's Board of Governors, including any violations by a state of its safeguards agreement with the IAEA (i.e. non-compliance). In the Safeguards Statement for 2005 the IAEA reported its safeguards conclusions with regard to each type of safeguard agreement, as follows.

- Seventy states had both CSAs and APs in force or otherwise being applied:
  - ⇒ For 24 of these states, the Agency found no indication of the diversion of declared nuclear material from peaceful activities and no indication of undeclared nuclear material or activities. On this basis, the Agency concluded that, for these states, all nuclear material remained in peaceful activities.

27 The Hon Alexander Downer MP, *Submission no. 33.2*, p. 7.

28 IAEA, *Strengthened Safeguards System: Status of Additional Protocols*, IAEA, Vienna, 2006, viewed 2August 2006, <http://www.iaea.org/OurWork/SV/Safeguards/sg_protocol.html>; IAEA, *Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, op. cit.*, p. 3.

29 The Hon Alexander Downer MP, *loc. cit*.

30 IAEA, *IAEA Safeguards Glossary*, *op. cit.*, pp. 16–17.

⇒ For 46 of the states, the Agency found no indication of the diversion of declared nuclear material, while evaluations regarding the absence of undeclared nuclear material and activities for these states remained ongoing. On this basis, the Agency only concluded that, for these states, declared nuclear material remained in peaceful activities.

- Seventy-seven states had CSAs in force but without APs, and for these states the Agency found no indication of the diversion of declared nuclear material from peaceful nuclear activities. It was concluded that declared nuclear material remained in peaceful activities in these states.
- At the end of 2005, 36 NNWS parties to the NPT had not yet brought CSAs with the IAEA into force. For these states the Agency could not draw any safeguards conclusions.[31]
- Three states had Item-Specific safeguards agreements in force and the Agency found no indication of the diversion of nuclear material or of the misuse of the facilities to which safeguards were applied. On this basis, the Agency concluded that, for these states, nuclear material, facilities or other items to which safeguards were applied remained in peaceful activities.
- Five NWS had VOAs in force and safeguards were implemented with regard to declared nuclear material in selected facilities in four of the five states (UK, US, France and China). For these four states, the Agency found no indication of the diversion of nuclear material to which safeguards were applied and concluded that these materials remained in peaceful activities.[32]

7.36 The IAEA reported that since December 2002, when the DPRK terminated the Agency's safeguards activities in the country, the Agency has not been able to perform any verification activities in the DPRK. The Agency is therefore unable to draw any conclusions about North Korea's nuclear materials or activities.[33] The DPRK, which has had a CSA in force with the IAEA since 1992, has stated that it now has a nuclear weapons capability.[34] In October 2006 the DPRK claimed to have conducted a nuclear weapons test.

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31 As of 14 July 2006, there were 32 NNWS that had still to bring CSAs into force. See: IAEA, *NPT Comprehensive Safeguards Agreement Overview of Status,* IAEA, Vienna, 14 July 2006, viewed 1 August 2006, <http://www.iaea.org/Publications/Factsheets/English/nptstatus_overview.html>

32 IAEA, *Safeguards Statement for 2005*, IAEA, Vienna, 2005, pp. 1–2, viewed 1 August 2006, <http://www.iaea.org/OurWork/SV/Safeguards/es2005.html>.

33 *ibid*., p. 9.

34 IAEA, A*nnual Report 2004*, IAEA, Vienna, 2005, p. 63, viewed 2 August 2006, <http://www.iaea.org/Publications/Reports/Anrep2004/safeguards.pdf>.

7.37 Iran has had a CSA in force with the IAEA since 1974 and in December 2003 it signed, but did not subsequently ratify, an AP. The 2005 Safeguards Statement reported that Iran had been found to have previously engaged in undeclared nuclear activities. The IAEA Board of Governors found that Iran's 'many failures and breaches of its obligations' to comply with its CSA constituted non-compliance.[35]

7.38 In particular, it was found that Iran has been conducting R&D into enrichment and plutonium separation, without reporting these activities to the IAEA, for some 20 years. It has therefore failed to meet its obligations under its CSA and the NPT. The IAEA has also consistently reported a lack of adequate transparency and cooperation on the part of Iran. ASNO noted that:

> Iran argues that it needs to be self sufficient in the nuclear fuel cycle to support a nuclear power program. However, the extent and timing of Iran's activities, the covert nature of the program, its links to illicit procurement networks, and the lack of an economic rationale for developing uranium enrichment are inconsistent with a peaceful civil nuclear power industry.[36]

7.39 Furthermore, ASNO noted that Iran does not actually have a nuclear power program (it has only one reactor under construction) and Russia, which is building the reactor in question, has undertaken to supply fuel for 30 years.[37]

7.40 At the end of 2005 there remained two issues of relevance to the IAEA's verification efforts in Iran: the origin of low enriched uranium and high enriched uranium particle contamination found at various locations in Iran; and the extent and nature of Iran's enrichment program.[38]

7.41 In recent developments, on 31 July 2006 the UN Security Council demanded, in Resolution 1696, that Iran suspend all enrichment-related and reprocessing activities by 31 August 2006. The Resolution stated that if Iran failed to comply it may be subjected to economic and diplomatic sanctions. The Resolution noted the Security Council's serious concerns, including: the series of reports and resolutions by the IAEA's Board of Governors on Iran's nuclear program; that after three years of IAEA verification efforts to clarify all aspects of Iran's nuclear program the Agency is still unable to provide assurances about Iran's undeclared nuclear material and activities; that Iran has resumed enrichment-related

35 IAEA, *Safeguards Statement for 2005*, *op. cit.*, pp. 8–9.

36 ASNO, *Annual Report 2004–2005*, Commonwealth of Australia, Canberra, 2005, p. 13.

37 The Hon Alexander Downer MP, *Submission no. 33.2*, p. 3.

38 IAEA, *Safeguards Statement for 2005*, *loc. cit.*

activities contrary to requirements by the IAEA; and its continued suspension of cooperation with the IAEA under the AP.[39]

7.42 The IAEA was requested to report back to the Security Council by 31 August on Iran's compliance with its demands as well as on Iran's compliance with steps required by the IAEA's Board of Governors. Iran rejected the suspension deadline.[40]

7.43 IAEA safeguards inspectors conduct over 2 000 inspections at over 600 facilities world-wide each year. Inspectors analyse some 880 environmental swipe samples and verify that hundreds of tonnes of special fissile material remains in peaceful use.[41] The IAEA's annual Safeguards Statement reports on the Agency's field activities during the previous year. For example, during 2005 safeguards inspectors carried out 1 700 inspections and 160 complementary accesses utilising some 11 300 calendar-days in the field for verification in states with CSAs and APs in force or otherwise applied.[42]

7.44 The 2005 Safeguards Statement notes that the IAEA's safeguards expenditure from the Program's regular budget amounted to US$130 million. An additional $12.9 million was spent from voluntary contributions from member states.[43]

7.45 In 1998 the IAEA commenced a program for the development of 'integrated safeguards', which refers to the optimum combination of all safeguards measures available to the IAEA under CSAs and APs, which is said to achieve maximum effectiveness and efficiency within available resources. In 2005 integrated safeguards were implemented in Australia, Hungary, Indonesia, Japan, Norway, Peru, and Uzbekistan.[44]

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39 UN Security Council, *Non-proliferation*, UN Security Council Resolution 1696 (2006), viewed 3 August 2006, <http://daccessdds.un.org/doc/UNDOC/GEN/N06/450/22/PDF/N0645022.pdf?OpenElement>.

40 See for example: A K Dareini, 'Iranian President Rejects Nuke Deadline', *The Guardian*, 1 August 2006, viewed 3 August 2006, <http://www.guardian.co.uk/worldlatest/story/0,,-5987979,00.html>.

41 IAEA, *IAEA Verification Activities at a Glance*, IAEA, Vienna, 2004, viewed 1 August 2006, <http://www.iaea.org/NewsCenter/Focus/Npt/activities_glance.shtml>.

42 See: IAEA, *Safeguards Statement for 2005*, *op. cit.*, pp. 4, 6, 7, 8.

43 *ibid.*, p. 10.

44 *ibid.*, p. 9; IAEA, *Non-Proliferation of Nuclear Weapons and Nuclear Security*, *op. cit.*, p. 7; IAEA, *Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, loc. cit.*

## Other elements of the non-proliferation regime

7.46 In addition to the NPT and safeguards measures of the IAEA, there are a range of complementary measures which support the global non-proliferation regime, such as national policies on nuclear supply and multilateral efforts to control the export of sensitive technologies, materials and equipment. These measures include, but are not limited to, the following:

- Nuclear Suppliers' Group (NSG) Guidelines—The NSG is a group of 45 nuclear supplier countries which seeks to contribute to the non-proliferation of nuclear weapons through the implementation of Guidelines for export controls on nuclear and nuclear-related material, equipment, software and technology, without hindering international cooperation on peaceful uses of nuclear energy.[45]
- Proliferation Security Initiative (PSI)—The PSI is an international counter proliferation effort, initiated by the US Government in 2003, which applies intelligence, diplomatic, law enforcement, military, and other tools to prevent transfers of weapons of mass destruction (WMDs), their delivery systems, and related materials to states and non-state actors of proliferation concern. Over 70 countries now support the PSI.[46]
- UN Security Council Resolution 1540—Adopted by the Security Council in April 2004, Resolution 1540 calls on all states to, inter alia, refrain from providing any form of support to non-state actors that attempt to obtain WMDs and to enforce appropriate domestic laws, take and enforce measures to establish domestic controls to prevent proliferation of WMDs, and take cooperative action to prevent illicit trafficking in such weapons.[47]
- G8 Action Plan on Non-Proliferation—In June 2004 the G8 group of nations agreed to a package of non-proliferation measures, which included, inter alia, a one-year freeze on any new initiatives to transfer

45 Nuclear Suppliers' Group web site, viewed 2 August 2006, <http://www.nuclearsuppliersgroup.org/>. A statement issued by the NSG following its most recent Plenary Meeting is available at: <http://www.nuclearsuppliersgroup.org/PRESS/2006-07-Brasilia.pdf>.

46 Information on the PSI available on the US Department of State web site, viewed 2 August 2006, <http://www.state.gov/t/np/rls/other/46858.htm>. See also: The Hon Alexander Downer MP, *Submission no. 33.4*, p. 2; Dr Michael Goldsworthy (Silex Systems Ltd), *Transcript of Evidence*, 9 February 2006, p. 5.

47 UN Security Council, *Non-proliferation of weapons of mass destruction*, UN Security Council Resolution 1540 (2004), viewed 2 August 2006, <http://daccessdds.un.org/doc/UNDOC/GEN/N04/328/43/PDF/N0432843.pdf?OpenElement>

enrichment and reprocessing technology to additional states pending possible further amendments to NSG Guidelines. The Action Plan foreshadowed developing new measures to ensure reliable access to nuclear materials, equipment and technology, including nuclear fuel and related services for all states, consistent with maintaining non-proliferation commitments. The G8 also called for universal adherence to IAEA comprehensive safeguards and the AP.[48]

## Dual use technologies and the link between civil and military nuclear programs

7.47 The principal criticism of nuclear power, on proliferation grounds, is that civil nuclear programs and weapons programs are said to be 'inextricably linked' because of the 'dual use' technologies of uranium enrichment and reprocessing outlined above. For example:

- The Darwin NO-WAR Committee submitted that there is 'an inextricable link between nuclear power and nuclear weapons'.[49]
- Mr Justin Tutty argued that: 'Ever since the development of the first nuclear reactors in the 1950s, nuclear power has been inextricably linked to the spectre of nuclear weapons.'[50]
- The Medical Association for the Prevention of War (MAPW) (WA Branch) argued that:

  > The technical link between nuclear power and nuclear weapons remains the strongest argument against … nuclear power plants so long as the current climate of mistrust and terrorist activity is compounded by the failure of the nuclear capable states to agree on a program to dismantle their weapons.[51]

- The Australian Conservation Foundation (ACF) argued that:

  > The nuclear industry is fundamentally 'dual use' across nuclear power capacity and nuclear weapons capabilities. Nuclear power programs provide technology, facilities, experience, skills, nuclear materials and a cover for many countries holding and developing threshold nuclear weapons potential. Australia's role as uranium fuel supplier to the world nuclear industry is inseparable from this dual use reality.[52]

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48 *G8 Action Plan on Non-Proliferation*, available on the White House web site, viewed 2 August 2006, <http://www.whitehouse.gov/news/releases/2004/06/20040609-28.html>.

49 Darwin NO-WAR Committee, *Submission no. 13*, p. 1

50 Mr Justin Tutty, *Submission no. 41*, p. 2.

51 Dr Stephen Masters (MAPW – WA Branch), *Transcript of Evidence*, 23 September 2005, p. 37.

52 ACF, *Submission no. 48*, p. 9.

- The MAPW (Victorian Branch) concluded that:

> … nuclear power pose[s] an unacceptable threat to human health, primarily because of the inextricable nexus between the expertise, technology and materials required to fuel nuclear power reactors and those required to produce nuclear bombs. Uranium mining underpins both nuclear reactors and nuclear bombs.[53]

7.48 Based on the belief that the danger of nuclear war is the greatest immediate threat to the health and survival of humankind, the MAPW (Victorian Branch), ACF and others expressed opposition to all exports of uranium, and the nuclear power industry as a whole, because 'there is an inevitable association between nuclear power generation and proliferation, and terrorist and other unacceptable health and environmental risks.'[54] The MAPW (Victorian Branch) were convinced that it is not possible to achieve a nuclear weapons-free world while nuclear power is used to generate a substantial proportion of world electricity.

7.49 Similarly, the MAPW (WA Branch) and others opposed further uranium mining on the basis that to increase uranium production will, allegedly, inevitably lead to an increase in the global stocks of fissile material, such as civil plutonium stockpiles, and thereby increase the risk of diversion into weapons programs.[55] However, MAPW (WA Branch) subsequently conceded that it 'could certainly envisage a time' when, if proliferation dangers were addressed, 'we could get nuclear power going and avoid most of the problems.'[56]

7.50 Some submitters also argued that civil nuclear programs have been used to support weapons programs, including in the five NWS. For instance, Friends of the Earth–Australia (FOE) argued that:

> It is … a matter of historical record that of the 60 countries which have developed a nuclear industry to any significant extent, including a power and/or research reactor, over 20 of those countries have used their supposedly peaceful nuclear facilities and materials for weapons research and/or production.[57]

53 MAPW (Victorian Branch), *op. cit*., p. 2. See also: Mr Colin Mitchell, *Submission no. 67*, p. 1.

54 Associate Professor Tilman Ruff (MAPW), *Transcript of Evidence*, 19 August 2005, p. 29; MAPW (Victorian Branch), *op. cit*., p. 4; ACF, *op. cit*., p. 10.

55 MAPW (WA Branch), *Submission no. 8*, p. 5. See also: Mr W Lewis, *Submission no. 65*, p. 1; Darwin NO-WAR Committee, *loc. cit*.

56 Dr Stephen Masters, *op. cit*., p. 45.

57 Dr Jim Green (FOE), *Transcript of Evidence*, 19 August 2005, p. 61; FOE, *Submission no. 52*, p. 17; MAPW (Victorian Branch), *op. cit*., p. 6.

7.51 More specifically, FOE claimed that ostensibly civil nuclear programs preceded and facilitated the successful development of nuclear weapons in India, Pakistan, and in the former nuclear weapons state South Africa.[58]

7.52 ASNO submitted that nuclear weapons programs have been supported by nuclear facilities that have included research reactors, citing India as an example.[59] It was also conceded that those countries that have pursued nuclear weapons have used scientists and engineers who have gained experience in nuclear research programs.[60] However, ASNO argued that, in the history of nuclear weapons programs, those countries with nuclear weapons developed them before they developed nuclear power programs and in some of the countries having nuclear weapons, nuclear power remains insignificant or non-existent:

- in the recognised nuclear-weapon states—US, Russia, UK, France and China—all of these states had nuclear weapons before they developed nuclear power programs;
- in those states found to be in non-compliance with their safeguards agreements—Romania, Iraq, DPRK, Libya and Iran—none of these had nuclear power at the time of the non-compliance, and only Romania has nuclear power now. Iran has a power reactor under construction (by Russia), but this reactor was not part of Iran's clandestine nuclear program; and
- in the three non-NPT states with nuclear weapons, Israel does not have a nuclear power program.[61]

7.53 In making the argument about civil nuclear programs preceding and facilitating development of nuclear weapons, FOE cited India, Pakistan and South Africa, as noted above. However, ASNO responded that:

- India completed its first power reactor, Tarapur 1, in 1969, and conducted its first nuclear explosion in 1974. However, the plutonium for this explosion was produced using the Cirus research reactor, which commenced operation in 1960. India's preparations to acquire a nuclear explosive capability pre-date the Tarapur power reactor by many years;
- Pakistan completed its KANUPP power reactor about the same time as the development of its uranium enrichment program. Pakistan's nuclear weapons program was based on HEU, while the KANUPP reactor operates on natural uranium. There is allegedly no connection between this reactor and the enrichment program; and

58 FOE, *Submission no. 52.1*, p. 3.

59 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 3.

60 *ibid*., p. 12.

61 *ibid*., p. 3.

- in South Africa's case, the first stages of the Valindaba vortex enrichment plant to produce HEU were commissioned in 1974, and the first nuclear weapon was produced in 1979. This was well ahead of the commissioning of South Africa's first power reactor at Koeberg, in 1984.[62]

7.54 In summary, ASNO argued emphatically that:

> The examples pointed to by FOE do not substantiate their claim that nuclear power programs support military programs. Currently there are 30 countries, plus Taiwan, operating nuclear power reactors. The overwhelming majority — 24 of the 31 — do not have nuclear weapons. The remaining seven comprise the five nuclear-weapon states and India and Pakistan.[63]

7.55 FOE argued that there would almost certainly be fewer nuclear weapon states in the world today if not for civil nuclear power. The reason given for this was that the non-declared weapon states would not have been able to 'ride their weapons programs on an ostensibly civil program'.[64] In contrast, Mr Ian Hore-Lacy, General Manager of the Uranium Information Centre (UIC), argued that:

> I disagree. I think there would probably be two or three times as many weapons states now if there were no civil nuclear power, because the Nuclear Non-Proliferation Treaty has had this trade-off of technical assistance for the development of civil power on the basis that people stood back from the possibility, and eschewed the possibility, of developing weapons. In the 1960s there were a number of reputable estimates that by the turn of the century there would be at least 30, probably 35, nuclear weapons states. Now we have five official ones, we have three unofficial ones … I think that is an extraordinarily good result.[65]

## The effectiveness of the non-proliferation regime

7.56 Evidence to the Committee on the effectiveness of the non-proliferation regime was sharply divided. ASNO argued that although the non-proliferation regime has recently come under serious challenge, to date the regime has been highly successful:

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62 *ibid*.

63 *ibid*., p. 4.

64 Dr Jim Green (FOE), *op. cit*., p. 72.

65 Mr Ian Hore-Lacy, *Transcript of Evidence*, 19 August 2005, pp. 93–94.

> In the 1960s it was thought the proliferation of nuclear weapons was inevitable, and it was predicted there would be some 25 to 30 nuclear armed states before the end of the 20th century. Since its conclusion in 1968, the NPT has helped to establish conditions under which proliferation, while not stopped, has been substantially slowed. Today, in addition to the five nuclear-armed states that existed then — the United States, Russia, the United Kingdom, France and China — there are only four that have or are believed to have nuclear weapons: the three non-NPT parties — India, Israel and Pakistan — and the DPRK.[66]

7.57 ASNO credited the success of the regime to the political commitment of the overwhelming majority of states not to acquire nuclear weapons. This political commitment has been reinforced by treaty commitments, particularly membership of the NPT, and further reinforced by confidence-building measures, of which the most important are IAEA safeguards that provide assurance through verification.[67]

7.58 The UIC also argued that:

> International nuclear safeguards have been an outstanding success story in the UN context. With the wisdom of hindsight, they might have been more ambitious when they came into effect in 1970, but the deficiencies - related to undeclared nuclear activities rather than simply traded fissile materials - have been addressed in the 1990s through the Additional Protocol which countries are encouraged to sign and ratify supplementary to their agreements with IAEA.[68]

7.59 Similarly, the Association of Mining and Exploration Companies (AMEC) argued that the international safeguards and other non-proliferation measures have 'arguably been the United Nation's most conspicuous success.'[69]

7.60 In sharp contrast, the ACF argued that the non-proliferation regime, 'including the Non-Proliferation Treaty, have failed to deliver on the key strategic requirement to prevent proliferation of nuclear weapons capabilities.'[70] It was also asserted that:

> Australians have been misled … by claims that IAEA and Australian (ASNO) nuclear safeguards could provide assurance

66 ASNO, *Annual Report 2004–2005*, *op. cit.*, p. 8.

67 ASNO, *Exhibit no. 93, loc. cit.*

68 UIC, *Submission no. 12*, p. 32; Mr Ian Hore-Lacy, *op. cit.*, p. 93;

69 AMEC, *Submission no. 20*, p. 5.

70 ACF, *op. cit.,* p. 9.

> against civilian nuclear programs contributing to military nuclear capabilities and programs.[71]

7.61 In a similar vein, the MAPW (Victorian Branch) asserted that 'it is widely acknowledged that IAEA safeguards, even with the Additional Protocol are inadequate.'[72] FOE added that the 'safeguards system was exposed as a farce' by the clandestine weapons program of the Iraqi regime and that the strengthened safeguards system is still inadequate.[73]

7.62 ASNO disagreed strongly with this view, arguing that current proliferation challenges do not show the break-down of the NPT. While it was a serious concern that some NNWS have attempted to pursue weapons, ASNO argued that this does *not* demonstrate a 'failure' of the NPT:

> The NPT cannot 'prevent' proliferation, any more than national laws can prevent crime. The NPT establishes a standard of behaviour, together with an objective mechanism — IAEA safeguards — for identifying non-compliance and a process for dealing with non-compliance … It is precisely because of the possibility of non-compliance that the Treaty includes a verification mechanism … In this respect, international law is little different to domestic law—when a crime is committed no-one calls for the scrapping of the criminal law on the basis that it is not working, but rather, for more effective law enforcement.[74]

## Alleged deficiencies in the non-proliferation regime

7.63 While it was conceded that improvements have been made to the IAEA's safeguards system in recent years, some submitters argued that these still 'face major problems, limitations and contradictions'.[75] It was argued that the IAEA's Strengthened Safeguards Program, which incorporates APs, does not address some of the 'fundamental problems and contradictions of the NPT/IAEA system.'[76]

7.64 Nine specific limitations to the non-proliferation regime were mentioned in evidence submitted by, among others, FOE, MAPW and the AMP

71 *ibid*.

72 MAPW (Victorian Branch), *op. cit*., p. 3.

73 FOE, *Submission no. 52.1*, p. 3.

74 ASNO, *Annual Report 2004–2005*, *op. cit*., p. 10.

75 FOE, *Submission no. 52*, p. 18.

76 *ibid*.

Capital Investors Sustainable Funds Team (AMP CISFT).[77] The alleged deficiencies of the regime are that:

- some NPT signatory states have pursued covert weapons programs under cover of the Treaty, and civil nuclear programs have facilitated covert weapons programs;
- NPT states could acquire proliferation-sensitive technologies, as is their right under Article IV of the NPT, then withdraw from the Treaty and pursue weapons programs;
- Nuclear Weapon States are in breach of their disarmament obligations under Article VI of the NPT;
- the IAEA's dual role of promoting the peaceful uses of nuclear energy while preventing weapons proliferation is inconsistent and contradictory;
- membership of the IAEA's Board of Governors is inappropriately weighted;
- timeliness in detecting the diversion of fissile material is problematic;
- nuclear 'Material Unaccounted For' could be diverted for military purposes;
- resource constraints on the IAEA's safeguards activities undermine its effectiveness; and
- safeguards are, in any case, of no relevance to non-NPT states.

7.65 These claims are summarised in the sections which follow. ASNO provided responses to each these alleged deficiencies in the non-proliferation regime, which are also included in the discussion of each issue.

## Some NPT signatory states have pursued covert weapons programs and civil nuclear programs have facilitated covert weapons programs

7.66 MAPW and FOE argued that civil programs can provide the expertise, facilities and materials to pursue weapons programs which may be conducted covertly and illegally under cover of the NPT. Civil nuclear programs are said to have facilitated covert weapons programs in countries that were, at various times, in good standing with the NPT such as Iraq, North Korea and Iran. At least eight NPT member states are said to have carried out weapons-related projects in violation of their NPT agreements, or carried out permissible weapons-related activities but

77 See: FOE, *Submission no. 52*, pp. 18–19; FOE, *Submission no. 52.2*, pp. 1–13; Professor Richard Broinowski, *Submission no. 72*, p. 3; MAPW (Victorian Branch), *Submission no. 30*, pp. 3–4; AMP CISFT, *Submission no. 60*, pp. 5–6.

failed to meet their reporting requirements to the IAEA. These countries were said to be: Egypt, Iraq, Romania, Taiwan, Libya, Yugoslavia, DPRK and the Republic of Korea (ROK or South Korea).[78] FOE made specific mention of the ROK, which it was argued conducted a series of 'illicit and/or unreported nuclear weapons research activities' in the 1980s.[79]

7.67 ASNO responded that five countries—Romania, Iraq, DPRK, Libya and now Iran—have been found in non-compliance with their safeguards agreements and have been reported to the Security Council. None of these cases involved countries eligible to use Australian uranium and none of the countries were operating nuclear power programs at the time. Neither Taiwan nor Yugoslavia have been found in non-compliance. There are 63 NNWS NPT parties with significant nuclear activities—only five, those listed above, have been in non-compliance.[80] FOE conceded in a supplementary submission that while it was true that Taiwan and Yugoslavia were not found to be in non-compliance, they nonetheless pursued nuclear weapons programs despite being NPT signatories.[81]

7.68 In relation to the ROK, ASNO argued that it has been accepted by the IAEA Board of Governors that the activities referred to by FOE were not authorised by the ROK Government. The ROK Government was also said to have taken action to improve the effectiveness of its nuclear regulatory arrangements. FOE's assertion that the ROK has a nuclear weapons research program is unsubstantiated. When the unauthorised nuclear experiments carried out by ROK scientists were reported to the IAEA Board of Governors, the Board concluded that these activities did not amount to non-compliance with the ROK's safeguards agreement. In other words, the Board did *not* consider that the activities constituted evidence of efforts to develop nuclear weapons.[82]

7.69 In relation to the issue of civil programs providing expertise, facilities and materials to assist weapons programs ASNO responded that:

> In asserting that civil nuclear programs have facilitated covert weapons programs, is FOE suggesting that all nuclear activities should cease? Of course those countries that have pursued nuclear weapons have used scientists and engineers who have gained experience in nuclear research programs. It is hardly a serious response to this issue to proscribe all nuclear research—while

78 FOE, *Submission no. 52*, p. 18; MAPW (Victorian Branch), *Submission no. 30*, p. 4.

79 *ibid*., pp. 24, 25–26. See also: FOE, *Submission no. 52.2*, p. 4–5.

80 The Hon Alexander Downer MP, *Submission no. 33,* p. 13; The Hon Alexander Downer MP, *Submission no. 33.1*, p. 12.

81 FOE, *Submission no. 52.2*, p. 12.

82 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 2.

> we're about it, why not proscribe all physics, all chemistry, all engineering, all mathematics and computing?[83]

## NPT states could acquire sensitive technologies, withdraw from the Treaty and develop weapons

7.70 Whereas the previous issue related to the possibility of NPT parties conducting covert weapons programs, an alternative possibility is that, having made full use of their right to access nuclear technologies for ostensibly peaceful purposes under Article IV of the Treaty, NPT parties could acquire all the materials and expertise needed for weapons programs, then withdraw from the Treaty and proceed with weaponisation. This problem is said to have been highlighted by the DPRK and, potentially, Iran.[84]

7.71 ASNO responded that only one country, the DPRK, has attempted to withdraw from the NPT but that the DPRK's nuclear capabilities were not obtained under the NPT. Withdrawal from the NPT is also not an unqualified right. Many countries, including Australia, consider that the DPRK has not complied with the withdrawal provisions. Australia is currently active in the development of international action against any further withdrawals, for example, to establish that nuclear technology acquired during NPT membership continues to be bound by peaceful use obligations.[85]

7.72 A key issue is that Article IV of the NPT (also known as the 'right-to-peaceful-uses guarantee') enshrines the:

> … inalienable right of all Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination… All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy.[86]

7.73 Mr Lance Joseph, Australian Governor on the Board of the IAEA from 1997 until 2000, explained that although the exercise of this right must be in conformity with the overriding obligation not to pursue a nuclear weapons program and the non-proliferation aims codified in Articles I and II of the Treaty, many NNWS regard their right to enjoy full access to the technologies for peaceful use as inviolate:

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83 *ibid*., p. 12.

84 MAPW (Victorian Branch), *loc. cit*.

85 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 12.

86 IAEA, *Treaty on the Non-Proliferation of Nuclear Weapons, loc. cit.*

> So the question remains how to ensure that a rogue state does not circumvent its NPT obligations using the cover of the Treaty to creep to the weapons threshold, then withdrawing from the Treaty and embarking on a full-scale weapons program. That's the dilemma currently confronting the international community in Iran, and the insistence of Iran on its right to acquire the technologies of all stages of the nuclear fuel cycle.[87]

7.74 In relation to the Iranian situation, Professor Richard Broinowski argued that:

> … Iran right now are acting perfectly legally under the NPT and the extended protocol in developing an enrichment plant. Indeed, they are encouraged to do that by the terms of the NPT and its extensions. Yet that could lead immediately to weapons-grade plutonium or uranium being developed in Iran. All you have got to do is go beyond a 20 per cent U-235 to up to 90 per cent and it is the same process.[88]

7.75 For Mr Joseph, the challenge now presented by Iran and North Korea points to a basic flaw in the NPT as it was negotiated in the 1960s, 'namely that any party should have the right to access the *full* nuclear technologies in return for its promise not to turn those skills to military use.'[89] While in the late 1960s it was thought that few countries either could or would seek to acquire the sophisticated technologies, uranium enrichment and extracting plutonium are now more widely understood and can be abused. Proposals now being considered to address this dilemma are summarised later in the chapter.

7.76 Mr John Carlson, Director General of ASNO, noted that Iran has indeed insisted that it has a right to pursue proliferation-sensitive technologies as part of the inalienable right to nuclear energy provided in Article IV of the NPT, but that:

> This is a serious misreading of the NPT. The NPT (Article IV) speaks of the right of all parties to use *nuclear energy* for peaceful purposes. This was never intended to mean development of *any* nuclear technology.[90]

7.77 Moreover, Mr Carlson argued that when the NPT was first negotiated it was envisaged that the NWS would provide enrichment and reprocessing

87 Mr Lance Joseph, *Submission no. 71*, p. 2.

88 Professor Richard Broinowski, *Transcript of Evidence*, 16 September 2005, pp. 20-21.

89 Mr Lance Joseph, *loc. cit*. Emphasis added.

90 Mr John Carson, *Safeguards and Non-Proliferation: Current Challenges and Implications for Australia*, Speech given to the 2005 Conference of the Australian Nuclear Association, Sydney, 10 November 2005, p. 4. Emphasis is original.

services for the NNWS. Furthermore, in terms of the NPT itself, the right to use of nuclear energy is not unqualified:

> … but is subject to the other provisions of the Treaty—including the commitment against seeking nuclear weapons and the commitment to place all nuclear material under IAEA safeguards. It is disturbing that the state most vociferous about this 'right'—Iran—has been selective in its observance of NPT provisions. It is even more disturbing that Iran has supporters despite its track record of NPT violations.
>
> Ultimately, the NPT is a treaty on *non-proliferation*, not technology acquisition.[91]

7.78 ASNO argued that the challenge presented by Iran points to the need for an international framework to deal with legitimate concerns about access to the benefits of nuclear science and technology, which is discussed further below.

## Nuclear Weapon States are in breach of their disarmament obligations under the NPT

7.79 It was argued that some or all of the NWS are in breach of their NPT obligation to pursue good-faith negotiations on nuclear disarmament, which is enshrined in Article VI of the NPT.[92] The 'intransigence' of the NWS was said to provide incentives and excuses for other states to pursue nuclear weapons.[93] FOE argued that the allegedly problematic role of the NWS has frequently been mentioned by the Director General of the IAEA.[94] For example, in May 2005, the Director General stated that:

> … we must show the world that our commitment to nuclear disarmament is firm. As long as some countries place strategic reliance on nuclear weapons as a deterrent, other countries will emulate them. We cannot delude ourselves into thinking otherwise.[95]

7.80 Moreover, it was alleged that vertical proliferation among the NWS (e.g. Chinese ballistic missile testing and new weapons R&D in the US and

91 ASNO, *Australian Safeguards and Non-Proliferation Office Annual Report 2004–2005*, *op. cit*., p. 10. Emphasis in original.

92 FOE, *Submission no. 52*, p. 18; FOE, *Submission no. 52.2*, p. 9; Professor Richard Broinowski, *loc. cit*.

93 FOE, *Submission no. 52*, p. 18.

94 FOE, *Submission no. 52.2*, p. 10.

95 Dr Mohamed ElBaradei (IAEA Director General), *Treaty on the Non-Proliferation of Nuclear Weapons*, Address at the 2005 Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons, 2 May 2005, United Nations, New York, viewed 12 February 2006, <http://www.iaea.org/NewsCenter/Statements/2005/ebsp2005n006.html>.

France) violates the spirit of Article VI of the Treaty. Inaction on disarmament and activities to develop new or enhanced nuclear weapons by the NWS was said to be placing further pressure on the NPT and the non-proliferation regime generally.[96]

7.81 Professor Richard Broinowski argued that there are double standards for the parties to the Treaty:

> Under article VI, the weapons states are supposed to reduce, and then do away with, their arsenals as a bargain for the non-nuclear weapons states saying, 'We will not possess, develop or acquire nuclear weapons.' In my view, we are going to see one or two extra nuclear states every year because they are absolutely sick and tired of having to follow their part of the bargain while the superpower and the other nuclear weapons states have no intention of reducing their armaments. Indeed, the United States has new programs to make new weapons.[97]

7.82 ASNO responded that it is not plausible that a NNWS would seek nuclear weapons because the NWS are not meeting their NPT commitments. In any case, ASNO disputed that all the NWS are in breach of their NPT disarmament obligations and that a closer examination of the actual obligations is required because the NPT disarmament provisions are more complex than many critics appreciate. Article VI of the NPT requires all NPT Parties to:

> … pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.[98]

7.83 ASNO stated that the disarmament commitment involves all parties, not just the NWS, and that it is neither reasonable nor consistent with the terms of the NPT to place all the onus on the NWS.

7.84 The principal weapon states, the US and Russia, have in fact concluded a series of agreements for nuclear weapons reductions. These countries have reduced deployed warhead numbers from 10 000 each in 1991 to 6 000 each in 2002, and are proceeding to levels of between 1 700 and 2 200 by 2012 in accordance with commitments contained in the 2002 Moscow Treaty on Strategic Offensive Reductions. ASNO observed that while there

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96 MAPW (Victorian Branch), *op. cit*., p. 3; AMP CISFT, *op. cit*., p. 6; Darwin NO-WAR Committee, *Submission no. 13*, p. 3.

97 Professor Richard Broinowski, *Transcript of Evidence*, 16 September 2005, p. 21.

98 Cited in the Hon Alexander Downer, *Submission no. 33.1*, p. 6.

is clearly more to be done in warhead reductions, it is not helpful to ignore this very real progress.[99]

7.85 France and the UK have both unilaterally reduced warhead numbers. Both countries have also de-targeted their warheads. The UK has placed surplus military fissile material under IAEA safeguards, and has also placed all enrichment and reprocessing activities under safeguards. France is dismantling its military production facilities. In relation to China, ASNO argued that there is no basis for the assertion that China has no intention of fulfilling its NPT disarmament obligations.

7.86 ASNO argued that what is lacking currently are wider international efforts, involving all NPT parties, to negotiate a treaty on general disarmament, as contemplated by the NPT. Also essential to establishing the conditions for deeper cuts in nuclear arsenals is a firm commitment by all parties, NNWS as well as the NWS, to non-proliferation. The efforts of some NNWS to pursue nuclear weapons are not conducive to nuclear disarmament. The NPT implicitly recognises the fact that a stable environment in terms of non-proliferation of other forms of WMD is also an essential condition for further nuclear disarmament.[100]

## The IAEA's dual role of promoting the peaceful uses of nuclear energy while preventing weapons proliferation is contradictory

7.87 The IAEA's dual role of promoting the peaceful uses of nuclear energy while also preventing weapons proliferation was argued to be 'contradictory'.[101] The MAPW (Victorian Branch) asserted that:

> … the simultaneous roles of the IAEA in discouraging actual proliferation, while assisting and promoting the spread of know-how, materials and technology relevant to weapons development is inherently contradictory, and ultimately, counterproductive.[102]

7.88 Similarly, the Darwin NO-WAR Committee argued that:

> In reality, these international mechanisms have been used to facilitate, rather than limit, the spread of nuclear technologies, facilities and materials across political boundaries.[103]

7.89 The ACF and FOE also argued that the IAEA is 'hopelessly compromised' by its mandate to promote the 'spread of dual use technology'.[104]

99 *ibid*. See also: US Department of State, Bureau of Arms Control, *Treaty Between the United States of America and the Russian Federation On Strategic Offensive Reductions*, viewed 28 July 2006, <http://www.state.gov/t/ac/trt/18016.htm>.

100 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 7.

101 FOE, *Submission no. 52*, p. 18.

102 MAPW (Victorian Branch), *op. cit.*, p. 6.

103 Darwin NO-WAR Committee, *Submission no. 13*, p. 3.

7.90 ASNO responded that there is no basis to the claim of a conflict of interest between the IAEA's safeguards responsibilities and its responsibilities to 'enlarge the contribution of atomic energy to peace, health and prosperity throughout the world'.[105] These responsibilities were argued to be complementary, not inconsistent. In practice, the IAEA's role with nuclear technology was said to be more one of facilitation and monitoring than promotion. The IAEA also has a very important role in technical assistance, making nuclear applications available to developing countries in areas such as health and agriculture. ASNO argued that:

> To claim that the IAEA's responsibilities are inconsistent is in effect to argue there should be no international cooperation on nuclear science and technology.[106]

## Composition of the IAEA Board of Governors is inappropriate

7.91 FOE argued that the membership of the Board of Governors of the IAEA is weighted in favour of countries with significant nuclear programs, claiming that 13 of the 35 seats on the Board are reserved for member states which are advanced in nuclear technology in their region of the world.[107]

7.92 ASNO responded that the 35 members of the Board of Governors are appointed on the basis of the IAEA Statute. The Statute has a formula for membership of the Board which includes 'the ten members most advanced in the technology of atomic energy ... and the member most advanced in the technology of atomic energy' in eight designated regions 'in which none of the aforesaid ten is located.'[108] The remaining members (around 22) are elected with due regard to equitable representation. ASNO stated that:

> It's not clear why the submitter objects to representation on the Board of those countries with significant nuclear programs, but in any event it can be seen from this formula that the Board is widely representative.[109]

104 FOE, *Submission no. 52.1*, p. 3; ACF, *op. cit.*, p. 9.

105 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 5.

106 *ibid.*, p. 6.

107 FOE, *Submission no. 52*, p. 18.

108 Cited in the Hon Alexander Downer MP, *Submission no. 33.1*, p. 13.

109 *ibid.*

7.93 In a supplementary submission FOE responded that 'countries with significant nuclear programs may have reason, e.g. commercial reasons, to downplay the proliferation risks associated with civil nuclear programs.'[110]

## Timeliness in detecting diversions of fissile material

7.94 FOE claimed that another problem is the timeliness of detecting diversions of fissile material. It was argued that plutonium and HEU could be diverted and incorporated into a nuclear weapon in a short space of time.[111]

7.95 ASNO responded that the IAEA has set its timeliness and quantity goals for verification of nuclear materials on the basis of conversion times (i.e. how long it would take to turn the material into a nuclear explosive device) based on the conservative assumption that all preparatory work has already been done. This preparatory work includes the construction and commissioning of relevant facilities, such as an enrichment or reprocessing plant. In practice, far greater warning times should be available than simply the IAEA's timeliness goals. Part of the IAEA's program to strengthen safeguards includes developing detection capabilities to find undeclared facilities, and information analysis to identify indicators of preparations to proliferate.[112]

## Possible diversion of nuclear 'Material Unaccounted For'

7.96 Another 'unresolved' proliferation issue was said to be 'Material Unaccounted For' (MUF)—discrepancies between the expected and measured amounts of nuclear material. This was said to be a particularly difficult problem for large throughput facilities (such as reprocessing, enrichment and fuel fabrication plants), where it is alleged that enough fissile material could be diverted to make several weapons without detection.[113] The Arid Lands Environment Centre (ALEC) claimed that:

> In the most up-to-date reprocessing plants ever built (currently being commissioned in Japan at Rokkasho-Mura), an accountancy level of 99% is being promised. That is, the operators guarantee to within 1% that all of the material (such as weapons-grade plutonium) received by the plant is accounted for. At that rate of assurance, this one facility alone will provide enough 'missing'

110 FOE, *Submission no. 52.2*, pp. 12–13.

111 FOE, *Submission no. 52*, p. 19.

112 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 13.

113 FOE, *Submission no. 52*, *loc. cit.*; FOE, *Submission no. 52.2*, p. 3; MAPW (Victorian Branch), *Exhibit no. 79, Safeguards and Plutonium Reprocessing*, p. 5.

> material to power a nuclear weapon every month. And this is the best that the industry can offer ...[114]

7.97 AMP CISFT also expressed concern about clerical errors at the Sellafield reprocessing facility in the UK which allegedly meant that up to 30 kg of plutonium could not be accounted for each year.[115]

7.98 ASNO responded that MUF is a normal occurrence in the verification of nuclear accounts. MUF is the difference between recorded quantities and measured quantities of nuclear materials. MUF does not imply that nuclear material is missing—as often as not, the measured quantity will be greater than the recorded quantity, i.e. material will be 'gained'.[116]

## Resource constraints on the IAEA's safeguards activities

7.99 FOE and others argued that: 'Resource constraints on the IAEA's safeguards system are an ongoing problem'.[117] The Director General of the IAEA has himself remarked that 'the Agency's verification activities operate on a shoestring budget, particularly given the expanding scope of [IAEA] responsibilities.'[118] As noted above, the Agency's annual safeguards budget is approximately US$130 million. The IAEA employs some 650 inspectors who oversee approximately 900 nuclear facilities in 71 countries. In order to address resource constraints, the Agency is exploring use of innovative technologies for detecting undeclared facilities and activities.[119] Nonetheless, the Director General has observed that 'we are clearly operating on a "bare minimum" of funding'.[120]

7.100 In relation to financial and personnel resource constraints on the IAEA's capacity to implement its strengthened safeguards program, ASNO stated that for the period from the early 1990s to 2003 the IAEA operated under the constraints of a 'zero real growth' budget applied by the member states, in line with similar action in other UN bodies. In recognition of the increased workload facing the IAEA, in 2003 the IAEA Board of

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114 ALEC, *Submission no. 75*, p. 3.

115 Dr Ian Woods (AMP CISFT), *Transcript of Evidence*, 16 September 2005, p. 29.

116 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 2.

117 FOE et. al., Exhibit no. 71, *Nuclear Power – no solution to climate change*, section 3.6.

118 Dr Mohamed ElBaradei, *Nuclear Non-Proliferation and Arms Control: Are We Making Progress?*, Statements of the Director General, Speech to the 2005 Carnegie International Non-Proliferation Conference, 7 November 2005, viewed 7 August 2006, <http://www.iaea.org/NewsCenter/Statements/2005/ebsp2005n017.html>.

119 *ibid*.

120 Dr Mohamed ElBaradei, *Nuclear Non-Proliferation: Responding to a Changing Landscape*, Statement by the IAEA Director General, 18 May 2006, viewed 8 August 2006, <http://www.iaea.org/NewsCenter/Statements/2006/ebsp2006n007.html>.

Governors agreed to a substantial increase—around 16 per cent—in the regular safeguards budget.[121]

7.101 Savings in safeguards costs are expected from the introduction of 'integrated safeguards', which allow for the rationalisation of safeguards activities in states where the IAEA has concluded there are no indications of undeclared nuclear material or activities. These savings will be available to offset increasing costs in other areas of safeguards implementation. Member states are also keeping the adequacy of the safeguards budget under review.

### International safeguards are of no relevance to non-NPT member states

7.102 FOE claimed that an on-going limitation of the NPT/IAEA safeguards system is that it is of no relevance to non-NPT states—India, Pakistan, Israel and, since its withdrawal, North Korea.[122]

7.103 In contrast, ASNO stated that the NPT is not irrelevant to the three non-NPT parties, arguing that their national security benefits substantially from the stable non-proliferation environment which the NPT provides. It was also observed that, to a significant extent, theses countries are bound by the non-proliferation commitments of the NPT, in the sense that they should not assist a party to break its commitment not to pursue nuclear weapons. Moreover, as noted in the overview of the IAEA safeguards agreements above, all three non-NPT parties accept IAEA safeguards on some of their facilities.[123]

## Vulnerabilities and challenges to the non-proliferation regime

7.104 ASNO argued that the greatest challenge for the non-proliferation regime is the weakening of political support for the NPT itself, evidenced by the failure of the 2005 NPT Review Conference to agree on any final document, notwithstanding that proliferation is widely seen as a serious threat.[124]

7.105 ASNO commented in its *2004–2005 Annual Report* that this loss of support is not occurring deliberately but more out of neglect, or lack of appreciation for the national security benefits of an effective non-proliferation regime. ASNO observed that many developing countries regard proliferation as a 'North/South' issue which is important only to

121 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 14. See also: US Government Accountability Office (GAO), *Nuclear Nonproliferation*, GAO, Washington DC, October 2005, viewed 25 November 2005, <http://www.gao.gov/new.items/d0693.pdf>.

122 FOE, *Submission no. 52*, p. 19.

123 The Hon Alexander Downer MP, *Submission no. 33.1*, p. 13.

124 ASNO, *Annual Report 2004–2005, op. cit.*, p. 6.

the 'North' and can therefore be used as a bargaining chip in other political arguments. Moreover, for many countries the focus of interest in the NPT now seems to be 'almost exclusively disarmament and technology acquisition. The non-proliferation core of the Treaty has receded in importance.'[125] However, ASNO argued that disarmament will not progress further while proliferation is becoming an increasing problem and, therefore, those countries who genuinely wish to encourage disarmament should support the non-proliferation aspects of the Treaty.

7.106 ASNO noted that one important positive development of the 2005 Review Conference was that NPT parties for the first time debated the issue of NPT withdrawal. Parties showed support for stronger disincentives to withdrawal and many NPT parties made clear that they regard NPT withdrawal as an issue of the highest concern.[126]

7.107 Despite the inability of the Review Conference to reach consensus on measures to address the compliance and verification challenges facing the NPT, ASNO argued that Australia, along with the overwhelming majority of states, continue to support the NPT and value highly the security benefits it delivers. It was argued that the Treaty 'remains of strong normative value as a near-universal instrument setting the benchmark for nuclear non-proliferation and disarmament.'[127]

7.108 ASNO also noted that it is important to recognise that the NPT's future does not hinge on the outcome of the 2005 Review Conference. The failure to produce a final document, while disappointing, was not a fatal blow. Several previous Review Conferences have also failed to produce final documents.

7.109 Since the Conference, non-proliferation objectives have been pursued in other forums, including the following:

- in June 2005 the IAEA Board of Governors decided to establish a special committee on safeguards and verification to examine ways to strengthen safeguards;
- the IAEA's Standing Advisory Group on Safeguards Implementation now meets regularly to consider improved nuclear safeguards approaches;
- a conference in July 2005 agreed on amendments to the *Convention on the Physical Protection of Nuclear Material* (CPPNM) to extend its application;

125 *ibid*.

126 The Hon Alexander Downer MP, *Submission no. 33.4*, p. 1.

127 *ibid*., p. 2.

- the NSG has met and discussed the current proliferation challenges of North Korea and Iran, and the strengthening of nuclear export controls; and
- parties to the Comprehensive Test Ban Treaty (CTBT) met in September 2005 to identify ways to accelerate entry into force of the CTBT.[128]

7.110 ASNO noted that while multilateral treaty regimes and supporting measures such as export controls are important defences against nuclear proliferation, they are not of themselves enough to stop determined proliferators. To this end, the PSI is said to have 'quickly proved its worth as a means of strengthening governments' ability to disrupt illicit trade in WMD materials and their delivery systems.'[129]

7.111 The AMP CISFT argued that long-lived nuclear waste also poses a challenge for the non-proliferation regime because of the time frames in which the waste must be isolated and managed. It was argued that the life span of the waste from nuclear reactors means that non-proliferation measures need to consider not just the current geopolitical situation but also the situation over the next 200 or more years:

> You might set up a framework which works within the current view of the world, but you actually need something which can transcend that, given the changes that can occur in the political arena.[130]

7.112 Similarly, the MAPW (Victorian Branch) insisted that the long time frames required for some radioactive material to decay was a sufficient reason for Australia to cease uranium exports:

> Even if Australia makes decisions today about the likely compliance or the documented compliance of countries with their safeguards obligations, either multilateral or bilateral, even if Australia makes assessments now about the weapons interests or aspirations of countries to which it may export nuclear materials, those assessments may be valid this year or even next year, but they are not valid in 10 years time, in 50 years time, in 100 years time, in 1,000 years time, in a couple of hundred thousand years time. You are talking about materials whose physical inherent nature involves time frames of hundreds of thousands of years of toxicity.[131]

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128 *ibid.*, pp.1–2.

129 *ibid.*, p. 2.

130 Dr Ian Woods, *op. cit.*, p. 30.

131 Associate Professor Tilman Ruff, *op. cit.*, p. 25.

7.113 In terms of other challenges to the non-proliferation regime, the Director General of the IAEA has spoken of three post-cold war developments that have altered the nuclear security landscape: the emergence of clandestine nuclear supply networks; the spread of fuel cycle technologies; and renewed efforts by a few countries and some terrorist groups to acquire nuclear weapons. These developments are said to have highlighted several vulnerabilities in the non-proliferation regime, including the limitations on the IAEA's verification authority, control of proliferation-sensitive technologies, and the IAEA's technical capability to detect undeclared nuclear activities.[132]

## Proposals to strengthen the non-proliferation regime

7.114 Evidence was presented which contained proposals to address two of the key challenges noted in the preceding section—controlling the further spread of proliferation sensitive technologies and enhancing the effectiveness of the nuclear verification regime.

### Controlling proliferation-sensitive technology

7.115 As noted at the beginning of the chapter, the importance of ensuring effective control over the proliferation-sensitive technologies of uranium enrichment and reprocessing, including limiting their spread, has long been recognised. In light of recent developments, notably the withdrawal of North Korea from the NPT and the Iranian situation, the need to limit the spread of sensitive technology is assuming increased urgency.

7.116 The NPT itself does not directly address this issue, other than through the commitments undertaken by NNWS not to seek nuclear weapons, not to divert nuclear energy from peaceful uses to nuclear weapons, and to accept IAEA safeguards to verify fulfilment of these commitments. ASNO explained that when the NPT was concluded it was expected that development of enrichment and reprocessing would be too complex and too expensive to be practicable for most countries. Instead, it was anticipated that the existing technology holders, principally the NWS, would provide fuel cycle services to other states. This is essentially what has occurred, with the world's reactors fuelled by enrichment services provided by the US, UK, France and Russia, together with Germany and

132 Dr Mohamed ElBaradei, *Nuclear Non-Proliferation and Arms Control: Are We Making progress?*, *loc. cit*.

the Netherlands. Reprocessing services are provided by the UK and France.[133]

7.117 The main international barrier to the spread of enrichment and reprocessing technologies has been the guidelines on sensitive technology transfers established through the NSG. However, the development of indigenous technology by some countries, and especially the emergence of a black market based on stolen enrichment technology, demonstrate the need for additional measures.

7.118 The issue has been highlighted by the situation of Iran, which claims it needs to develop enrichment to ensure security of supply of nuclear fuel. ASNO commented that Iran's argument about its 'right' to develop the full fuel cycle should be seen against the following facts:

- Iran does not actually have a nuclear power program—it has only one power reactor under construction;
- Russia, which is building the reactor in question, has undertaken to supply fuel for 30 years; and
- Iran has developed its enrichment program, and undertaken other nuclear activities, in secret over a period of some 20 years. This contravenes its IAEA safeguards agreement and the NPT, both of which require all nuclear activities and nuclear material to be placed under IAEA safeguards. As noted above, the IAEA Board of Governors has determined that Iran is in non-compliance with its safeguards agreement.[134]

7.119 ASNO submitted that what is needed is a framework for international cooperation, under which states can be assured of access to nuclear fuel and reactors on reasonable and non-discriminatory terms in exchange for eschewing national development of proliferation-sensitive technologies. It was proposed that such a framework could include a combination of measures along the following lines:

- criteria for assessing the international acceptability of proposed sensitive projects—e.g. the non-proliferation/safeguards credentials of the country concerned; whether there is a clear economic/energy rationale for the project; whether the country is located in a region of tension, and so on;
- a more rigorous safeguards regime for countries with sensitive facilities;

133 The Hon Alexander Downer MP, *Submission no. 33.2*, p. 2.

134 *ibid.*, p. 3.

- internationally guaranteed supply assurances to ensure reliable access to reactor fuel for countries that forgo national enrichment and reprocessing capabilities; and
- possibly, establishment and operation of sensitive facilities on a multination basis.[135]

7.120 In 2004 the IAEA commissioned a study by a group of international experts on possible multilateral approaches to address concerns over the dissemination of proliferation-sensitive technologies. The study covered the interwoven issues of 'assurances of supply' and 'restraints for use' together with the concept of 'multinational fuel cycle facilities'. The study drew extensively from a similar international review coordinated by the IAEA in the 1970s and early 1980s—the International Nuclear Fuel Cycle Evaluation (INFCE).

7.121 The report by the expert group, *Multilateral Approaches to the Nuclear Fuel Cycle*, outlined five multilateral nuclear approaches (MNAs) which could be gradually introduced to strengthen controls over enrichment, reprocessing, spent fuel repositories and spent fuel storage. It was concluded that these approaches would achieve the objective of increasing non-proliferation assurances associated with the civilian nuclear fuel cycle, while preserving assurances of supply and services:

- reinforce existing commercial market mechanisms on a case-by-case basis through long-term contracts and transparent suppliers' arrangements with government backing. Examples would be: fuel leasing and fuel take-back, commercial offers to store and dispose of spent fuel and commercial fuel banks;
- develop and implement international supply guarantees with IAEA participation, notably with the IAEA as guarantor of service supplies, e.g. as administrator of a fuel bank;
- promote voluntary conversion of existing facilities to multilateral control, and pursue them as confidence-building measures, with the participation of NPT NNWS and NWS, and non-NPT states;
- create, through voluntary agreements and contracts, multinational, and in particular regional, MNAs for new facilities based on joint ownership, drawing rights or co-management for front-end and back-end nuclear facilities, such as uranium enrichment, fuel reprocessing, disposal and storage of spent fuel; and
- the scenario of a further expansion of nuclear energy around the world might call for the development of a nuclear fuel cycle with stronger

135 *ibid*.

> multilateral arrangements—by region or by continent—and for broader cooperation, involving the IAEA and the international community.[136]

7.122 Mr Lance Joseph, who was a member of the independent expert group that prepared the report, felt that the group was most positive about the more modest proposal—that the IAEA could take on additional multilateral functions, including by becoming a multilateral guarantor of supply of nuclear material and services.[137]

7.123 It was noted however that negotiating such an arrangement would not be easy and nor would the existence of such multilateral alternatives necessarily stop committed proliferators, or countries wishing to acquire their own capacity:

> Still, for a large body of states, a satisfactory multilateral option for guaranteeing reliable and adequate supplies of fuel and services might well prove preferable to an independent, but more problematic alternative.[138]

7.124 It was argued that Australia should perform a 'catalytic role' on behalf of the IAEA-as-guarantor idea because, firstly, Australia is said to have the requisite non-proliferation credentials as well as respect and credibility within the IAEA, but also for reasons of national self-interest:

> … Australia, anxious to boost uranium sales but still constrained by political concerns not to fuel the proliferation threat, must surely have a vested interest in any initiative designed to limit the spread of dangerous technologies. Viewed in the proper light, an active role in encouraging further examination of the proposal might be seen as an opportunity rather than as a burden, with the prospect for an outcome that could measurably advance the non-proliferation cause.[139]

7.125 ASNO responded that although Australia is a major supplier of uranium, the nation is not well placed to take on a catalytic role because the issue of supply guarantees relates much more to enrichment services, and also to fuel fabrication services, than to uranium supply. That is, while uranium is, or could be, supplied by many countries, enrichment is supplied by a relative handful.[140]

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136 IAEA, *Multilateral Approaches to the Nuclear Fuel Cycle* (INFCIRC/640), IAEA, Vienna, 2005, p. 15, viewed 16 January 2006, <http://www.iaea.org/Publications/Documents/Infcircs/2005/infcirc640.pdf>. Emphasis in original.

137 Mr Lance Joseph, *op. cit.*, p. 3.

138 *ibid*.

139 *ibid*.

140 The Hon Alexander Downer MP, *Submission no. 33.2*, p. 5.

7.126 Since the expert group on multilateral approaches reported in February 2005, the Director General of the IAEA has proposed that the move towards multinational arrangements for enrichment and plutonium separation should progress as a series of four measures:

- provide assurance of supply of reactor technology and nuclear fuel for all bona fide users for peaceful civilian applications;
- accept a time-limited moratorium (of perhaps 5–10 years) on new uranium enrichment and plutonium separation facilities—at the very least for countries that do not currently have such technologies;
- establish a framework for multilateral management and control of the back end of the fuel cycle (i.e. spent fuel reprocessing and waste disposal); and
- create a similar framework for multilateral management and control of the front end of the fuel cycle (i.e. enrichment and fuel production).[141]

7.127 The G8, the NSG as well as various governments are now considering multi-nation arrangements to limit the spread of proliferation-sensitive technologies. The Director General of the IAEA has noted that progress is already being made on the first measure—nuclear fuel supply guarantees for those countries willing to foreswear developing enrichment and reprocessing technologies. It is hoped that assurance of supply will remove the incentive and the justification for each country to develop its own complete fuel cycle. Two ideas are currently under development:

- the IAEA is developing a concept where the Agency would have available reserves of nuclear material in cooperating countries which it could release for supply to qualifying countries; and
- the US has announced a proposal to reserve an initial 17.4 metric tons of its surplus weapons-program HEU for downblending and use as civil reactor fuel, to be available to countries that forswear the development of enrichment and reprocessing.[142]

7.128 Russia has also indicated that it will make fuel available to the IAEA to be used as part of an Agency fuel bank.[143] In September 2006 the IAEA will host a conference to further examine frameworks for assurances of supply.[144]

141 Dr Mohamed ElBaradei, *Nuclear Non-Proliferation and Arms Control: Are We Making Progress?*, *loc. cit*.

142 The Hon Alexander Downer MP, *Submission no. 33.2*, p. 5.

143 See for example: Dr Mohamed ElBaradei, *Putting Teeth in the Nuclear Non-Proliferation and Disarmament Regime*, Statement by the IAEA Director General, 25 March 2006, viewed 8 August 2006, <http://www.iaea.org/NewsCenter/Statements/2006/ebsp2006n004.html>.

144 See: IAEA, *Special Event in September: Assurances of Nuclear Supply and Non-Proliferation*, viewed 8 August 2006, <http://www.iaea.org/NewsCenter/News/2006/assurancesofsupply.html>.

7.129 Mr Jerry Grandey, Chief Executive Officer of Cameco, suggested that as part of the current discussion of multilateral proposals, Australia (along with Canada) could play a role in assurance of supply of fuel for those countries that agree to forego development of weapons.[145]

7.130 ASNO noted that while multilateral approaches are unlikely to dissuade a country intent on developing fuel cycle technology for military purposes, the proposals will at least:

> … expose the real reasons for a country's actions. If a country insists on proceeding with indigenous enrichment or reprocessing because of concerns about 'energy security', despite being given long term fuel supply guarantees, the international community can draw its own conclusions and act accordingly.[146]

7.131 Nonetheless, as noted above, a key political issue is that some states, particularly Iran and some members of the Non-Aligned Movement (NAM), emphasise the 'right' to develop the full nuclear fuel cycle while ignoring the corresponding duty to comply with NPT and safeguards commitments. Furthermore, a number of NAM members are said to be concerned that limits on the spread of sensitive technology will entrench the 'monopoly' position of existing technology holders. ASNO argued that this overlooks the fact that, far from being monopolistic, the current market for fuel cycle services is highly competitive and buyers benefit from low prices. In any event, customers can seek to acquire a shareholding in a fuel service provider. Moreover, ASNO argued that, under current circumstances, with established global enrichment and reprocessing capacities exceeding demand, the development of indigenous enrichment/reprocessing is not economic, except possibly in the case of countries with very large power programs (e.g. Japan with 55 power reactors). The majority of the world's nuclear power programs are based on external fuel cycle service providers.[147]

7.132 ASNO observed that developing the framework described above is a difficult objective to pursue because of widely competing national interests. In particular, the proposal of multi-nation operation of sensitive facilities has been considered in the past without particular progress and that: 'Further advances seem unlikely in the short term.'[148]

7.133 FOE were sceptical of the potential of multi-nation control of proliferation-sensitive technologies because it claimed that while these initiatives may reduce the risk of horizontal proliferation, the potential for diversion of

145 Mr Jerry Grandey (Cameco Corporation), *Transcript of Evidence*, 11 August 2005, p. 12.

146 The Hon Alexander Downer MP, *Submission no. 33.2*, p. 4.

147 *ibid*.

148 The Hon Alexander Downer MP, *Submission no. 33*, p. 3.

materials by customer countries could not be eliminated. FOE also noted that such proposals are likely to face 'insurmountable opposition' in practice.[149]

7.134 Professor Broinowski recommended that Australia work with like minded countries to develop a new non-proliferation Treaty, including abolishing the right of countries to access sensitive technologies under the NPT. Professor Broinowski also supported proposals for the IAEA to lease fuel for countries with nuclear power, thereby obviating the need for yet more countries to develop domestic enrichment technology.[150]

7.135 However, Mr Joseph observed that amending the NPT has been considered and is thought to be highly problematic:

> … any careful balancing of the divergent interests in the NPT suggests that any attempt to renegotiate the Treaty or reinterpret the Treaty—especially if directed explicitly at curtailing nuclear access even for peaceful purposes—would be a fraught exercise. Therefore, a more pragmatic approach to amending or reinterpreting the Treaty is needed.

7.136 It is for this reason, Mr Joseph stated, that multilateral approaches to control over proliferation-sensitive technologies are being pursued.

## Improving the effectiveness of the verification regime

7.137 ASNO explained that strengthening safeguards, particularly to detect undeclared nuclear activities, involves technical and political aspects. At the technical level is the need to improve detection methods, and at the political level there is the need to extend the IAEA's authority to require information and physical access through universalisation of the AP. Another important technical goal is the development of proliferation-resistant technologies, which are considered separately below.[151]

7.138 Central to the effort to strengthen safeguards is the effective use of information—involving collection and analysis of information that can enhance the IAEA's knowledge and understanding of nuclear programs—and providing more extensive rights of access to nuclear and nuclear-related locations, including for the resolution of questions arising from information analysis. Major areas of safeguards development include:

- detection methods for undeclared activities—including environmental sampling/analysis, satellite imagery and new sensing technologies;

149 FOE, *Submission no. 52*, p. 19.

150 Professor Richard Broinowski, *Transcript of Evidence*, 16 September 2005, pp. 23, 24.

151 The Hon Alexander Downer MP, *Submission no. 33.2*, p. 6.

- safeguards procedures—particularly greater use of unpredictability in inspections (e.g. through unannounced or short-notice inspections); and
- the state-level approach—tailoring safeguards implementation to state specific circumstances—moving from the uniform approach taken by safeguards in the past, and basing safeguards intensity on expert judgment taking account of all relevant circumstances.[152]

7.139 ASNO explained that the IAEA's verification authority is defined principally by the safeguards agreement between the IAEA and each country, and the IAEA's own Statute. The principal limitation in safeguards agreements relates to rights of access for IAEA inspectors. Under 'traditional' safeguards, access for routine inspections is limited to 'strategic points' at facilities. This limitation was exploited by Iraq, which was able to conduct undeclared activities at safeguarded sites, at locations which inspectors were not entitled to access. This limitation is largely addressed by the AP, which, as noted above, introduces the concept of 'complementary access', substantially extending the locations to which inspectors are able to go.[153]

7.140 However, the Director General of the IAEA, along with ASNO, has stated that adoption of APs has been disappointing and still falls well short of universal application. Dr ElBaradei has argued that:

> The Agency's verification efforts will not be judged fully 'effective' on a global scale as long as its access rights remain uneven. The additional protocol must become the universal standard for verifying nuclear non-proliferation commitments.[154]

7.141 To address situations where proliferation concerns have created a 'confidence deficit', such as in Iran, the Director General has proposed that additional 'transparency measures' be required of such countries, beyond those contained in safeguards agreements and the AP, to enable the IAEA to provide the required assurance about the peaceful nature of a country's nuclear program.[155]

7.142 Another form of limitation, receiving international attention at the moment, concerns the IAEA's verification rights with respect to 'weaponisation' activities. Current safeguards agreements are expressed in terms of verification of nuclear material. Certain weaponisation activities do not involve nuclear material, and are 'dual-use' in nature, i.e. are not irrefutably limited to nuclear applications. Examples include experiments

152 *ibid*.

153 *ibid*., pp. 7–8.

154 Dr Mohamed ElBaradei, *Nuclear Non-Proliferation and Arms Control: Are We Making Progress?*, *loc. cit.*

155 *ibid*.

with high-explosive lenses, acquisition of particular types of high-energy electrical circuits, and certain types of high-speed cameras. Also there are certain non-nuclear materials, such as beryllium, polonium and tritium, which may evidence nuclear weapon intent but also could have other explanations.[156]

7.143 ASNO explained that the conventional view is that for the IAEA to have a right of access to investigate such activities there must be a clear nexus with nuclear material. For example, high-explosive testing with a uranium target would be a sufficient nexus, whereas high explosive testing with a target of non-nuclear material might not be.

7.144 ASNO advised that this issue requires more deliberation by governments and the IAEA itself. However, Australia is active in pursuing analysis and debate on these issues by governments and the IAEA, with the object of further strengthening the non-proliferation regime.[157]

7.145 The Director General of the IAEA has explained that another key to making verification activities effective is the availability of sufficient resources. As noted in the discussion of limitations of the non-proliferation regime, the IAEA states that its verification activities are operating with a 'bare minimum' of funding. The IAEA is also facing recruitment challenges and recognises that it must remain in the market for innovative technologies for use in its verification program.[158]

7.146 In addition to achieving greater control over proliferation-sensitive technology and enhancing the effectiveness of nuclear verification, in recent statements the Director General of the IAEA has also proposed a further three measures to address the vulnerabilities described in the preceding section and to strengthen the non-proliferation regime: accelerate global efforts to protect nuclear material; reinvigorate disarmament efforts; and increase the effectiveness of the UN Security Council.[159]

## Proliferation resistant technologies

7.147 In addition to the institutional and technical proposals to strengthen the non-proliferation regime described above, a number of other technical measures are also under consideration, specifically, the development of proliferation-resistant technologies. Proliferation resistance refers to

156 The Hon Alexander Downer MP, *Submission no. 33.2*, p. 8.

157 *ibid*., p. 8.

158 Dr Mohamed ElBaradei, *Nuclear Non-Proliferation: Responding to a Changing Landscape*, *loc. cit*.

159 See for example: Dr Mohamed ElBaradei, *Putting Teeth in the Nuclear Non-Proliferation and Disarmament Regime*, *loc. cit*.; Dr Mohamed ElBaradei, *Nuclear Non-Proliferation: Responding to a Changing Landscape*, *loc. cit*.

characteristics of a nuclear energy system that impedes the diversion or undeclared production of nuclear material, or misuse of technology, to acquire nuclear weapons or other nuclear explosive devices.[160] These technologies include the development of a nuclear fuel cycle that does not require enrichment and currently-established reprocessing technologies, and the development of reactor types that incorporate proliferation resistance into the reactor design.[161] These technological developments are considered in the following sections.

## Advanced Fuel Cycle Initiative and Generation IV reactors

7.148 ANSTO submitted that the next series of nuclear power reactors, called Generation IV, are being designed to be proliferation-resistant through improvements in the fuel cycle (Advanced Fuel Cycle Initiative), to better integrate waste management issues and to enhance physical protection. Work on such designs is underway through the Generation IV International Forum (GIF), with the input of IAEA member states through the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO).[162]

7.149 ANSTO and ASNO explained that achieving sustainable growth of nuclear energy will require a transition from the current once-through fuel cycle to an advanced fuel cycle that recycles nuclear materials. Recycling plutonium offers significant advantages for efficient uranium utilisation (it could extend world uranium resources by a factor of about 60) and waste management. One such fuel cycle is the so-called fast neutron fuel cycle, the basis of which is the use of fast (unmoderated) neutrons to convert the predominant uranium isotope U-238 to plutonium, and the use of that plutonium as reactor fuel.[163]

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160 ANSTO, *Submission no. 29*, p. 19.

161 See for example: Dr Mohamed ElBaradei, *Nuclear Technology in a Changing World: Have We Reached a Turning Point?*, Statements of the Director General, Address at the Massachusetts Institute of Technology, 3 November 2005, IAEA, viewed 9 December 2005, <http://www.iaea.org/NewsCenter/Statements/2005/ebsp2005n016.html>.

162 ANSTO, *op. cit.*, p. 18. Three generations of reactors have existed from the 1940s to the present. Generation I consisted of early prototype reactors of the 1950s and 1960s and none are now operating outside the UK. Generation II systems, patterned after Generation I reactors, began operation in the 1970s and comprise most of the large commercial power plants currently operating in the US and elsewhere. Generation III systems are Advanced Reactors and were developed in the 1980s. These include a number of evolutionary designs that offer significant advances in safety and economics. A number of Generation III systems have been built, primarily in East Asia. Generation IV systems are still being designed and are not expected to be operational before 2020 at the earliest. See: UIC, *Advanced Nuclear Power Reactors*, Nuclear Issues Briefing Paper 16, December 2005, viewed 9 August 2006, <http://www.uic.com.au/nip16.htm>.

163 *ibid.*; ASNO, *Exhibit no. 93*, p. 6.

7.150 The Advanced Fuel Cycle Initiative (AFCI) is a US R&D program, the mission of which is:

> To develop proliferation resistant spent nuclear fuel treatment and transmutation technologies in order to enable a transition from the current once-through nuclear fuel cycle to a future sustainable, proliferation-resistant closed nuclear fuel cycle.[164]

7.151 AFCI aims to develop a fuel cycle that does not produce plutonium which could be diverted for weapons, to reduce the inventory of civilian plutonium and to reduce the heat and toxicity of waste. It is intended that these technologies will be deployed to support current nuclear power plants and, eventually, Generation IV systems. A spent fuel separation process is being pursued under ACFI that would extract a mixture of plutonium and neptunium that would be unusable for weapons purposes from Generation IV spent fuel.[165]

7.152 Among the goals of the GIF, which involves a group of 10 countries and Euratom (China and Russia have also recently been admitted), are the development of reactor designs which are proliferation resistant. The GIF have selected six reactor technologies for further development which they believe represent the future shape of nuclear energy. Dr Ian Smith, Executive Director of ANSTO, explained that these reactors, which are expected to be deployed around 2030, will require refuelling every 20 or more years, thereby greatly reducing access to nuclear material.[166]

7.153 For financial year 2005, the US Government has appropriated US$79.2 million and $54.5 million to ACFI and Generation IV respectively. The request for financial year 2007 was $243 million for ACFI and $31.4 for Generation IV.[167]

7.154 MAPW argued that the new reactor technologies will increase rather than reduce plutonium hazard and proliferation risks, because Generation III reactors use mixed oxide fuel (MOX) (fuel that mixes uranium dioxide and plutonium dioxide) and fast breeder reactors (FBRs) will essentially operate on plutonium:

> What both of those do is increase the amount, the transport, the handling and the number of facilities that handle very large quantities of plutonium. We are not talking kilogram quantities

164 ANSTO, *Exhibit no. 74, Presentation by Dr Ron Cameron and Dr Ian Smith,* slide 57.

165 ANSTO, *Submission no. 29*, p. 20.

166 Dr Ian Smith (ANSTO), *Transcript of Evidence*, 13 October 2005, p. 13.

167 See: US Department of Energy (DOE), *Advanced Fuel Cycle Initiative*, Program Overview, January 2006, viewed 9 August 2006, <http://nuclear.gov/infosheets/afci.pdf>; DOE, *Generation IV Nuclear Energy Systems Initiative*, Program Overview, January 2006, <http://nuclear.gov/infosheets/geniv.pdf>.

> here, we are talking tonnes, and plutonium that is highly suited for use in weapons. The potential direction of reactor technology in terms of generation III and IV reactors would take us much further in a dangerous direction from a plutonium hazard and proliferation point of view.[168]

7.155 FBRs are one type of fast neutron reactor (FNR), which deliberately use the U-238 as well as the fissile U-235 isotope to generate energy. If FNRs are designed to produce more plutonium than they consume, they are called FBRs, or 'breeders', and if they are net consumers of plutonium they are called 'burners'.

7.156 To date, the plutonium separated from reprocessing spent reactor fuel has been recycled to make MOX for use in conventional light water reactors (LWRs). FBRs, such as the Phenix reactor in France and the Monju reactor in Japan, have also used MOX fuel, but with a relatively high proportion of plutonium, surrounded by a blanket of depleted uranium (thus providing a use for the millions of tonnes of tails left after the uranium enrichment process, which are currently treated as waste) to produce further plutonium. However, the plutonium produced in FBRs has a very high proportion of Pu-239 and is thus suitable for weapons. Moreover, the blanket material needs to be reprocessed to separate the plutonium, and these factors present proliferation concerns, as noted by MAPW.[169]

7.157 However, ASNO argued that attention is now being given to FNR concepts, such as the Russian BREST reactor and the US General Electric Super-PRISM reactor, in which spent fuel undergoes simplified reprocessing which avoids plutonium separation.[170] Of the six Generation IV technologies selected for further R&D by GIF, three are FNRs and a fourth may be constructed as a fast reactor.[171]

7.158 In the case of the BREST reactor, plutonium with an isotopic composition suitable for weapons is never produced. Reprocessing and fuel fabrication would also take place at the power plant site, eliminating any physical protection issues associated with long-distance shipments of fuel. The concept also offers major advantages for waste management with fission products and actinides recycled for transmutation, substantially reducing the period of radiotoxicity—the resulting high level waste would decay to

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168 Associate Professor Tilman Ruff (MAPW), *Transcript of Evidence*, 19 August 2005, p. 32.

169 ASNO, *Exhibit no. 93, op. cit.*, p. 6.

170 *ibid.*, pp. 10, 11.

171 UIC, *Fast Neutron Reactors*, Briefing Paper No. 98, June 2006, viewed 9 August 2006, <http://www.uic.com.au/nip98.htm>.

levels comparable with natural uranium within 200 years.[172] In the case of the Super-PRISM reactor concept, on-site processing of the spent fuel is also a design option.

7.159 Thus, ASNO argued that while the increasing use of plutonium fuels and the development of a plutonium breeding cycle could present a substantial challenge to non-proliferation objectives, if concepts such as those mentioned above are established then uranium enrichment and current reprocessing technology will be phased out. If developed in an appropriate way, 'plutonium recycle could actually bring major non-proliferation advantages.'[173]

7.160 The Committee also received some evidence concerning other reactor designs, some of which are now being tested in Japan and China, which offer non-proliferation advantages. These so-called Advanced Reactor types include the modular high temperature gas-cooled reactors (MHTGCRs), of which the South African Pebble Bed Modular Reactor (PBMR) and the General Atomics (GA) Gas Turbine-Modular Helium Reactor (GT-MHR) are at an advanced stage of development. Professor Leslie Kemeny noted that the spent fuel from these reactors is highly proliferation-resistant.[174]

7.161 GA noted that the MHR can use diverse fuels, including LEU, spent fuel from conventional LWRs, weapons-grade plutonium (so the reactor can consume plutonium from weapons programs), and also utilise thorium-based fuels. Furthermore, the properties of the MHR and its fuel (which is in the form of particles less than a millimetre in diameter known as 'TRISO' fuel) allows for a so-called 'deep burn', which enables a more efficient approach to fuel utilisation and waste disposition. The MHR is able to burn all of the transuranic actinides from conventional LWR spent fuel, without requiring separation of the plutonium. The plutonium and

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172 Actinides are an element with atomic number of 89 (actinium) to 102. Usually applied to those above uranium - 93 up (also called transuranics). Actinides are radioactive and typically have long half-lives. They are therefore significant in wastes arising from nuclear fission, e.g. used fuel. They are fissionable in a fast reactor. Fission products are daughter nuclei resulting either from the fission of heavy elements such as uranium, or the radioactive decay of those primary daughters. These include caesium, iodine, strontium and xenon. Usually highly radioactive. See: World Nuclear Association (WNA), *Glossary*, WNA, London, December 2005, viewed 10 August 2006, <http://www.world-nuclear.org/info/inf51.htm#d>.

173 ASNO, *Exhibit no. 93, op. cit.*, p 11.

174 Professor Leslie Kemeny, *Exhibit no. 42, Emerging Nuclear Energy Systems – A One Hundred Year Perspective*, p. 5; Professor Leslie Kemeny, *Exhibit no. 38, Stochastic Techniques for the Control and Surveillance of a Modular Pebble Bed Reactor, p. 1.* See also: M LaBar, *The Gas Turbine-Modular Helium Reactor: A Promising Option for Near Term Deployment*, GA, San Diego, 2002, p. 8, viewed 30 August 2006, <http://gt-mhr.ga.com/summary_all.html>.

transuranics are destroyed in the deep burn MHR. This reduces the volume of residual waste requiring disposal in repositories.[175]

## The Global Nuclear Energy Partnership

7.162 In February 2006 the US Government announced a Global Nuclear Energy Partnership (GNEP) initiative which seeks to develop a worldwide consensus on enabling expanded use of nuclear energy through the deployment of a fuel cycle that enhances energy security, while promoting non-proliferation.[176]

7.163 As currently proposed, GNEP has the following key features:

- 'Fuel supplier nations' would undertake to supply 'user nations' with reactors, and to supply nuclear fuel on a 'cradle-to-grave' basis. This would include spent fuel take-back—users could return spent fuel to the fuel supplier, who would recycle the fuel and treat the eventual high level waste (HLW). HLW is most likely to be returned to the user, but because of the reduced isolation period HLW will be easier to manage than currently—instead of deep geologic disposal, above-ground storage and eventual shallow burial could be satisfactory.
- User nations, in return for these supply commitments, would undertake not to develop enrichment or reprocessing. The initiative envisages users will operate conventional LWRs, will lease LEU fuel from suppliers, and return the spent fuel to suppliers.
- Fuel supplier nations would operate FNRs and advanced spent fuel separation, in order to recycle plutonium and transmute longer-lived radioactive materials formed in spent fuel to shorter-lived elements. Advanced spent fuel separation differs from current reprocessing in that plutonium is not fully separated, but remains mixed with uranium and highly radioactive materials. Transmuting the longer-lived materials reduces the period HLW has to be isolated from the environment, from some 10,000 years to 300-500 years.[177]

7.164 In essence, GNEP envisages that those countries with advanced nuclear capabilities (the five NWS plus Japan) will provide fuel services (supply and recovery of used fuel) to other nations who agree to use nuclear energy for power generation purposes only and to forego uranium

175 GA, *Exhibit no. 80, Sustainable Long Term Nuclear Power: Destruction of Nuclear Waste and Recycle of Resources for the long run using MHR Deep Burn Technology and Fusion*, slide 25; ASNO, *Exhibit no. 93, op. cit.*, p. 5. See also: GA, *GT-MHR Plant Description*, viewed 11 August 2006, <http://gt-mhr.ga.com/1simpl_all.html>.

176 See: DOE, *The Global Nuclear Energy Partnership*, p. 1, viewed 10 August 2006, <http://www.gnep.energy.gov/>.

177 ASNO, *Exhibit no. 93, op. cit.*, p. 2.

enrichment and reprocessing activities. The supplier nations will fabricate and lease fuel for conventional reactors, with the used fuel being returned to the supplier countries and reprocessed to recover uranium and actinides, leaving only fission products as high-level waste. The actinide mix is then burned in on-site fast reactors known as advanced burner reactors (ABRs), or 'plutonium burning reactors', which consume plutonium and other long-lived radioactive material.[178]

7.165 The UIC reports that the two significant new technical elements in GNEP are new reprocessing technologies which separate all transuranic elements together (and not plutonium on its own), starting with a laboratory–proven reprocessing technology known as 'UREX+' and eventually moving to a pyroelectrolytic process, and the development of ABRs which can consume the resulting plutonium/uranium and actinide mix and do not produce weapons useable plutonium.[179]

7.166 In addition, GNEP will support an expanded program to design and deploy small scale nuclear reactors that are suited to conditions in developing nations, and will also seek to incorporate advanced safeguards approaches into the planning and building of power plants and fuel cycle facilities.[180]

7.167 ASNO explained that GNEP seeks to bring together in a coherent program several technical proposals which have been under development in several countries over a number of decades. In addition to addressing proliferation concerns and allowing for greater utilisation of uranium resources, the initiative also promises to reduce the quantity of HLW, thus reducing storage requirements by up to 90 percent. Moreover, the isolation period for the HLW will be significantly shortened.[181]

7.168 It was submitted that GNEP will benefit non-proliferation objectives by limiting the spread of enrichment and reprocessing, reducing the holdings of plutonium-bearing spent fuel and it would enable the use of plutonium

178 UIC, *Fast Neutron Reactors, loc. cit.*

179 Transuranic elements are very heavy elements formed artificially by neutron capture and possibly subsequent beta decay(s). The have a higher atomic number than uranium (92). All are radioactive. Neptunium, plutonium, americium and curium are the best-known. All commercial reprocessing plants use the PUREX process (Plutonium Uranium Extraction Process) which separates a stream of plutonium and a stream of uranium from the waste stream containing both transuranics and fission products. UREX (Uranium Reduction and Extraction) separates only uranium, then keeps the plutonium with transuranics and separates both from shorter-lived fission products. The UREX+ process separates a mixed uranium-plutonium stream from a transuranic stream and fission product streams. UIC, *Newsletter*, Issue 2, 2006, March/April 2006, p. 2, available online, viewed 10 August 2006, <http://www.uic.com.au/news206.pdf>.

180 DOE, *The Global Nuclear Energy Partnership*, *op. cit.*, p.4.

181 ASNO, *Exhibit no. 93, op. cit.*, p. 1.

fuels without production of separated plutonium. ASNO explained that GNEP is of significance because the US, which has opposed reprocessing since the Carter Administration because of proliferation dangers, now recognises that plutonium recycle offers advantages for efficient uranium utilisation and spent fuel management. It also involves funding (US$150 million for the first year) that will enable the US to take a technological lead and is providing focus and leadership for international collaboration in developing advanced fuel cycle technologies. However, as the project has only recently been launched, it can be expected to evolve over time.[182]

## Australia's contribution to the non-proliferation regime

7.169 ASNO and the UIC described Australia's significant contribution to the development of the non-proliferation regime. For example, in the 1960s Australia participated in the drafting of the IAEA's Statute and, since then, has been continuously represented on its Board of Governors.[183]

7.170 An Inquiry conducted in 1984 by the Australian Science and Technology Council (ASTEC), *Australia's Role in the Nuclear Fuel Cycle*, also found that Australia's voice has been strong in non-proliferation debates and that Australian initiatives have helped to strengthen the regime. It was found that Australia's voice is heeded in part because of the considerable reserves of uranium Australia possesses. ASTEC concluded that through 'active involvement in the nuclear fuel cycle' Australia will be able to 'further advance the cause of nuclear non-proliferation.'[184] However, it was also concluded that:

> …without such involvement … global energy security would be less assured and our ability to strengthen the non-proliferation regime and to influence the future developments in the fuel cycle would be reduced. We do not wish to exaggerate Australia's role in matters related to the nuclear fuel cycle but we are convinced that it is only by active involvement that Australia can expect to be able to influence the future course of events.[185]

7.171 AMEC and the UIC also argued that Australia's position as a major uranium exporter assists the nation to influence the ongoing development of non-proliferation measures and to exert influence in international nuclear issues:

182 *ibid*.

183 UIC, *Submission no. 12*, p. 31.

184 ASTEC, *Australia's Role in the Nuclear Fuel Cycle*, *op. cit*., pp. 135–136.

185 *ibid*., p. 136.

> … with the extent of the world's uranium resources it controls, Australia is uniquely placed to exercise even greater international influence to maintain the safety and security of the nuclear fuel cycle.[186]

7.172 Similarly, ASNO observed that: 'Our position as a major uranium exporter gives us both the responsibility and the standing to pursue these issues effectively'.[187]

7.173 ASNO submitted that Australia is currently playing a major role in efforts to strengthen the non-proliferation regime, including in such bodies as the IAEA Board of Governors and the NSG. Australia is also active in bilateral and regional efforts to strengthen the non-proliferation regime. Examples of the areas where Australia is active include the following:

- Australia chairs the Vienna-based Group of 10 (G-10) countries who are like-minded on the NPT's vital security benefits. The G-10 meets informally prior to each NPT meeting.[188]
- As a member of the NSG, Australia participates in its plenary meetings including the meeting held in June 2005 at which the NSG adopted measures to further strengthen nuclear export controls, including:
  - ⇒ procedures for suspending nuclear transfers to countries that are non-compliant with their safeguards agreements;
  - ⇒ measures to evoke fall-back safeguards if the IAEA can no longer undertake its safeguards mandate in the recipient state; and
  - ⇒ making export controls in the recipient state a criterion of supply.

  The NSG plenary agreed to continue discussions on the AP as a condition of supply and on further strengthening of the NSG guidelines with respect to enrichment and reprocessing technologies.
- Australia pursues diplomatic efforts through the IAEA Board of Governors and through Australia's bilateral/multilateral contacts. Australia's nuclear science program, and its position as a major uranium exporter, gives Australia a permanent seat on the IAEA Board of Governors and substantial influence in international nuclear issues.
- Australia has advocated firm action by the IAEA against safeguards non-compliance. Australia has consistently supported resolutions in the IAEA Board of Governors on Iran's nuclear program and has urged Iran to comply with these resolutions. Australia supported the Board's

186 UIC, *op. cit*., p. 3. See also: AMEC, *loc. cit*; The Hon Alexander Downer MP, *Submission no. 33*, p. 4.

187 The Hon Alexander Downer MP, *Submission no. 33*, p. 3.

188 The G-10 countries are Australia, Austria, Canada, Denmark, Hungary, Ireland, the Netherlands, New Zealand, Norway and Sweden.

4 February 2006 resolution reporting Iran's safeguards non-compliance to the UN Security Council.

- Australia is working to strengthen verification of NPT non-proliferation commitments. Australia strongly supported establishment of the IAEA Board's safeguards and verification committee and is participating actively in its work. ASNO's Director General, Mr John Carlson, chairs the IAEA Standing Advisory Group on Safeguards Implementation (SAGSI). SAGSI is at the forefront in developing new safeguards approaches and methods.
- Australia is working to secure wider application of the IAEA safeguards strengthening AP, consistent with the prominent role Australia played in development of the IAEA's strengthened safeguards system. Australia is working with the IAEA and other countries to increase the number of APs in force, in particular through outreach and assistance to states in the region. As noted, Australia was the first country to sign and ratify an AP (in 1997) and in 2005 Minister Downer announced that Australia will make the AP a pre-condition for the supply of uranium to NNWS.
- Australia provides technical support to the IAEA through trialling of new safeguards approaches and methods in Australia, through a formal Safeguards Support Program covering safeguards R&D projects, and through making analytical and other capabilities of ANSTO available to the IAEA.
- Australia is a strong advocate of the CPPNM and was an active contributor in negotiations on amendments to the CPPNM to extend its application. Australia chaired the main committee at the July 2005 diplomatic conference to amend the CPPNM. Australia is increasing its efforts to encourage countries in the region to accede to the amended CPPNM.
- On 26 July 2005 Mr Downer joined with the Foreign Ministers of Chile, Indonesia, Norway, Romania, South Africa and the United Kingdom in issuing a joint declaration on nuclear non-proliferation and disarmament. The aim of this initiative was to stimulate a strong outcome on these issues at the UN Summit in September 2005. Australia chaired the consultations on the non-proliferation and disarmament component of the 2005 UN Summit draft outcomes document. Regrettably, the Summit was unable to reach agreement on these issues. However, the seven country group is considering possible further initiatives on these issues.
- Australia continues to work for the CTBT's entry into force. In September 2005, Mr Downer chaired a conference of CTBT parties on

ways to accelerate the Treaty's entry into force. As the current coordinator of CTBT parties' efforts to promote entry into force, Australia has a special role in urging countries in our region and elsewhere to ratify the CTBT as soon as possible. Australia welcomed Vietnam's recent ratification of the CTBT.

- Australia is making a significant contribution to the establishment of the CTBT's International Monitoring System (IMS) to verify that CTBT parties comply with their commitments. In addition to the 21 IMS facilities Australia will host, Australia contributes to the work of the CTBT PrepCom on development of the IMS. An Australian is currently Task Leader for the elaboration of the CTBT On-Site Inspection Operational Manual.
- At the 2005 UN General Assembly First Committee Australia supported key nuclear non-proliferation and disarmament related resolutions. In particular, Australia worked closely with Japan on its nuclear disarmament resolution and was an original sponsor of this resolution. Other nuclear related resolutions supported by Australia included those on the CTBT and on the negotiation of a Fissile Material Cut-off Treaty (FMCT) to end the production of fissile material for nuclear weapons.
- Australia is currently undertaking a three-year regional program to increase engagement with regional countries on WMD counter-proliferation. This program tailors practical assistance to local needs, including advice on the development of export control legislation and control lists, the conduct of industry outreach and licensing and enforcement training for officials.
- Australia continues to strongly support the PSI. A priority for Australia, and for other PSI participants, is to maintain and refine capabilities for interdicting WMD-related trade. Australia hosted its second multi-nation PSI exercise in Darwin in April 2006 focusing on air/ground interdiction. Australia hosted the first ever PSI exercise in 2003 and has also hosted two major PSI meetings.[189]

189 The Hon Alexander Downer MP, *Submission no. 33.4*, pp. 2–4; The Hon Alexander Downer MP, *Submission no. 33.2*, p. 7.

## Conclusions

7.174 The Committee concludes that the global safeguards regime has indeed been remarkably successful in limiting the proliferation of nuclear weapons. Today, in addition to the five nuclear-armed states that existed prior to the NPT's entry into force in 1970, there are only four states that have or are believed to have nuclear weapons: the three non-NPT parties—Israel, India and Pakistan—and North Korea. This is clearly a tremendous achievement, particularly in light of predictions that by the end of the 20th century there would be some 25 to 30 nuclear armed states.

7.175 The key treaty and institutional elements of the non-proliferation regime have been the NPT and the safeguards measures of the IAEA. The regime has been supported and reinforced by a range of complementary measures, such as multilateral efforts to control the export of sensitive technologies and materials.

7.176 In response to the discovery of a clandestine weapons program in Iraq, which had a comprehensive safeguards agreement in force with the IAEA at the time, a range of safeguards strengthening measures have now been introduced. These measures enable the IAEA to draw conclusions about the absence of *undeclared* nuclear materials and activities in countries, in addition to the assurance provided under traditional safeguards about the non-diversion of *declared* nuclear material and activities. The Committee considers that these measures are clearly a great advance.

7.177 Central to the safeguards strengthening measures has been the adoption by states of an Additional Protocol to their safeguards agreements with the IAEA. APs require states to provide the IAEA with broader information, allow the IAEA wider access rights and enable it to use the most advanced verification technologies. The Committee is pleased to note the Australian Government's strong support for the AP, its prominent role in the AP's formulation and that Australia was the first country to sign and ratify an AP. The Committee also welcomes the Government's decision to make the AP a condition for the supply of uranium to NNWS. The Australian public will now be able to have greater assurance that Australian obligated nuclear material will not be diverted for use in weapons programs.

7.178 However, the Committee is concerned that the uptake of APs remains slow. As of July 2006, only 77 countries had APs in force. The Committee notes with concern the IAEA Director General's comment that the Agency's verification efforts will not be judged fully effective on a global scale as long as its access rights remain uneven. The AP must become the

universal standard for verifying nuclear non-proliferation commitments. The Committee urges the Australian Government to redouble its efforts to encourage adoption APs by other countries.

7.179 A main criticism of nuclear power is that civil and weapons programs are said to be inextricably linked. The reason for this is that two technologies used to produce nuclear reactor fuel—uranium enrichment and plutonium separation (reprocessing of used reactor fuel)—can also be used to produce fissile material for weapons. This fact has long been recognised and is reflected in efforts to limit the spread of these proliferation-sensitive technologies.

7.180 Critics of nuclear power also argue that civil programs have preceded and facilitated development of nuclear weapons in those countries which possess them. However, evidence shows that countries with nuclear weapons developed them *before* they developed nuclear power programs, and in some of the weapon states nuclear power remains insignificant or non-existent.

7.181 Submitters alleged that there are a range of deficiencies and limitations to the NPT/IAEA safeguards regime. While the Committee believes that most of these alleged deficiencies are without substance, it notes that the non-proliferation regime is now facing several challenges. The Committee concurs with the Minister for Foreign Affairs that these challenges must be met so that the public can be confident that an expansion of nuclear power (and of uranium exports) will not represent a risk to international security.

7.182 Among these challenges is the weakening of political support for the non-proliferation regime, evidenced perhaps by the failure of the 2005 NPT Review Conference to agree on any final document. The Committee is concerned that some NNWS apparently perceive the current regime to be discriminatory, arguing that the NNWS are required to keep their non-proliferation commitments while, it is claimed, the NWS do not adhere to their disarmament obligations under the Treaty. A worrying trend seems to have emerged in which some countries focus exclusively on disarmament and nuclear technology acquisition, and use proliferation as a chip to be bargained with, thus neglecting the non-proliferation core of the Treaty.

7.183 This perspective clearly misses a key point—that adherence by all NNWS to nuclear non-proliferation commitments under the NPT is manifestly in the interests of those very same states. The NPT delivers all states vital security benefits. Moreover, the Committee agrees with ASNO that a stable non-proliferation environment and a firm commitment by all NNWS to non-proliferation are likely to be essential conditions for further nuclear disarmament. Furthermore, the Committee believes that that the

very significant reductions in nuclear arsenals in the NWS to date must be acknowledged.

7.184 Another limitation to the IAEA's verification regime, now receiving international attention, relates to so-called 'parallel weaponisation' activities. While current safeguards agreements are expressed in terms of verification of nuclear material, certain weaponisation activities do not involve nuclear material and are dual use in nature. Currently, for the IAEA to investigate such activities, there has to be a clear nexus with nuclear material. The Committee believes that the verification regime must continue to develop so as to provide the IAEA with a right of access sufficient to investigate possible parallel weaponisation activities.

7.185 The Committee notes the expanded responsibility the IAEA now has with APs in force and the range of additional verification activities in which it may engage. The Committee shares submitters' concerns about the adequacy of the resourcing (financial, technological and staffing) for the IAEA's safeguards program. The Committee believes that the value of the assurance provided by the IAEA safeguards program far outweighs its cost and, in view of the likely expansion of nuclear power worldwide, believes that the IAEA must be adequately resourced to meet the increased demands. Notwithstanding the savings that may follow the wider development of integrated safeguards, the Committee urges the Australian Government to keep this matter under close observation and consider advocating within the IAEA for an increased safeguards program budget and increased contributions from IAEA member governments.

7.186 Another key challenge is the problem now presented by Iran, which claims the right to develop the *full* nuclear fuel cycle, ostensibly on the grounds of security of nuclear fuel supply. This raises the possibility that, having made full use of the alleged 'right' to acquire proliferation-sensitive technologies under Article IV of the Treaty, states could then withdraw from the NPT and pursue weapons programs.

7.187 The Committee notes that the claim of a right to pursue proliferation-sensitive technologies may indeed be a serious misreading of the Treaty, which speaks of the right of all parties to use *nuclear energy* for peaceful purposes and that this was never intended to mean development of *any* nuclear technology. It is clear that when the NPT was first negotiated it was envisaged that the NWS would provide these fuel cycle services to the NNWS. Moreover, the Committee notes that the right to use of nuclear energy is subject to the other provisions of the Treaty, notably the corresponding duties to comply with NPT and safeguards commitments—factors that seem to have been ignored by Iran and its supporters.

7.188 Nonetheless, the Committee is pleased to note that this dilemma is receiving considerable attention and that there are a range of proposals now being considered that will increase control over proliferation-sensitive technologies and limit their spread. ASNO has suggested:

- the development of criteria for assessing the international acceptability of proposed sensitive projects (this criteria could include factors such as the non-proliferation credentials of the country concerned, whether there is a clear economic/energy rationale, and whether the country is located in a region of tension);
- a more rigorous safeguards regime for countries with sensitive technologies;
- international guarantees of fuel supply for countries that forgo national enrichment and reprocessing capabilities; and
- possible establishment and operation of sensitive facilities on a multination basis.

7.189 An expert group appointed by the Director General of the IAEA has proposed a series of five multilateral approaches to the nuclear fuel cycle, including international supply guarantees, and multinational/regional operation of new nuclear facilities based on joint ownership, drawing rights or co-management.

7.190 The Committee notes ASNO's observation that Australia would have a limited capacity to take on a 'catalytic role' in forming a group of countries to advocate on behalf of the supply guarantee proposal. This is because supply guarantees relate more to enrichment and fuel fabrication services, rather than uranium supply. However, as ASNO notes, if countries choose to develop enrichment and reprocessing technologies despite being given long-term fuel supply guarantees this could well expose the real reasons for the country's actions. The Committee agrees with Mr Lance Joseph's observation that Australia does have a vested interest in seeing that the spread of proliferation-sensitive technologies remains limited. The Committee supports nuclear fuel supply guarantees for those countries who foreswear the right to develop enrichment and reprocessing technologies.

7.191 In view of the situation presented by Iran and other nations claiming the 'right' under Article IV of the NPT to develop any nuclear technology (including proliferation sensitive technologies), the Committee believes that the NPT should be renegotiated to address this ambiguity. The Committee also concludes that the framework proposed by ASNO and the incremental multilateral approaches proposed by the IAEA should be pursued.

7.192 While the Committee acknowledges that technical measures to prevent proliferation are unlikely to be successful in the absence of political commitment, the Committee is encouraged to note that proliferation-resistant technologies are continuing to be developed. In particular, the Committee was informed about efforts to develop a nuclear fuel cycle that does not require enrichment and currently-established reprocessing technologies (which separate out plutonium that could potentially be diverted for weapons), and the development of reactor types that incorporate proliferation resistance into their designs.

7.193 The Advanced Fuel Cycle Initiative and the Global Nuclear Energy Partnership project will allow for the recycling of plutonium, thereby extending significantly the energy that can be obtained from uranium, but without the dangers of plutonium separation. Furthermore, as noted in the chapter five, GNEP proposes that plutonium and much of the waste will be consumed in reactors deigned to burn this material, thereby reducing significantly the volume and toxicity of waste requiring final disposal. Should these concepts be developed and receive wide acceptance, the challenge to contain enrichment and reprocessing technologies will eventually end.

7.194 Finally, the Committee welcomes the commendable range of efforts the Australian Government is undertaking to advance non-proliferation objectives. As a major uranium exporter and, potentially, as the world's largest uranium producer, Australia has a strong interest in ensuring that the material and technologies required for peaceful use of nuclear energy are not diverted for any military purpose. The following chapter considers the range of bilateral measures undertaken by the Australian government to ensure that such diversion does not occur.

## Recommendation 4

**The Committee recommends that the Minister for Foreign Affairs:**

- **seek, through all relevant fora, to impress on other countries the central importance of the non-proliferation aspects of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the security benefits of the NPT for all countries;**
- **redouble efforts to encourage adoption by other countries of an Additional Protocol to their safeguards agreements with the International Atomic Energy Agency (IAEA);**
- **advocate strengthening the verification regime so that the IAEA is empowered to more thoroughly investigate possible parallel weaponisation activities;**
- **seek the development of criteria for assessing the international acceptability of proposed sensitive projects, particularly in regions of tension, and advocate the development of a more rigorous verification regime for countries that either possess or choose to develop sensitive facilities;**
- **support proposals for nuclear fuel supply guarantees for those countries who waive the right to develop enrichment and reprocessing technologies; and**
- **come to a considered view about the adequacy of the resources currently allocated to the IAEA's safeguards program and, if deemed necessary, advocate within the IAEA Board of Governors for an increased allocation of resources to verification activities and recommend increased contributions from member states.**