AN ILLUSION OF PROTECTION

Full Report

The unavoidable limitations of safeguards on nuclear materials and the export of uranium to China

Australian Conservation Foundation

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Both the Full Report and Executive Summary
An Illusion of Protection
The unavoidable limitations of safeguards on nuclear materials and the export of uranium to China
is available at the ACF and MAPW websites:
www.acfonline.org.au
www.mapw.org.au

A report prepared for the Australian Conservation Foundation and the Medical Association for Prevention of War (Australia) by:

Marko Beljac[1]

Assoc Prof Tilman A Ruff[2]

Prof Jim Falk[3]

Prof Joseph Camilleri[4]

David Noonan[5]

Dimity Hawkins[6]

Dr Jim Green[7]

October 2006

Editing: Dr Cath Keaney
Design: Natalie Lowrey

[1] PhD scholar, Dept of Politics, Monash University

[2] Associate Professor, Nossal Institute for Global Health, University of Melbourne; President, Medical Association for Prevention of War

[3] Director, Australian Centre for Science, Innovation and Society, University of Melbourne

[4] Professor of International Relations; Director, Centre for Dialogue, La Trobe University

[5] Nuclear campaigner, Australian Conservation Foundation

[6] Executive Officer, Medical Association for Prevention of War

[7] National nuclear campaigner, Friends of the Earth Australia; Coordinator, Beyond Nuclear Initiative

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Abbreviations

AA	Administrative Arrangement
ACF	Australian Conservation Foundation
ANZUS	Australia, New Zealand, United States Security Treaty
AONM	Australian Obligated Nuclear Material
ASNM	Australian Sourced Nuclear Material
ASNO	Australian Safeguards and Non-Proliferation Office
ASO	Australian Safeguards Office
ASTEC	Australian Science and Technology Council
CTBT	Comprehensive Test Ban Treaty
FMCT	Fissile Material Cut-off Treaty
HEU	Highly Enriched Uranium
IAEA	International Atomic Energy Agency
ICBM	Intercontinental Ballistic Missile
LAO	Limited Attack Options
MAPW	Medical Association Prevention of War (Australia)
MBA	Material Balance Area
MC&A	Material Control and Accountancy
MIRV	Multiple Independently Targetable Re-entry Vehicles
NATO	North Atlantic Treaty Organisation
NWS	Nuclear Weapon State
NNWS	Non-Nuclear Weapon State
NPT	Nuclear Non-proliferation Treaty
NSA	Negative Security Assurance
NSPD	National Security Presidential Directive
NWS	Nuclear Weapons State
SIOP	Single Integrated Operational Plan
SIPRI	Stockholm International Peace Research Institute
SQ	Significant Quantities
VOA	Voluntary Offer Agreement
WMD	Weapons of Mass Destruction
WMDC	Weapons of Mass Destruction Commission

Foreword

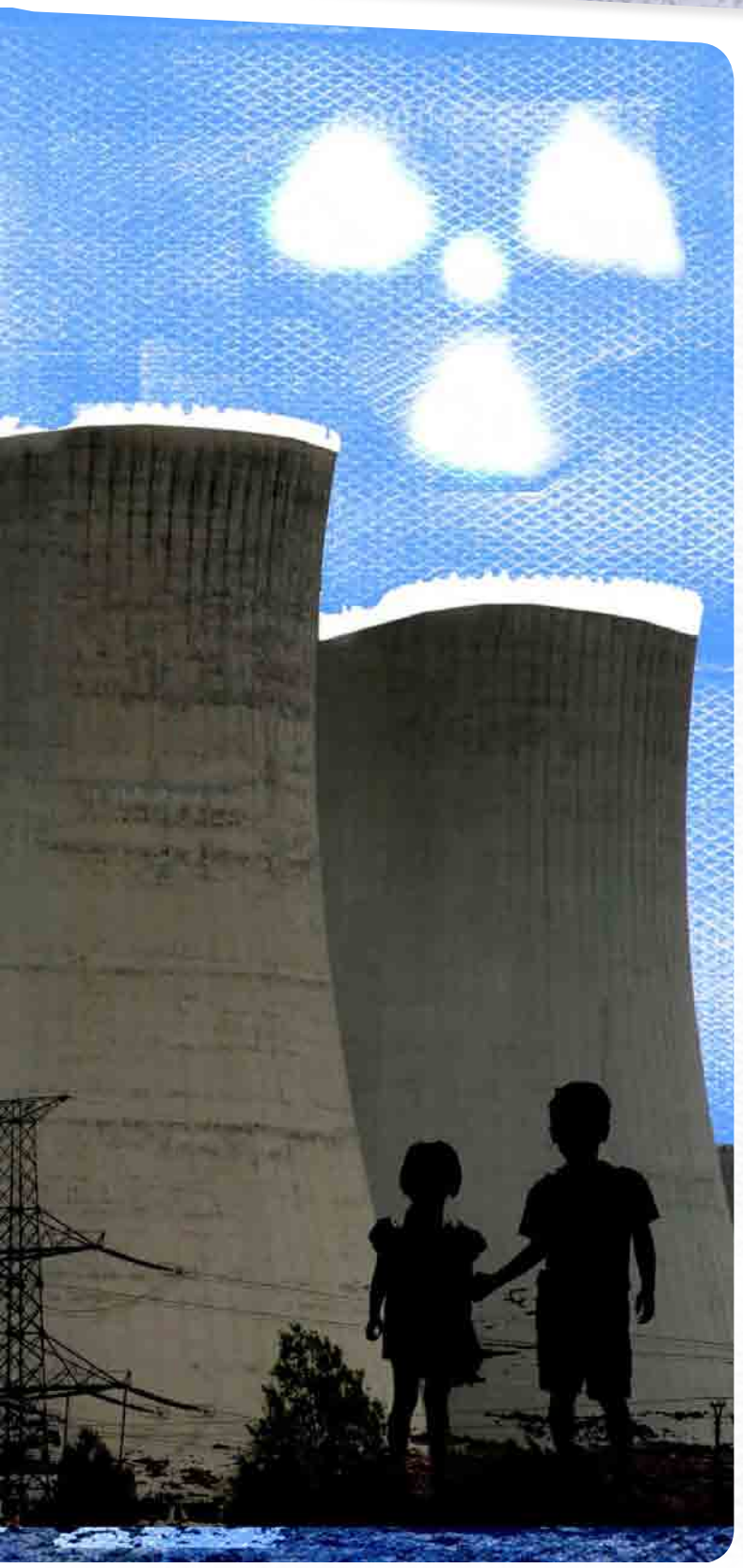

Image: Nuclear Future? Source: © Natalie Lowrey

An Illusion of Protection includes a critique of the international nuclear safeguards system. It deals in particular with the proposed sale of Australian uranium to China. The report is an extremely valuable and topical one. It comes at a time when the world is on the brink of a rapid expansion of the use of nuclear-power reactors for the generation of electricity Exporters of uranium, of which Australia is one of the largest, have the power to determine the extent and nature of any nuclear renaissance.

The nuclear fuel for many of the new reactors will contain a mixture of uranium and plutonium dioxides. The plutonium could easily be chemically removed from the fuel and could be used, by governments or terrorist groups, to fabricate nuclear weapons.

Given the dire consequences that could follow a large expansion of the global use of nuclear power, uranium exporters have a special responsibility to consider whether they should continue to mine and trade in uranium. They should, above all, ask themselves: Will systems for the international control of nuclear materials, usually called nuclear safeguards, be adequate in tomorrow's world? The information in *An Illusion of Protection* will help them work out the answer. It should be read by all those involved in the uranium business and by all people interested in global security issues.

The concept of 'safeguards' dates back to November 1945, when the term was used in a document, called the "*Three Nation Agreed Declaration*" on international nuclear energy policy, by the American President and the Prime Ministers of Canada and the United Kingdom. In December 1953, US President Dwight Eisenhower, in a speech before the

United Nations, proposed, as part of his "Atoms for Peace" programme, the creation of a new International Atomic Energy Agency to take custody of nuclear material, ensure its safe keeping, and use it for peaceful purposes.

In 1954, the US started to enter into bilateral nuclear cooperation agreements with other countries. These agreements included provisions, called safeguards, by which the USA could be assured that nuclear material and technology it provided to other countries was not diverted to military use. At the same time, the US began negotiations to create the International Atomic Energy Agency (IAEA). The IAEA was given the authority to enter into safeguards agreements with individual nations to ensure that any nuclear materials, equipment or facilities offered up for inspections were not diverted to military purposes.

The non-nuclear-weapon parties to the NPT (defined as states that had not manufactured and detonated a nuclear device by 1 January 1967) have assumed obligations vis-à-vis the IAEA under safeguards agreements, which under the NPT itself they are obliged to conclude with the Agency.

As described in *An Illusion of Protection*, the goal of the IAEA is to verify that for a given period, "no significant quantity of nuclear material has been diverted or that no other items subject to safeguards have been misused by the State". A 'significant quantity' is the amount of nuclear material for which "the possibility of manufacturing a nuclear explosive device cannot be excluded".

For plutonium, a significant quantity is defined as eight kilograms; for highly enriched uranium (enriched to 20 per cent or more in the isotope uranium-235) it is defined as 25 kilograms; for low-enriched uranium (enriched to less than 20 per cent in uranium-235) it is 75 kilograms; and for uranium-233 it is 8 kilograms. The significant quantities are, on today's standards, far too high. There is no difficulty in fabricating a nuclear weapon with an explosive power equivalent to that of 20,000 tonnes of TNT using about 4 kilograms or less of suitable plutonium. A country with access to medium level technology could do so. A good designer could get an explosive power equivalent to that of about 1,000 tonnes of TNT with just one kilogram of such plutonium. To be credible, the 'significant amounts' used by the IAEA should be redefined and considerably reduced.

In the concept of IAEA safeguards, the timeliness of detection of the diversion of nuclear material from peaceful to military purposes is crucial. The Agency's objective is defined as "the timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection".

The guidelines established for effective safeguards are that the diversion of a significant quantity should be detected, with a 90-95 per cent probability, within a 'conversion time' with a false-alarm rate of no more than 5 per cent. The concept of a conversion time is based on the time likely to be required to convert diverted fissile material into a form that could be used in a nuclear weapon.

The times are: for each of plutonium and highly-enriched uranium, 7-10 days; for plutonium in spent nuclear-reactor fuel, 1-3 months; for low-enriched and natural uranium 12 months; and for plutonium oxide 1-3 weeks. Again, on today's standards these times are too long. In fact, the cases of Iraq, North Korea, and South Africa have put paid to the expectation of timely detection.

The fact is that the IAEA cannot ensure timely detection. If a country decided to divert plutonium or highly enriched uranium from its civil nuclear programme to fabricate nuclear weapons, it could assemble nuclear weapons very quickly. The country could first produce all the non-nuclear components

of nuclear weapons. The diverted fissile material could be fabricated into the nuclear components for the weapons and these components assembled into the weapons in a short time. The Agency's timeliness goal is simply not attainable, even with the best will in the world. But undoubtedly the most serious problem facing a nuclear safeguard system is that the most sensitive plants so far as the diversion of weapon-usable materials - particularly plutonium reprocessing plants (in which plutonium is chemically separated from unused uranium and fission products in spent nuclear-power reactor fuel elements) – are impossible to safeguard effectively. Using existing and foreseeable safeguards technology, it is not possible for a safeguards agency to detect the diversion of quantities of weapon-usable plutonium from a reprocessing plant that could be used to fabricate one or more, or even many, nuclear weapons.

The IAEA was lulled into a false sense of security by the assumption that any clandestine programme to manufacture nuclear weapons could be detected at an early stage by national intelligence agencies, particularly by the use of satellite surveillance. The nuclear-weapon programmes of Iraq and North Korea showed that this assumption was false.

The truth is that international safeguards can only be effectively applied if the country concerned is not intent on violating its obligations under the NPT or its safeguards agreement with the Agency. In other words, safeguards depend on the country behaving lawfully. The IAEA cannot be expected to discover clandestine nuclear facilities - such as a relatively small hidden nuclear reactor and a small facility to separate plutonium from spent reactor fuel - in a country that deliberately sets out to deceive the Agency.

The results of IAEA safeguards inspections are kept closely guarded secrets. The ostensible reason is to protect sensitive commercial information. But the effect is to prevent commentators from judging the adequacy of safeguards. As always, secrecy breeds suspicion. Making safeguards information publicly available would significantly improve the credibility of the international safeguards system.

An Illusion of Protection states that, "there is much that could be done to improve the international safeguards system, however its fundamental flaws and the pervasive interconnections between the civil and military application of nuclear technologies and materials mean that the most prudent and responsible position is to oppose the mining and export of uranium". I agree entirely with this conclusion. The world would be a much safer place if the Australian government acted on this advice.

FRANK BARNABY, BSc, MSc, PhD, DSc (Hon)

Frank Barnaby is a nuclear physicist by training. He worked at the Atomic Weapons Research Establishment, Aldermaston (1951-57) and was on the Senior Scientific Staff of the Medical Research Council at University College, London (1957-67). He was the Executive Secretary of the Pugwash Conferences on Science and World Affairs (1967-70) and Director of SIPRI, the Stockholm International Peace Research Institute (1971-81). He was Professor at the Free University, Amsterdam (1981-85) and Visiting Professor, Stassen Chair, at the University of Minnesota (1985). He currently works for the Oxford Research Group on research into the civil and military uses of nuclear energy and the terrorist use of weapons of mass destruction. He has honorary doctorates in Science from the Free University, Amsterdam and the University of Southampton.

He is the author of many books including: **Man and the Atom** (Thames and Hudson, 1971); **The Nuclear Age** (MIT Press, 1974); **The Automated Battlefield** (Sidgwik and Jackson, 1987); **How Nuclear Weapons Spread** (Routledge, 1993); **The Invisible Bomb** (Tauris, 1989); **Instruments of Terror** (Vision Books, 1996); **How to Make a Nuclear Weapon and other Weapons of Mass Destruction** (Granta, 2004), and editor of **Plutonium and Security** (MacMillan, 1992).

He has published a number of research reports on civil and military nuclear issues, including reprocessing and mixed-oxide fuel plants, and was a co-author of the **International Mixed-Oxide Fuel Assessment Report** (1997).

A dose of reality on the IAEA and nuclear safeguards
IAEA Director-General Dr Mohamed ElBaradei

- "The IAEA's Illicit Trafficking Database has, in the past decade, recorded more than 650 cases that involve efforts to smuggle such [nuclear and radioactive] materials." [1]

- "Today, out of the 189 countries that are party to the NPT, 118 still do not have additional protocols in force." [1]

- "IAEA verification today operates on an annual budget of about $100 million – a budget comparable to that of a local police department. With these resources, we oversee approximately 900 nuclear facilities in 71 countries. When you consider our growing responsibilities – as well as the need to stay ahead of the game - we are clearly operating on a shoestring budget." [1]

- "… we are only as effective as we are allowed to be." [1]

- "In specific cases of arms control, the Security Council's efforts have not been very systematic or successful." [1]

- "If a country with a full nuclear fuel cycle decides to break away from its non-proliferation commitments, a nuclear weapon could be only months away." [2]

- "… the Agency's legal authority to investigate possible parallel weaponisation activity is limited …" [2]

Image: time bomb Source: shutterstock.com

Regarding protecting nuclear material: "… experts estimate that perhaps 50 per cent of the work has been completed."[1]

"… We are in a race against time."[2]

(1) Putting teeth in the nuclear non-proliferation and disarmament regime. 2006 Karlsruhe Lecture, Karlsruhe, Germany, 25 March 2006

(2) Reflections on nuclear challenges today. Alistair Buchan Lecture, International Institute for Strategic Studies, London, UK 6 Dec 2005

These and other statements available at www.iaea.org

Executive Summary

This report addresses the flaws and limitations of the international nuclear safeguards system with particular reference to the proposed sale of Australian uranium to China, a declared nuclear weapons state. The report highlights the limitations of the global nuclear safeguards regime, an issue of particular importance in the context of current moves to dramatically expand the Australian uranium industry.

The Medical Association for the Prevention of War and the Australian Conservation Foundation maintain that there is a serious and unavoidable risk that Australian uranium exports to China will directly or indirectly support Chinese nuclear weapons manufacture, and potentially nuclear weapons proliferation in other countries.

There is much that could be done to improve the international safeguards system, however its fundamental flaws and the pervasive interconnections between the civil and military applications of nuclear technologies and materials mean that the most prudent and responsible position is to phase out the mining and export of uranium.

Supporters of Australia's uranium export industry claim that the safeguards applied to Australia's uranium exports are the equal of, or better than, safeguards applied by other uranium exporting nations. This claim ignores the problem that all uranium-exporting nations are reliant on the inadequate and under-resourced safeguards system of the IAEA, and it cannot be credibly advanced to justify Australian uranium exports.

Claims that Australia would have no leverage in relation to international nuclear safeguards in the absence of a uranium export industry are false. Australia's moral and political authority to actively pursue a strengthened non-proliferation and safeguards regime would be enhanced by such an approach. Furthermore, non-nuclear and non-uranium exporting states can and do influence international safeguards through the Board of Governors of the International Atomic Energy Agency (IAEA) and by engagement with a range of other international fora and mechanisms.

Source: shutterstock.com

"No system of safeguards that can be devised will of itself provide an effective guarantee against production of atomic weapons by a nation bent on aggression."

Harry S Truman, CR Attlee & WL Mackenzie King.
Declaration on atomic bomb by President Truman and Prime Minsters Attlee and King.
15 Nov 1945.

Nuclear Weapons and Nuclear Proliferation

A strong nexus exists between the use of uranium for civil and military purposes. Nobel Prize winning physicist Hannes Alven described the peaceful and military atom as "Siamese twins".

This link has resulted in the international community putting in place a non-proliferation regime that is meant to halt the spread of nuclear weapons and to provide a framework for disarmament by the nuclear weapons states. The key platform for this regime is the nuclear Non-Proliferation Treaty (NPT).

The NPT recognises two forms of state—Nuclear Weapon States (NWS) and Non-Nuclear Weapon States (NNWS). The treaty takes the form of a three-way bargain between these states. The Non-Nuclear Weapon States, in Articles I and II, agree not to acquire or manufacture nuclear weapons. In Article VI the Nuclear Weapon States pledge to work to eliminate their nuclear arsenals. As confirmed by the 1996 International Court of Justice Advisory Opinion, the obligation to achieve nuclear disarmament is legally binding. Article IV allows for the use of nuclear technologies for peaceful purposes and provides for international trade in nuclear materials and technology, subject to Articles I and II.

The integrity of the NPT regime itself is currently very fragile and indeed fractured. As the 2004 report of the UN Secretary-General's High Level Panel on Threats, Challenges and Change noted, "We are approaching a point at which the erosion of the non-proliferation regime could become irreversible and result in a cascade of proliferation".

The underlying flaw in the regime lies in the consanguineous relationship between civil and military nuclear operations. Article IV enables a NNWS to acquire nuclear materials, technology and infrastructure. However, once such a nuclear capacity is realised the potential for NNWS to acquire nuclear weapons is inescapable. There are clear examples demonstrating that NNWS can become nuclear weapons capable relatively quickly. By legitimising and encouraging the expansion of nuclear fuel cycle capabilities around the world the NPT has the perverse effect of promoting the means for a cascade of proliferation.

The declared Nuclear Weapons States — the USA, Russia, the UK, China and France — are another part of the same problem. Their refusal to seriously pursue nuclear disarmament undermines the wider regime. In February 2004 the Director General of the International Atomic Energy Agency, Dr Mohamed ElBaradei, noted, "We must abandon the unworkable notion that it is morally reprehensible for some countries to pursue weapons of mass destruction yet morally acceptable for others to rely on them for security - indeed to continue to refine their capacities and postulate plans for their use".

The June 2006 "Weapons of Terror" report of the Weapons of Mass Destruction Commission (WMDC) chaired by Dr Hans Blix drew similar conclusions:

> *The Commission rejects the suggestion that nuclear weapons in the hands of some pose no threat, while in the hands of others they place the world in mortal jeopardy. …The three major challenges the world now confronts – existing weapons, further proliferation and terrorism – are interlinked politically and also practically: the larger the existing stocks, the greater the danger of leakage and misuse.*[8]

International Safeguards System

The NPT system provides for the use of nuclear materials and technology in civil nuclear energy programs under a system of safeguards. These are supposed to provide assurance that nuclear materials and technology are not being diverted from civil to military uses. The IAEA administers this system, which does not seek to prevent diversion, merely to detect and deter diversion.

The safeguards system arises from Article III of the NPT. This requires that nuclear trade is to be conducted only when safeguards are in place, and requires NNWS to accept IAEA safeguards on their nuclear infrastructure. The NWS are not obliged to accept the same level of safeguards, and choose to which of their nuclear facilities safeguards will apply.

The IAEA system of safeguards relies upon three methods, known as material accountancy, containment and surveillance. Material accountancy is the primary method, with containment and surveillance being secondary or complementary methods. Material accountancy is

[8] Weapons of Mass Destruction Commission final report, Weapons of Terror. Stockholm, Sweden, 1 June 2006. www.wmdcommission.org pp 60- 62.

essentially a book-keeping exercise to ensure that nuclear materials flowing through a safeguarded plant are not being diverted. On-site inspections are used to verify that nuclear materials stay within the production pipeline.

The details of the way in which the IAEA implements these safeguards in a given state and in a given facility is via subsidiary arrangements, in effect providing safeguards 'action plans'. These are confidential agreements between the IAEA and the safeguarded state; essentially action plans that provide the working details and institutional arrangements for how safeguards are implemented in practice. They are of first importance in any assessment of the effectiveness of safeguards in a given state or facility.

The Office of Technology Assessment of the United States Congress has demonstrated that the technical goals that the IAEA has set itself in relation to safeguards are faced with "unavoidable limitations". This is because the IAEA system of safeguards is not able to meet the IAEA's own criteria in relation to the detection of diversion of "significant quantities" of nuclear materials in a "timely fashion". In addition, it is possible to develop a nuclear weapon with materials less than the significant quantity provided for by the IAEA.

Nuclear technology is progressing rapidly, making it easier to develop nuclear weapons. The IAEA system of already inadequate safeguards is lagging further behind the developing technology. One example of this can be seen with the laser enrichment of uranium. Traditionally uranium has been enriched in huge plants, which are easy to detect. However, moves to develop laser enrichment, including the Australian-based Silex process, would not only make enrichment of uranium cheaper and easier, but at the same time make detection more difficult.

The ineffectiveness of the safeguards approach was recognised by former IAEA Director General Dr Hans Blix in the important Weapons of Mass Destruction Commission report (2006). It documents that Iraq, Libya and North Korea were all able to effectively hoodwink the IAEA while being NPT signatories.

Due to the inadequacy of the safeguards system, following the 1991 discovery of Iraq's advanced nuclear weapons program, the international community put in place a series of *additional protocols* to enhance the safeguards regime. These are not a fundamental change in the safeguards system *per se*; they are merely add-ons to the traditional system. The additional protocols fail to address the fundamental limitations and flaws of the safeguards system, particularly the permissibility and indeed encouragement of the spread of nuclear facilities and materials.

Although the classical system of safeguards is strengthened by the Additional Protocols, the system is still subject to the inherent limitations of the system of classical safeguards precisely because they are simply additional to it. They do not replace it nor provide for fundamental change. The Additional Protocols do not address the main flaws in the classical system of safeguards, nor can they, as safeguards still rely upon material accountancy which is subject to error. Furthermore, 118 of the 189 countries party to the NPT still do not have Additional Protocols in force.

The Additional Protocols are further significantly limited in their application to China and other NWS, where it is left up to the state to decide to which facilities they should apply.

While there are inherent flaws and limitations in the safeguards and Additional Protocols, they should, at a minimum, be applied in full to all countries, including the NWS.

Australian Safeguards

In the 1970s successive governments came under increasing pressure from mining corporations to allow the mining and export of Australian uranium. This became a major political issue and in 1974 the Whitlam government set up an inquiry chaired by Justice Russell Fox to examine the matter, a process continued by the Fraser government. The subsequent Fox Report was ambiguous and cautious about proceeding with the export of uranium. The report:

- stated that the major hazard of the nuclear industry was its unintentional contribution to, "an increased risk of nuclear war"
- recognised that the IAEA system of safeguards provided only "an illusion of protection"
- recognised that Article IV confers upon Australia no obligation to export uranium, contrary to the claims made by mining advocates.

In 1977 the Fraser government decided to allow uranium mining in Australia. The government stated that the decision was made to strengthen

the goal of non-proliferation and had nothing to do with commercial gain. It announced a system of bilateral safeguards that would regulate the export of Australian uranium. The main provisions were:

- the recipient state must pledge not to divert Australian uranium into military programs and to accept a number of safeguards provisions governing its use in a bilateral agreement
- uranium would only be sold to those States that are party to the NPT
- no enrichment of uranium to higher than 20% U-235 could occur without Australian consent
- Australia would need to give prior written consent for any reprocessing of nuclear material derived from the use of Australian uranium
- Australia would oppose the stockpiling of plutonium
- there would be no further transfer of Australian uranium or nuclear material derived from the use of Australian uranium without Australia's prior consent.

The history of Australian safeguards policy is one of progressive weakening of already inadequate provisions. An example is the Howard Government's exporting of uranium to Taiwan in the absence of a bilateral safeguards agreement and despite advice from the Department of Foreign Affairs and Trade that this could in no way meet the criteria of Australian safeguards policy. The Fox Report also recommended that Australian uranium should only be sold to a state that is party to the NPT — Taiwan is not a signatory to the NPT.

The Fraser Government watered down the Fox Report recommendations to allow the export of Australian uranium to France, a nuclear weapon state that only subsequently joined the NPT (in 1992) and has a strong link between its civil and military nuclear programs.

The prior written consent clause for reprocessing has also been watered down by a policy known as "programmatic consent". Programmatic consent means that Australia gives long-term consent to the reprocessing of spent fuel derived from the use of Australian uranium. This has led to the stockpiling of Australian-obligated plutonium in Japan and the European Union.

A 2003 Massachusetts Institute of Technology multi-disciplinary study on nuclear power recommended that, given the proliferation risk, there should be a global ban on the reprocessing of spent nuclear fuel. A supplier state of uranium, should it value non-proliferation, would refuse to supply uranium to any state that expresses an interest in developing a plutonium fuel cycle. There exists no record of Australia using its leverage as a supplier of uranium to strengthen safeguards.
Australia allows for the "flag-swapping" or "flag transferring" of Australian uranium. This makes accounting of Australian Obligated Nuclear Material (AONM) apply to an equivalent quantity and not to actual nuclear material of Australian origin (which is indistinguishable from uranium from anywhere else).

In essence Australia's system of safeguards is a book-keeping exercise that relies upon the importing state to adhere to the material accountancy system. This can be murky in the case of nuclear weapon states because of the clear and proven linkages between civil and military facilities, including in the USA where a power reactor is used to produce tritium for nuclear weapons.

Australia's Safeguards and Non-proliferation Office (ASNO) has no substantive verification capacity to add to limited IAEA safeguards. The government's Regulation Impact Statement for its two nuclear agreements with China foreshadows only that "…ASNO officials visit bilateral counterparts annually to reconcile nuclear material transfer reports in detail."[9]

Non-proliferation and the Export of Uranium to China

In April 2006 Australia and the People's Republic of China signed two nuclear agreements. The first is a bilateral safeguards agreement that allows the export of Australian uranium to China. The second is a broader nuclear cooperation agreement.

The IAEA administers safeguards in China according to the provisions of a 1988 Voluntary Offer Agreement (VOA). The IAEA safeguards only three nuclear facilities in China - a nuclear power reactor, a uranium enrichment plant and a research reactor. Of these three facilities, only the power reactor actually has a safeguards action plan in force. The application of international safeguards to the Chinese nuclear industry is more symbolic than real and cannot deliver the required levels of transparency and certainty.

[9] www.aph.gov.au/house/committee/jsct/8august2006/index.htm

The bilateral agreement between Australia and China recognises that the 1988 agreement between Beijing and the IAEA provides the safeguard system to be applied to Australian uranium in the first instance. It will cover an equivalent amount rather than Australia uranium *per sé*. In other words, Australian uranium can be used in Chinese nuclear weapons without breaching the agreement, despite statements to the contrary from the Australian Government.

The way in which the bilateral agreement is to be implemented is via an administrative arrangement - a detailed plan outlining how the safeguards are to work in relation to Australian uranium. The administrative agreement will be secret, will not be subject to parliamentary approval (as its status is less than a treaty document), is subject to change at any time and is yet to be negotiated. Should the Australian Parliament ratify the bilateral safeguards agreement, it will lose effective oversight of ongoing negotiations between Canberra and Beijing.

The agreement allows for use of Australian derived nuclear materials in plutonium reprocessing plants. Currently no reprocessing plants are safeguarded in China. The IAEA global fuel cycle profile states that China currently has no reprocessing plant save for a pilot reprocessing facility. This refers only to the civil sector—reprocessing plants in China are associated with the Chinese nuclear weapons program.

China has an experimental fast breeder reactor outside Beijing where plutonium is used to make more plutonium, and is keen to develop a plutonium economy based on breeder reactors. This policy flows from an energy strategy that is designed to maximise China's autonomy in the global energy market. By enshrining its support for reprocessing of spent nuclear fuel to extract plutonium in the bilateral agreement, Australia undermines its declared commitment to nuclear non-proliferation.

Essential to the working of safeguards will be China's material accounting system for fissile materials. There are serious deficiencies in China's fissile material accounting system. A US analysis of the Chinese nuclear industry stated: "China may not even have a precise inventory of the amount of nuclear materials in its facilities" and that "without this knowledge there is no way to detect the disappearance of any material". Furthermore, the study noted that it would seem that China's nuclear facilities have not been designed to measure the "amount of fissile materials accurately, easily and frequently".

If China does not have a precise inventory, it is simply not credible to accept the proposition that the Australian Government will be able to satisfactorily ensure material accountancy.

The bilateral agreement can be changed over time and does not actually lock China in to a system of safeguards over the thirty year life span of the agreement. On past experience, any change is likely to weaken rather than strengthen safeguards.

China currently relies heavily upon oil and coal for its energy needs. It is a net oil importer and its reliance upon Middle East oil is expected to grow rapidly. China is currently making large investments in oil and other resources in Iran and seeks to be as free as possible from outside (particularly US) interference in its energy and industrial policies.

Iran has an interest in nuclear power and technology and its nuclear compliance record is patchy. China's nuclear know-how is creating a strategic relationship that is problematic from a proliferation perspective as China may assist, both overtly and covertly, Iran in the development of its nuclear capabilities. China's poor record in fuelling nuclear weapons proliferation, most notably through export of nuclear weapons plans, highly-enriched uranium, plutonium production and reprocessing capacity to Pakistan, is cause for serious concern.

China's looming energy crisis means it is embarking on an ambitious expansion of its domestic nuclear industry. The World Nuclear Association estimates that based on the projected expansion targets, the annual amount of spent nuclear fuel arising from China would be 600 tonnes in 2010 and 1000 tonnes in 2020, with the cumulative amounts increasing to 3800 tonnes and 12 300 tonnes respectively. These are sobering numbers. The large annual throughputs for reprocessing that could result from this magnify the inevitable safeguards measurement uncertainties.

Based on current plans, China cannot meet its ambitious nuclear plans by relying upon domestic sources of uranium. Australia has the largest reserves of economically recoverable uranium in the world. It is estimated that Australia will export several thousand tonnes of uranium per year to China. The large amounts of uranium to be exported, the large annual throughputs in reprocessing facilities, the limitations of safeguards and the long-term consent to reprocessing of Australian nuclear material, lead to the distinct possibility that China could divert

fissile materials from civil to military programs.

A consistent non-proliferation policy would see Australia refuse to supply uranium to China, in the context of phasing out uranium mining and exports.

The Balance of Leverage and Safeguards

China is Australia's second largest trading partner and as such holds significant leverage over the Australian government. In addition, it is expected that much of the proposed uranium supply from Australia to China would come from BHP Billiton's Olympic Dam mine in South Australia. BHP Billiton has become heavily reliant upon the Chinese market to sustain its record rates of profit. Commercial imperatives and a weak international safeguards regime combine to mean that Australia is in a weak negotiating position and will be unlikely to influence Chinese nuclear conduct.

The bilateral safeguards agreement with China is a living document that does not lock China over the life of the agreement to current safeguards policy. China's leverage over Canberra and BHP Billiton means that should the agreement be revised, it is likely to be in the direction of weakening of safeguards.
In addition, Australia's bilateral safeguards agreements lack enforceability and any degree of effective sanction for breaches, even if they could be detected and proven. Under Article XII of the Australia-China Transfer of Nuclear Material Agreement, the supplier has the right to suspend or cancel further transfers of nuclear material, to require corrective steps to be taken, and potentially require the return of nuclear material, for breaches of the agreement or IAEA safeguards. It is highly improbable that in reality Australia would be in a position to enforce anything further in response to an identified safeguards breach other than suspension of further supply; in effect closing the stable door after the horse has bolted.

Chinese Nuclear Modernisation and the Potential for Conflict

The relatively low number of warheads in China's arsenal means Beijing maintains a policy of ambiguity in relation to fissile material production and its nuclear policies more broadly. This poses a problem for Australian safeguards because China would seek to maximise secrecy in relation to its nuclear potential. During the bilateral safeguards agreement talks the Australian Government unsuccessfully sought clarification from Beijing on this key issue.

China is currently engaged in a nuclear weapons modernisation program. Initially China was interested in replacing older missile systems for more modern designs but increasingly China has predictably become concerned about US plans to construct a ballistic missile defence system and to place other weapons in space, and is likely to increase its nuclear arsenal in response.

Current levels of military-grade plutonium create an upper bound on how many new warheads China can produce quickly. A US National Security Presidential Directive (NSDP 23) stipulates that as any state develops its response to the US missile defence system, the US will expand the system to meet the new challenge to its integrity. This means that should Beijing manufacture more warheads, the US will upgrade its missile defences. A likely scenario is that Beijing would manufacture more warheads in response to any US move. Such an escalation could propel a potential arms race and increase regional insecurity.

Such an arms race would take place in the context of the ongoing dispute regarding Taiwan. Recently the US military drew up formal plans (OPLAN5077) for a major military conflict with China that would include the use of nuclear weapons. Zhu Chenghu, a senior Chinese general responded to this development by warning that Beijing is ready to use nuclear weapons in response.

China does not have enough uranium to meet its civil and military plans simultaneously. This was made clear in a mining industry address given by Madame Fu Ying, the Chinese ambassador to Australia in Melbourne on 1 December 2005. Madame Fu indicated that while China has sufficient uranium reserves to support its nuclear weapons program it needed imports to meet power demands. At best, this means that the export of uranium to China will free up Chinese uranium for warhead modernisation. At worst, Australian uranium would be diverted directly to nuclear weapons production. Clearly neither outcome is in Australia's national interest or the wider interests of the region.

Recommendations

1. Australia should stop its contribution to the global nuclear chain by phasing out mining and export of uranium.

2. Australia should not export uranium to China. On such a serious matter as proliferation of nuclear weapons, China's poor non-proliferation record and lack of transparency – and indeed active contribution to horizontal nuclear proliferation – warrants the disqualification of China as an appropriate recipient of Australian uranium on these grounds alone.

3. Massive resources and government support in Australia and China, as elsewhere, should be directed as an urgent priority to research, development and deployment of safe and renewable sources of energy, in combination with improved efficiency of energy use; and not to nuclear power. China has made clear a substantial financial and planning commitment to developing renewable energy technologies over the coming decade, and should be encouraged to replace their plans for nuclear power with an expanded commitment to energy efficiency and deploying a mix of renewable energy sources.

4. IAEA safeguards should be strengthened through universal, mandatory and permanent application, including the full application of Additional Protocols, to Nuclear Weapon States including China, to the same degree as to Non-Nuclear Weapon States.

5. Australia should withdraw from agreement to export uranium to Taiwan and fully enforce and maintain restrictions against nuclear trade including uranium sales to any non-NPT signatory entities, including India, Pakistan and Israel.

6. Proposed administrative arrangements to enact the Australian bilateral safeguards agreement with China should be made public and be subject to parliamentary scrutiny as part of the process of formal consideration of the proposed Nuclear Cooperation Treaty with China.

7. The Australian Government should withdraw consent in existing bilateral treaties, and not provide any future agreements or consent, including to China, for reprocessing of Australian Obligated Nuclear Materials or for any use of such materials in mixed oxide (MOX) or other plutonium-based fuels.

8. Australia should require verifiable cessation of production of missile material and support for a Fissile Materials Cut-Off Treaty that prohibits reprocessing and the separation of weapons-usable fissile materials, from all countries with which Australia currently has bilateral nuclear cooperation agreements.

9. Application of IAEA safeguards should be extended to fully apply to mined uranium ores, to refined uranium oxides, to uranium hexafluoride, and to uranium conversion facilities, prior to the stages of enrichment or fuel fabrication.

10. Australia should not enter into additional bilateral agreements allowing for conversion and enrichment of Australian uranium in countries, including China and India, where such safeguards arrangements are not in place.

11. Australia should withdraw uranium sales from all Nuclear Weapon States that have breached their non-proliferation obligations, or continue to fail to comply with their nuclear disarmament obligations under the Non-Proliferation Treaty, and that fail to ratify and abide by the Comprehensive Test Ban Treaty including verifiable closure of nuclear weapons testing facilities.

"It is clear that no international safeguards system can physically prevent diversion or the setting up of an undeclared or clandestine nuclear programme."

IAEA
"Against the Spread of Nuclear Weapons: IAEA Safeguards in the 1990s", 1993.

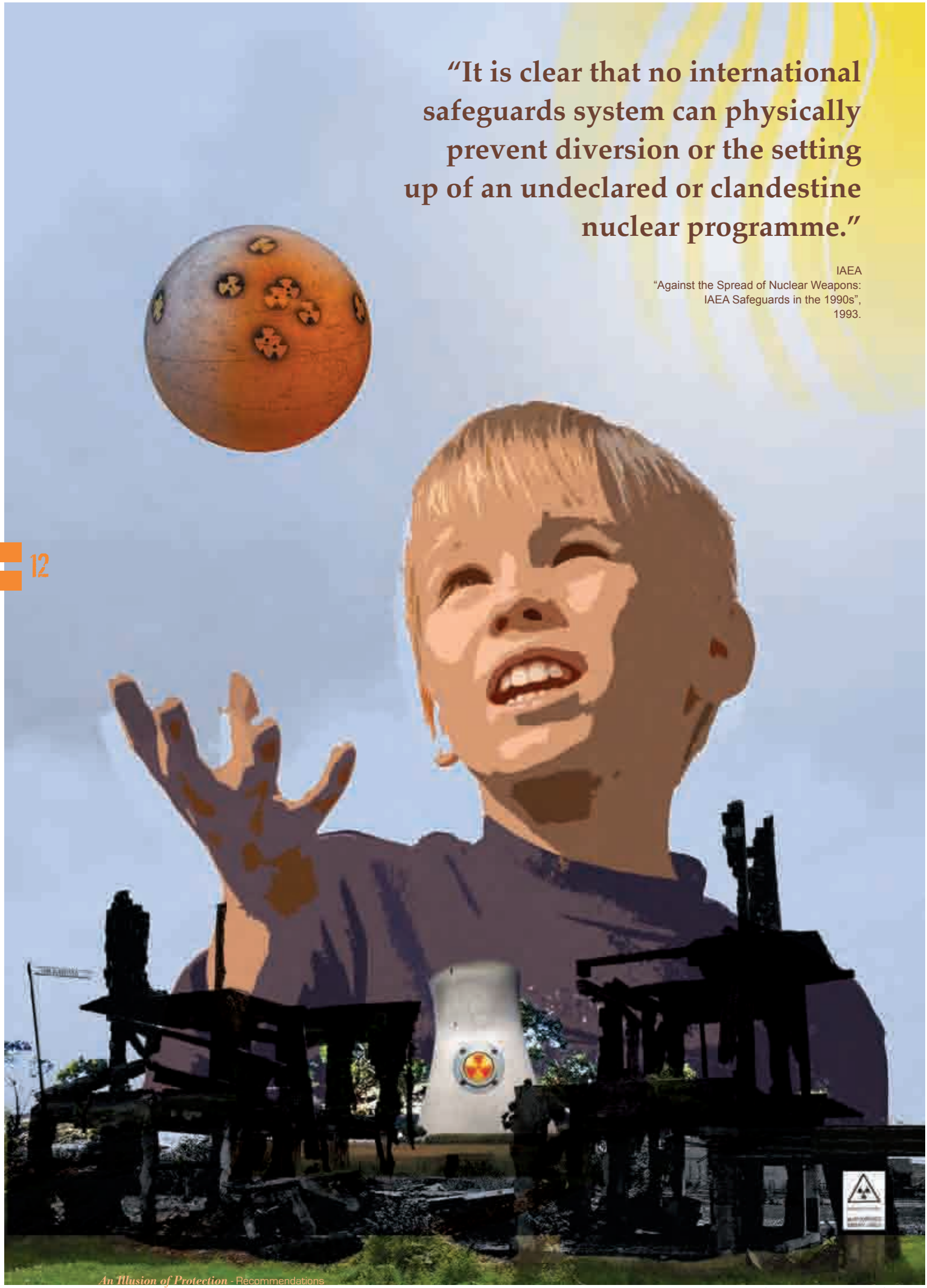

Image: Nuclear Future? Source: © Natalie Lowrey

Chapter 1

Nuclear Weapons and Nuclear Proliferation

Ever since many of the world's most renowned scientists and engineers assembled in New Mexico in order to "produce a practical military weapon in the form of a bomb in which the energy is released by a fast neutron chain reaction in one or more of the materials known to show nuclear fission"[11], nuclear weapons have assumed a central place in any consideration of the destiny of humankind.

Fissile materials which can be used to form the core of a nuclear weapon include highly enriched uranium (HEU, typically containing 85% or more of the uranium isotope U-235); or plutonium containing a high proportion of the isotope Pu-239. Modern nuclear weapons using a thick neutron reflector contain less than 4 kg of weapon-grade plutonium (typically 93% Pu-239)[12]. A simple implosion nuclear weapon would require 4-5 kg of HEU.[13]

Nuclear fission can also be used to generate power in a nuclear reactor. The various components of the mining, use, storage or reprocessing of uranium and associated nuclear material is called the nuclear fuel chain. Australia is a player in the global nuclear fuel chain because it is a major supplier of uranium. Plutonium, an end product of the fuel chain, produced in a civil power reactor, can be used in nuclear weapons. The long-standing head of the Australian Safeguards Office, John Carlson, testified to the Senate Uranium Mining and Milling Committee that "the plutonium produced with Australian uranium in power reactor operation is not suitable for nuclear weapons".[14] The committee made much of this, dismissing the idea that reactor grade plutonium can be used for weapons as being a "hypothetical problem".[15]

In a paper for the leading science journal, Nature, Amory Lovins documented that in fact reactor grade plutonium can be used as the fissile material for nuclear weapons.[16] This has been proven in the most irrefutable way: the US has tested a weapon constructed with reactor-grade plutonium in 1957[17] and at least one such device in the 1960s.[18] The Totem nuclear test explosions conducted by the British at Emu Field in South Australia on 15 and 27 October 1953 (with yields of 10 and 8 kt respectively) also utilised reactor-grade plutonium.[19] The aim of the Totem series was to discover what effect the inclusion of varying amounts of Pu-240 would have on the yield of a nuclear weapon, to guide the plutonium composition to be used in British nuclear weapons.[20] The usability in weapons of all plutonium has been confirmed by numerous official and authoritative sources at the highest level:

- Former IAEA Director-General Hans Blix has stated that the IAEA: "considers high burn-up reactor-grade plutonium and in general plutonium of any isotopic composition … to be capable of use in a nuclear explosive device. There is no debate on the matter in the Agency's Department of Safeguards".[21]
- In 1993, J Carson Mark, former Head of the Theoretical Division at Los Alamos National Laboratory, who had been intimately involved in the design of both fission and thermonuclear weapons, outlined four differences between

[11] Robert Serber, The Los Alamos Primer: The First Lectures on How to Build an Atomic Bomb (Berkeley: University of California Press, 1992) p3. For more on the development of the atomic bomb see Richard Rhodes, The Making of the Atomic Bomb (New York: Simon and Schuster, 1986). Henry De Wolf Smyth, Atomic Energy for Military Purposes: The Official Report on the Development of the Atomic Bomb Under the Auspices of the United States Government, 1940-1945. Written at the request of L.R. Groves (Princeton: Princeton University Press, 1946).

[12]Barnaby F. The proliferation consequences of global stocks of separated civil plutonium. Oxford Research Group, June 2005. www.oxfordresearchgroup.org.uk

[13] Union of Concerned Scientists. Preventing nuclear terrorism . April 2004. www.ucsusa.org/global_security/nuclear_terrorism

[14] The Parliament of the Commonwealth of Australia, Uranium Mining and Milling in Australia: The Report of the Senate Select Committee on Uranium Mining and Milling Volume 1 (Canberra: Australian Government Publishing Service, 1997), p156.

[15] The Parliament, Uranium Mining and Milling, p157.

[16] Lovins A.B., "Nuclear Weapons and Power Reactor Plutonium", Nature, Vol 283 (28 Feb 1980), pp 817-823.

[17] Thomas B Cochran, William M Arkin, Milton M Hoenig. US nuclear forces and capabilities. Nuclear Weapons Databook Vol 1. Natural Resources Defense Council. (Cambridge MA; Ballinger, 1984) p24.

[18] Frank Barnaby, How Nuclear Weapons Spread: Nuclear Weapon Proliferation in the 1990s (London: Routledge, 1993), p33 and Richard Kokoski, Technology and the Proliferation of Nuclear Weapons (New York: Oxford University Press, 1995), p75

[19] Lorna Arnold . A very special relationship: British atomic weapon tests. (London, HMSO, 1987), chapter 4.

[20] Robert S Norris, Andrew S Burrows, Richard W Fieldhouse. British, French and Chinese nuclear weapons. Nuclear Weapons Databook Vol V. Natural Resources Defense Council. (Boulder Co: Westview Press, 1994) p 27.

[21] Hans Blix . Letter to Nuclear Control Institute, Washington DC, 1990.

reactor-grade and weapon-grade plutonium that would need to be taken into account when building a nuclear weapon - the need for a larger critical mass (c. 30%); greater heat output; neutron emission from the spontaneous fission of Pu-240; and greater radiation exposure; but concluded that "Reactor-grade plutonium with any level of irradiation is a potentially explosive material.....The difficulties of developing an effective design of the most straightforward type are not appreciably greater with reactor-grade plutonium than those that have to be met for weapons-grade plutonium".[22]

• In 1997, Matthew Bunn, who chaired the US National Academy of Sciences analysis of options for the disposal of plutonium from nuclear weapons, made an important statement based on then recently declassified material "of unprecedented detail on this subject", which concluded: "… in some respects it would actually be easier for an unsophisticated proliferator to make a bomb from reactor-grade plutonium (as no neutron generator would be required)."[23]

• This was also confirmed in 1997 by the US Dept of Energy: "In short, reactor-grade plutonium is weapons-usable, whether by unsophisticated proliferators or by advanced nuclear weapon states. Theft of separated plutonium, whether weapons-grade or reactor-grade, would pose a grave security risk."[24]

• In the UK, there has been official recognition that reactor-grade plutonium can be used to fabricate nuclear weapons.[25]

• Independent scientific bodies have reached similar conclusions. In 1995, a Special Panel of the American Nuclear Society, comprising senior representatives from the US, Russia, France, Germany, Japan and the UK, and chaired by Glenn Seaborg, co-discoverer of plutonium and former Chair of the US Atomic Energy Commission, concluded: "We are aware that a number of well qualified scientists in countries that have not developed nuclear weapons question the weapons-usability of reactor-grade plutonium. While recognising that explosives have been produced from this material, many believe that this is a feat that can be accomplished only by an advanced nuclear weapon state such as the United States. This is not the case. Any nation or group capable of making a nuclear explosive from weapons-grade plutonium must be considered capable of making one from reactor-grade plutonium".[26]

It is a simple fact, as pointed out by Nobel Prize winning nuclear physicist Hannes Alven that the peaceful and military atoms are "Siamese twins".[27]

1.1) The Nuclear Non-Proliferation Treaty

There exists widespread international consensus, at least at the level of rhetoric, that the further spread of nuclear weapons would have serious consequences for international security and needs to be prevented. The nuclear Non-Proliferation Treaty (NPT)[28] may be read as an attempt by the international community to codify this norm.

Almost all states are now signatories to the treaty with the exception of Israel, India and Pakistan. North Korea withdrew from the treaty in 2003. The treaty recognises two forms of state, Nuclear Weapon States (NWS) that had tested a nuclear weapon by 1967 (USA, USSR now Russia, China, Britain, France), with the remaining state signatories designated as Non Nuclear Weapon States (NNWS). For Butfoy, one of Australia's leading arms control specialists, "the clear intent of the treaty's creators was to ensure that these weapons would be tightly held by members of an exclusive club of established members."[29]

The treaty can be characterised as a three-way deal between the NWS and the NNWS, whereby the NNWS give up the option of acquiring or developing nuclear weapons and the NWS agree to assist the NNWS in the peaceful use of nuclear

[22] J Carson Mark. Explosive Properties of Reactor-Grade Plutonium, Science and Global Security, 1993, Vol 4, pp111-128 .

[23] Matthew Bunn, paper at IAEA conference, Vienna, June 1997, cited in: Frank Barnaby. The proliferation consequences of global stocks of separated civil plutonium. June 2005. Oxford; Oxford Research Group. www.oxfordresearchgroup.org.uk.

[24] US Department of Energy. Final nonproliferation and arms control assessment of weapons-usable fissile material storage and excess plutonium disposition alternatives. 1997 pp38-39.

[25] Lord Gilbert,, Minister of State, Ministry of Defence, House of Lords, Hansard 24 July 1997, Col WA 184.

[26] American Nuclear Society, Protection and Management of Plutonium, Special Panel Report, 1995, p25

[27] Barnaby, How Nuclear Weapons Spread, p1. For further discussion see also Jim Falk, "The Deadly Connection: Uranium Mining, Nuclear Power and Nuclear Weapons", Victorian Association for Peace Studies, Melbourne, April 1984.

[28] can be found online,"The Treaty on the Non-proliferation of Nuclear Weapons", United States of America, Department of State http://www.state.gov/t/np/trty/16281.htm. See also Appendix C in Ian Bellany, Curbing the Spread of Nuclear Weapons (Manchester: Manchester University Press, 2005). References to the text of the NPT made here are from Bellany.

[29] Andrew Butfoy, Disarming Proposals: Controlling Nuclear, Biological and Chemical Weapons (Sydney: University of New South Wales Press, 2005), p27.

science and technology, whilst the NWS pledge to work to eliminate their nuclear weapons.[30] This is the only treaty obligation committing NWS to nuclear disarmament. The 1996 International Court of Justice Advisory Opinion declaring that the pledge of achieving disarmament is a binding legal obligation again highlighted this aspect of the NPT bargain.

1.2) NPT Articles

The treaty consists of nine articles with articles I, II, III, IV and VI being of particular importance.

Article I
This states that no NWS is to transfer either directly or indirectly nuclear weapons or control over them "to any recipient whatsoever" or in any way to assist a NNWS in manufacturing and acquiring nuclear weapons. A number of issues have arisen over the years in regards to Article I. Disputes exist as to whether NATO nuclear co-operation is compliant with the provisions of this article.[31] Since the end of the 1995 NPT review conference, reports have appeared (more below) that Chinese corporations have provided Pakistan with equipment for use in the production of highly enriched uranium[32] in violation of Article I. This has occurred to the extent that there is synergy between corporate action and state policy in China. Also of interest was the sale of dual-use exports by Western corporations, including those of the United States and United Kingdom, to Iraq whilst these states were supporting Iraqi aggression in Iran.[33]

Article II
Here it is stipulated that NNWS are not to receive nuclear weapons or control over them, not to manufacture nuclear weapons nor to seek or receive any assistance in the manufacture of nuclear weapons. As Dunn points out, Article II "helps to create a norm of non-proliferation, once widespread fears of a world of runaway proliferation have been checked".[34] An interesting issue here is what precisely constitutes the manufacture of nuclear weapons? There is no international consensus on this and clearly to define manufacture as the final assembly of a nuclear weapon is inadequate. The lack of consensus leaves open the possibility that a non-compliant state could make significant progress towards the construction of a bomb without it being construed as manufacture of a nuclear weapon.

Article III deals with the "safeguards" obligations of the parties, to be discussed in depth later on in the report.

Article IV
Addresses the issue of peaceful uses of nuclear energy. According to this article states have an "inalienable right" to use nuclear energy for peaceful purposes, "without discrimination" and in conformity with Articles I and II. Under this article, states also have the right to participate in nuclear trade so long as the objectives of such trade are peaceful and, "with due consideration for the needs of the developing areas of the world". This article makes a significant contribution to the goals of the NPT bargain by affirming an, "obligation on the part of the most advanced countries to facilitate access to the benefits of the peaceful atom".[35]

Article VI
This article is a perennial sticking point as it calls for the NWS to, "in good faith", pursue negotiations on effective measures that lead to the cessation of the nuclear arms race and to nuclear disarmament.

Long advocated by Australia, the Comprehensive Test Ban Treaty (CTBT) constitutes a crucial litmus test of a commitment to disarmament. The US and China have not ratified the CTBT. New technologies may mean that the NWS

[30] Bill Hayden, Uranium, The Joint Facilities, Disarmament and Peace, (Canberra: Australian Government Publishing Service, 1984), p5.

[31] Lewis A. Dunn, "The Nuclear Non-Proliferation Treaty: Issues of Compliance and Implementation", Programme for Promoting Nuclear-Non-proliferation Issue Review No.9 February 1997, p2.

[32] Dunn, "The Nuclear Non-Proliferation", p2.

[33] Dunn, "The Nuclear Non-Proliferation", p2.

[34] Dunn, "The Nuclear Non-Proliferation", p2.

[35] Dunn, "The Nuclear Non-Proliferation", p5.

may be able to develop and 'test' new nuclear weapons without explosive testing. This would be at odds with Article VI.

Another significant disarmament measure would be a Fissile Material Cut-off Treaty (FMCT), which would halt the production of weapons grade fissile materials. A ban on the production of fissile materials would thereby place an upper bound on the number of weapons able to be produced, serving as a starting point for proceeding with Article VI. However, the US has opposed a FMCT on the grounds that it could not be verified and thereby rejects a verifiable FMCT. China has linked a FMCT in the UN Conference on Disarmament with progress on an arms control regime for space. While the US has recently signalled support for resurrection of discussion of the FMCT[36], the question of a verifiable FMCT is still unresolved[37], and little substantive progress has occurred to date, and the issue of existing stocks of fissile materials will likely remain a contentious issue.

In any case, the travails of Article IV remain because civil reactor-grade plutonium can be used to develop nuclear weapons and the existence of uranium enrichment facilities, a spent fuel reprocessing plant, and/or a plutonium stockpile constitute a virtual nuclear arsenal.

Article X

The NPT has rather liberal withdrawal provisions. provides for the possibility for a state to break out of the treaty with only three months notice. Article IV allows states to acquire key nuclear technology and know-how as part of a peaceful nuclear fuel cycle programme. As much of the technology and materials for civilian nuclear programmes can be shared with military ones, states can therefore acquire key weapons capable infrastructure, and then simply walk from the Treaty and go on and manufacture, at short notice, a nuclear weapon. In this way the NPT, rather than being a true non-proliferation treaty, actually provides a framework for legitimating proliferation capacity. This makes the treaty flawed in principle, for Article X and Article IV undermine Article I and II. It would only take a downturn in international stability to bring these contradictory aspects of the treaty to relief, as the controversy over Iran's nuclear program sharply highlights.

Any nuclear trade must conform to Articles I and II. This clearly implies that any such trade must be associated with the strictest of safeguards and that there can be no compromise between a supplier state's other commercial and strategic goals and its professed commitment to the norm of non-proliferation. Should such compromises occur then a supplier state violates Article IV in spirit, if not expressly. Australia, a supplier of uranium, is then duty bound to put in place a system of safeguards either directly or indirectly via the auspices of the International Atomic Energy Agency (IAEA).

1.3) The Broader Nuclear Non-Proliferation Regime

It would be erroneous to suppose that the NPT regime is merely a security regime. It is also an economic regime in that arising from it is a set of strictures on the conduct of nuclear trade.[38] In fact, the entire regime is best understood by using an economic analogy: examining rules and obligations that seek to address the issue of nuclear proliferation both on the demand side and the supply side.

Supply side measures seek to regulate trade in nuclear materials and technology whereas demand side measures seek to deal with the underlying incentives for the manufacture or acquisition of nuclear weapons.

Supply perspective

Following the entry into force of the NPT, the Zangger Committee sought to interpret the safeguards clause, Article III.2 and to agree on common rules for the application of nuclear exports requiring safeguards. The committee agreed to establish and review such a list of nuclear materials and equipment and this list became known as the trigger list because the export of these items would trigger the application of safeguards.[39]

[36] USA: White Paper on a Fissile Material Cutoff Treaty - Conference on Disarmament, U.S. Mission to the UN, Geneva, May 18, 2006. www.state.gov/t/isn/rls/other/66901.htm

[37] http://geneva.usmission.gov/Press2006/0518RademakerPress.html

[38] Organisation for Economic Cooperation and Development Nuclear Energy Agency, The Regulation of Nuclear Trade: Volume 1 International Aspects (Paris: OECD, 1988). .

[39] OECD, The Regulation,p17.

These materials are broadly classified as, "source or special fissile material", for instance uranium, and other technological items such as reactors, components and equipment necessary for the nuclear fuel chain. It should be emphasised that the list did not include a ban on transfers of technologies related to enrichment and reprocessing.[40] This has clear implications for Australia as a supplier of uranium.

Demand perspective

Article VI is a very important demand side measure because, if the NWS were to disarm, a powerful incentive for further proliferation would be eliminated.

The structure of world order, as pointed out in the recent report of the high level Weapons of Mass Destruction Commission (WMDC), also plays an important part on the demand side. In an open rebuke to US policy that reserves the right to wage preventive war, the Commission noted that "disarmament and non-proliferation are best pursued through a cooperative rule-based international order, applied and enforced through effective multilateral institutions, with the UN Security Council as the ultimate global authority."[41]

As long as states, or the most powerful among them (those that possess nuclear weapons with a permissive employment policy), do not adhere to such a rule-based international order, there will always exist demand side pressures for proliferation. Indeed the Weapons of Mass Destruction Commission pointed out that "the NPT is the weakest of the treaties on WMD in terms of provisions about implementation."[42]

The NPT is at a painful crossroad, as demonstrated by the 2005 Review Conference which failed, after four weeks, to reach any agreement on further steps to deal with any non-proliferation or disarmament issue. In fact the US repudiated the commitments it made at the 1995 and 2000 NPT review conferences, crucial to gaining indefinite extension of the treaty, thereby placing the provisions agreed upon there in danger. The non-aligned states, led by Egypt, did not seek to ratify this US stance at the conference hence the impasse. Iran used the conference to emphasise its rights in regards to peaceful nuclear energy.[43]

In a penetrating analysis of the conference, Wade Boese noted that the conference ended "as it began with competing agendas, widespread mistrust, and no consensus on next steps for stopping the spread of or eliminating nuclear weapons".[44] Boese goes on to suggest "the divergence among states/parties stems in large part from tensions between the nuclear haves and have-nots over how to implement the treaty's dual obligations".

The report of the UN Secretary-General's High Level Panel on Threats, Challenges and Change stated "we are approaching a point at which the erosion of the non-proliferation regime could … result in a cascade of proliferation."[45] Precisely when an expansion of nuclear energy programmes is being planned, and implemented. The parlous state of the unique dangers posed by nuclear weapons was emphasised again by the WMD Commission:

> *Over the past decade, there has been a serious, and dangerous, loss of momentum and direction in disarmament and non-proliferation efforts. …In 2005 there were two loud wake-up calls in the failure of the NPT Review Conference and in the inability of the World Summit to agree on a single line about any WMD issue. It is critical for those calls to be heeded now.*[46] *The three major challenges the world confronts – existing weapons, further proliferation and terrorism – are interlinked politically, and also practically: the larger the existing stocks, the greater the danger of leakage and misuse.*[47]

Do Australia's uranium exports contribute to the problem or to the solution of these three linked critical issues of sustainability and survival?

[40] OECD, The Regulation, p17 see also p77-78.

[41] Weapons of Mass Destruction Commission. Weapons of Terror: Freeing the World of Nuclear, Biological and Chemical Arms, (Stockholm, Sweden, 1 June 2006) p18. Report online at http://www.wmdcommission.org

[42] Weapons of Mass Destruction Commission. Weapons of Terror: p103.

[43] Daryl G. Kimball, "Repairing the Regime", Arms Control Today, July/August 2005

[44] Wade Boese, "Nuclear Non-proliferation Treaty Sputters", Arms Control Today, July/August 2005.[45] Weapons of Mass Destruction Commission.

[45] Weapons of Mass Destruction Commission. Weapons of Terror: p103. Weapons of Terror: p103.

.[46] Daryl G. Kimball, "Repairing the Regime", Arms Control Today, July/August 2005.

[47] Wade Boese, "Nuclear Non-proliferation Treaty Sputters", Arms Control Today, July/August 2005.

Chapter 2

International Safeguards

Australia's system of bilateral safeguards, as with all bilateral safeguards, relies upon International Atomic Energy Agency safeguards in the first instance.[48] It is therefore worth looking in detail into their history, nature and effectiveness. In fact, bilateral safeguards are an add-on to IAEA safeguards and the system put in place by the IAEA provides the core of any bilateral safeguards agreement.

As noted previously, Article III of the NPT provides the safeguards provisions of the treaty. Article III states:

> *each non-nuclear weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency…for the exclusive purpose of verification of the fulfilment of its obligation assumed under this Treaty with a view of preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other explosive devices.*[49]

Article III goes on to state that the safeguards:

> *shall be implemented in a manner designed to comply with Article IV of this treaty, and to avoid hampering the economic or technological development of the Parties or international cooperation in the field of peaceful nuclear activities.*[50]

According to Article III, the Nuclear Weapon States, such as China, are under no obligation to accept IAEA safeguards over their nuclear facilities.

Article III stipulates that responsibility for implementing the system of safeguards arising from the NPT falls to the IAEA. However, according to the IAEA statute, the agency is also charged with promoting the nuclear industry. Thus the IAEA had an inherent conflict of interest within its directives.

The IAEA operates two different safeguards systems. The pre-NPT safeguards embodied in IAEA document INFCIRC/66[51] still operate in nuclear facilities in states outside of the NPT, such as India. This would be an important point to consider in any assessment of possible export of Australian uranium to India.

INFCIRC/153 represents the model or classical agreement to be reached between the IAEA and NPT state parties. Following the Iraq case in 1992, which demonstrated major weaknesses in this system, a number of additional protocols were adopted to strengthen the system. It should be stressed that these protocols were simply added on to the classical system, so the classical system of safeguards still forms the bedrock of international safeguards arising from the NPT.

2.1.) The Classical System of Safeguards

The term "safeguards" was first employed in 1945 by the US, UK and Canada in a joint declaration that only, "when effective enforceable safeguards" against the use of nuclear energy for weapons purposes were in place would there be any sharing of information to enable cooperation on nuclear energy.[52]

In INFCRIC/153 the IAEA defines the objective of safeguards to be:

> *the timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosives or for purposes unknown, and deterrence of such diversion by risk of early detection.*[53]

[48] David Fischer and Paul Szasz, **Safeguarding the Atom: A Critical Appraisal** (London: Taylor and Francis, 1985), p7.

[49] Robert Mozely, **The Politics and Technology of Nuclear Proliferation**. (Seattle: University of Washington Press, 1998), p284.

[50]can be found online,"The Treaty on the Non-proliferation of Nuclear Weapons", **United States of America, Department of State** http://www.state.gov/t/np/trty/16281.htm. See also Appendix C in Ian Bellany, **Curbing the Spread of Nuclear Weapons** (Manchester: Manchester University Press, 2005). References to the text of the NPT made here are from Bellany.

[51] Available online at http://www.iaea.org/Publications/Documents/Infcircs/Others/inf66.2.shtml

[52] Kokoski, **Technology and the Proliferation**, p147.

[53] Kokoski, **Technology and the Proliferation**, p280.

The objective of the classical system of safeguards is not the prevention of diversion but the detection of diversion *once it has taken place.*

In this sense, the system is meant to operate much like customs operations aiming to deter drug smuggling. Customs does not seek to prevent drug smuggling as to do so would require every traveller on every occasion to be thoroughly searched. Rather, customs seeks to deter smuggling by posing a certain level of risk, too high for the rational traveller, that they would be caught out and duly punished. The effectiveness of such an operation relies on a fear of sanction; deterrence is powerless unless there are negative consequences for transgressions.

This dichotomy between prevention and deterrence renders the term "safeguards" in the context of INFCIRC/153 rather Orwellian. As Parliamentary researcher David Anderson, in a research report for the Senate Uranium Mining and Milling Committee, stated, "public expectation, making, what some would say is a reasonable interpretation of the word safeguards, tends to demand a performance beyond the system's established role".[54]

In addition, note that the safeguards provision of the NPT, Article III, speaks of "preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other explosive devices". INFCIRC/153 and the system of safeguards that derives from it do not live up to Article III, as the document itself clearly articulates.

The IAEA essentially operates three means of employing safeguards, namely material accountancy, containment and surveillance. The IAEA has set a number of technical goals for the objective of timely detection of significant quantities of fissile materiel. A significant quantity refers to 8kg of plutonium, 25kg of U-235 contained in uranium enriched to 20 per cent or more (of U-235) and 8kg of U-233.[55] Timely detection goals are 7–10 days for plutonium or highly enriched uranium in metallic form, 1–3 months for plutonium in irradiated fuel and approximately one year for natural or low enriched uranium. For purposes of "risk of early detection" the agency seeks to achieve a 90–95% probability of detecting diversion and less than 5% probability of sounding a false alarm regarding these significant quantities in the time frames specified.[56]

Material accountancy is essentially a reporting and recording system which measures the inventory and flow of nuclear material in a, "material balance area" (MBA).[57] An MBA may be part of a nuclear plant or a whole plant where all material that passes through, or is present, in the area can be measured.[58] Keeping track of the materiel that flows through an MBA enables the construction of a book value for the amount of material in the MBA. After a specified period an operator performs a physical inventory of the amount of material present in the MBA. A discrepancy between the book value and the physical inventory is referred to as the Material Unaccounted For (MUF) and may represent possible diversion.[59]

The system of material accountancy is complemented by containment and surveillance, but it must be stressed that these are secondary safeguards methods. To verify that material accounts of nuclear material are accurate, on-site inspections are allowed.

As we will see the classical system of safeguards is weak. An important consideration in their design is the desire to limit costs for the nuclear industry, particularly at the insistence of Germany and Japan. The system adopted is sometimes known as the *Karlsruhe interpretation* because the Germans did not want the evolving safeguards system to impact their Karlsruhe fast breeder reactor programme.[60]

The devil is always in the detail and as far as safeguards are concerned these details are called subsidiary arrangements. The subsidiary arrangements are detailed action plans that govern exactly how safeguards are to be implemented in a particular state. Fischer and Szasz observe: "like the agreement itself, the subsidiary arrangements and their facility

[54] David Anderson, "Nuclear Safeguards" in **The Report of the Senate Select Committee on Uranium Mining and Milling in Australia Volume 2 Research Papers**, p215.

[55] Fischer, **Safeguarding the Atom**, p25.

[56] Fischer, **Safeguarding the Atom**, p26.

[57] A Von Baeckmann, "IAEA Safeguards Technology" in Stockholm International Peace Research Institute, **Nuclear Energy and Nuclear Weapon Proliferation (London: Taylor and Francis**, 1979), p181.

[58] Kokoski, **Technology and the Proliferation** ,p150.

[59] Kokoski, **Technology and the Proliferation**, p150.

[60] James Spigelman and Peter Pringle,The Nuclear Barons. (New York: Holt, Rinehart and Winston, 1981), p303.

attachments are a crucial supplement to the safeguards agreement."[61]

In a report by the Office of Technology Assessment of the Congress of the United States on nuclear proliferation and safeguards it was pointed out that:

> *it is now generally accepted that there are unavoidable limitations [emphasis added] on material accountancy because of measurement errors … for nuclear facilities with very large throughputs, cumulative measurement errors on nuclear material will introduce uncertainties in the material balance which exceed by several times the IAEA's own limits on significant quantities of diverted plutonium or uranium which it must detect.*[62]

Walter Patterson, writing in a well-known study on nuclear power, refers to a report by Emmanuel Morgan, a former IAEA inspector, which concluded that, "existing safeguards were incapable of detecting diversion to weapons use of a significant quantity of nuclear material in any state with a moderate to large nuclear establishment."[63] In a standard textbook on the systems and processes of nuclear engineering, Raymond Murray observes: "it is certain that a country that is determined to have a weapon can do so … non-proliferation measures can merely reduce the chance of incident."[64] In other words, safeguards are not actually a high level of assurance that non-diversion of nuclear materials is not technically feasible.

It should also be stressed that increasing evidence is emerging that indicates that the IAEA's stipulation of significant quantities (SQ) is too high. Interestingly Hans Blix, when IAEA Director General, stated that as the SQ rates are lowered, "the cost of the safeguards and the manpower needed for safeguards would increase very quickly as that figure declined".[65] If the SQ rate is indeed too high a proliferator may be able to divert nuclear material to a weapons programme without being detected because the problem posed by measurement error becomes greater. In fact, the total weapons grade plutonium in the US stockpile is estimated to be about 93,000 kilograms. This gives an average of 3-4 kilograms of weapons grade plutonium per warhead, that is sufficient for a nuclear explosive.[66] This is 50 per cent less than the IAEA's SQ level for plutonium.

This is of importance because the entire system relies upon its deterrence function to dissuade proliferation. If the SQ is too high then a would-be proliferator would be less dissuaded from pursuing a nuclear programme and if states are generally aware of this flaw then the confidence provided by the system of safeguards, their primary function, would be worthless.

In the 1970s Inglis stated that the most sensitive points of the fuel cycle from a proliferation perspective, "are those parts of the of the fuel processing plant where the plutonium is separated out, handled, and eventually fabricated into fuel assemblies for trial use in reactors if it does not go into storage or bombs".[67] The Office of Technology Assessment report took a rather dim view of IAEA safeguards in relation to reprocessing. The report concluded that:

> *the eventual effective safeguarding of a large reprocessing plant presents the greatest technological uncertainty of all safeguarding problems facing the IAEA … the detection of diversion from a large reprocessing plant by the present materials accounting systems is not very sensitive to quantities of the order of tens of kilograms, nor, more important, is the detection timely. That is, detection would take weeks or months after the diversion.*[68]

Although plutonium has traditionally been of most concern from a safeguards perspective now highly enriched uranium is increasingly becoming a source of concern. Laser technology is able

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[61] Fischer, **Safeguarding the Atom**, p27.

[62] Congress of the United States Office of Technology Assessment, **Nuclear Proliferation and Safeguards** (New York: Praeger,1977), p206.

[63] Walter C. Patterson, **Nuclear Power** (Harmondsworth: Penguin, 1986), p208.

[64] Raymond L. Murray, **Nuclear Energy: An Introduction to the Concepts, Systems and Applications of Nuclear Processes Third Edition** (Oxford: Pergamon Press, 1984), p333.

[65] Kokoski, **Technology and the Proliferation**, p167.

[66] Steve Fetter, Valery A. Frolov, Oleg F. Orilutsky and Roald F. Sagdeev, "Fissile Materials and Weapon Design", **Science and Global Security** 1990 Vol 1, pp256-257.

[67] David Inglis, **Nuclear Energy: Its Physics and Social Challenge** (Reading, MA: Addison-Wesley, 1973), p59.

[68] Office of Technology Assesment, Nuclear Proliferation and Safeguards, pp209-210.

to selectively excite and separate U-235 in a sample of natural uranium. The facilities needed to achieve this, if successfully further developed, would be much smaller, more modular, simpler and requiring less energy than those traditionally associated with uranium enrichment, could achieve their task more easily and at much lower cost.[69] The challenge this poses for safeguards is clear because smaller enrichment infrastructure would be much more difficult to detect. At the moment, uranium enrichment by laser has not yet been developed and deployed at industrial scale.

For decades, research and development work on laser enrichment has been underway in Australia in the publicly funded nuclear facility at Lucas Heights in Sydney's southeastern suburbs. Originally commenced under the auspices of the Australian Atomic Energy Commission, this work was continued after 1990 by a private company, Silex Systems. In May 2006, Silex Systems and GE Energy announced they had signed an agreement giving GE the right to license and develop the Australian company's laser uranium enrichment technology, and that this development would occur at GE's North Carolina site.[70] Silex Systems claims to expect to bring their technology to market "over the next few years".[71] Work on laser enrichment has been a significant proliferation concern, reflected in the US Dept of Energy (DOE) in 1996 classifying the Silex process as 'Restricted Data', the first publicly known occasion on which privately held technology has been given this highest level of security classification by the US DOE.[72]

The sensitive, inherently dual nature of enrichment technology was highlighted by the then Australian Defence Minister Robert Hill's acknowledgement that dual-use materials from Australia might have been "innocently" exported and used within an unnamed country's nuclear weapons program.[73] As noted by the WMD Commission, "... existing global capacity for enrichment and reprocessing is enough to meet the needs arising from a considerable expansion" [of nuclear power].[74] Active promotion of the possibility of uranium enrichment in Australia, with this history and context, in a global setting of serious erosion of and threats to nuclear non-proliferation, undermines the Australian government's stated commitment to non-proliferation. It does not inspire confidence that continued and expanded uranium exports from Australia will be conducted in a manner which gives highest priority to effectively preventing nuclear weapons proliferation.

It is interesting too to reflect on the economics of the situation. As technology is progressing, costs associated with the sensitive aspects of the fuel cycle, such as uranium enrichment, are decreasing whilst at the same the cost of safeguards in response are increasing.

In sum the technical aspects of safeguards have always been inadequate and although technology has progressed the technical goals of the safeguards system, already insufficient, have stalled.

2.2.) Classical Safeguards and the Iraq Case

Iraq, prior to the 1991 Persian Gulf War, embarked upon an ambitious nuclear weapons programme. Subsequently the 2003 invasion of Iraq was justified as an example of the new doctrine of preventive war (which the Australian Government supports) in order to disarm Iraq. That Iraq did not posses a WMD programme, let alone a nuclear programme, is now well documented.[75]

What is of interest here is the implicit dismissal of the system of safeguards contained within the preventive war doctrine. However, as we shall see, the government talks up the effectiveness of safeguards in relation to the export of Australian uranium. As far as the effectiveness

[69] Greenpeace Australia, Secrets, Lies and Uranium Enrichment: The Classified Silex Project at Lucas Heights (Sydney: Greenpeace Australia, Nov 2004),p18.

[70] Silex Systems Ltd. Silex signs commercialisation and license agreement with General Electric Company for the SILEX uranium enrichment technology. 22 May 2006. www.silex.com.au; accessed 29 Sep 2006.

[71] Silex Systems Ltd. Project and operational update. 12 Sep 2006. www.silex.com.au; accessed 29 Sep 2006.

[72] Greenpeace Australia, Secrets, Lies and Uranium Enrichment: The Classified Silex Project at Lucas Heights (Sydney: Greenpeace Australia), p12.

[73] J Boureston, CD Ferguson. Laser enrichment: separation anxiety. Bull Atomic Scientists 2005;Vol 62, no. 2 p14-8.

[74] Weapons of Mass Destruction Commission. Weapons of Terror: Freeing the World of Nuclear, Biological and Chemical Arms,Stockholm, Sweden, 1 June 2006 p74. www.wmdcommission.org

[75] See, "Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD September 30 2004" online at http://www.cia.gov/cia/reports/iraq_wmd_2004/index.html

of safeguards goes, the Iraq case demonstrates that the government's position is rather inconsistent.

Revelations about the pre-Gulf War Iraqi weapons programme prompted the IAEA to declare that Iraq had violated its safeguards agreements by its programmes to enrich uranium and produce plutonium.[76] The original agreement between Iraq and the IAEA specified that two inspections per year were to be carried out in four facilities at Al Tuwaitha. Prior to Iraq's invasion of Kuwait, a total of 25 inspections by 13 inspectors had been carried out. After the invasion the IAEA-conducted inspections were carried out at Al Tuwaitha, which gave Iraq a clean bill of health. It was subsequently discovered that Iraq had, undetected, separated a small amount of plutonium at a safeguarded facility.[77] On 9 August 1991 the IAEA announced that Iraq had clandestinely produced and separated plutonium at another safeguarded facility, the IRT-5000 reactor.[78]

It should be stressed that we know of these violations of safeguards not via subsequent IAEA inspection but by the special inspections that were carried out pursuant to United Nations Resolution 687. Special inspections are permitted by INFCIRC/153 but were not carried out prior to the 1991 Persian Gulf War. The nature of special inspections is concerned with uncovering the existence of undeclared facilities, in this case uranium enrichment facilities, but to do this the inspecting agency would naturally need to be in possession of information pointing to their existence. As Hans Blix pointed out, the subsequent discovery of Iraq's programme decisively depended upon this intelligence.

The high level WMD Commission, which included amongst its number William Perry (former US Secretary of Defence) and former Australian Foreign Minister Gareth Evans, concluded that:

> *the IAEA safeguards system, created to verify that no nuclear material is diverted from peaceful uses, proved inadequate to discover the Iraqi and Libyan violations of the NPT. Iran failed for many years in its duty to declare important nuclear programmes.*[79]

Libyan violations were discovered only when Tripoli decided it was in its interests to come clean.[80] Furthermore, the WMD Commissioners state:

> *while IAEA safeguards inspections revealed that declarations by North Korea regarding its holdings of plutonium were misleading, they failed to discover the efforts of Iraq and Libya to develop nuclear weapons. They also did not discover the failure of Iran to respect all its safeguards obligations.*[81]

Any rational observer would judge the effectiveness of safeguards precisely on the basis of these difficult cases. As the WMD Commission attests, the system of safeguards has failed to prevent but also, more importantly, deter determined proliferators, and certainly it has a poor track record in detecting them. This provides empirical justification for in-principle critiques of the classical system of safeguards. In fact after the 1981 Israeli air strike against the Osiraq nuclear reactor (supplied by France), Iraq decided upon the highly enriched uranium path to the bomb whilst "appearing to remain in compliance with the nuclear Non- Proliferation Treaty."[82]

The Iraq case is particularly disturbing because Baghdad used the NPT as a shield behind which it pursued its nuclear ambitions without being caught by the IAEA, and with a degree of knowledge by member states of the IAEA. Demonstrating that the NPT may effectively legitimate development and acquisition of the means for proliferation.

Even if the system of safeguards were technically adequate, wider political, economic and strategic concerns can easily render them useless. Sadly, they are not even technically adequate.

2.3) The Additional Protocol

With the Iraq case in mind the IAEA's member states have constructed a voluntary addition to the model safeguards agreement known as the additional protocol. They are not root and

[76] Kokoski Technology and the Proliferation,p97.

[77] Kokoski, Technology and the Proliferation,p 101

[78] Kokoski, Technology and the Proliferation, p104

[79] WMD Commission, Weapons of Terror,p24

[80] Butfoy, Disarming Proposals, p44.

[81] WMD Commission, Weapons of Terror,pp52-53.

[82] Jeffrey Richelson, Spying on the Bomb: American Nuclear Intelligence from Nazi Germany to Iran and North Korea (New York: W.W. Norton & Company, 2006), pp322-323.

branch changes of INCIRC/153 but contain additional measures that, it was hoped, would prevent a repeat of the Iraq case. They modify to a certain extent the Karlsruhe interepration of INCIRC/153. The Additional Protocol makes four key modifications to the classical system of safeguards.

Firstly, states must provide an expanded declaration of nuclear activities on a much broader array of nuclear related activities. Secondly, the number and nature of facilities that the IAEA has access to must be increased to cover any location that the Agency sees fit. In effect the Agency has the right to conduct short notice inspection of all facilities, including undeclared facilities. Thirdly, inspectors are to be given visas on a more prompt basis and for 12 months duration. Lastly, the Agency has the right to conduct environmental sampling at both declared and undeclared sites.[83]

By strengthening the system of IAEA safeguards the Agency weakens state sovereignty, further demonstrating the contradiction between the over arching non-proliferation imperative and the system of sovereign states. Any non-proliferation regime is effective to the extent that it erodes state sovereignty. However, as Deadly Arsenals points out the Additional Protocol "cannot prevent a determined state from acquiring a nuclear weapons capability".[84] In this the WMD Commission supports the authors.[85]

Although the classical system of safeguards is strengthened by the Additional Protocol, the system is still subject to the inherent limitations of the system of classical safeguards precisely because they are simply additional to it. They do not replace it nor provide for major change. They also are limited to yesterday's problem, like the army that is forever doomed to prepare for the last war.

The Additional Protocol do not address the in-principal critique of the classical system of safeguards, nor can they given their status. In fact, as the Office of Technology Assessment of the United States Congress stated these limitations are "unavoidable". This is because safeguards still relies upon material accountancy which, as noted, are subject to error. They fail to address the political reasons for the failure to deal with Iraq's nuclear weapons programme, which were of decisive importance.

Furthermore, of the 189 countries that are party to the NPT, 118 still do not have Additional Protocol in force.[86].

2.4) Conclusion

Given the complementary and inextricable relationship between the peaceful and military atom, the only effective safeguards against the proliferation and eventuality of use of nuclear weapons are the combination of abolition of nuclear weapons, securing fissile materials and the capacity to produce them, and phasing out of nuclear power.

Photo: Uranium Street, Broken Hill, NSW Source: Friends of the Earth

[83] Joseph Cirincione, Jon B. Wolfstahl, Miriam Rajkumar, Deadly Arsenals: Nuclear, Biological and Chemical Threats (Washington DC: Carnegie Endowment for International Peace, 2005), p31.

[84] Cirincione et al, Deadly Arsenals, p32.

[85] Blix, Weapons of Terror, p53.

[86] Mohamed ElBaradei. Putting teeth in the nuclear non-proliferation and disarmament regime. 2006 Karlsruhe Lecture, Karlsruhe, Germany, 25 March 2006. Available at www.iaea.org.

Chapter 3

Australian Safeguards

From 1969, Australian mining companies undertook large scale uranium exploration activities. In the years immediately afterward a number of significant uranium deposits were discovered which, "galvanised Australia's volatile stock exchanges into a frenzy. Uranium was once again the new glamour mineral."[87] The enthusiasm of the stock market was premature for the price of uranium was quite low, in fact producers could hardly recover costs. The strategy adopted in light of this by the Whitlam government under minerals Minister Rex Connor was to hoard Australia's uranium in anticipation of an upswing in the price. By 1974 the mining companies all sought a relaxation of this policy. A factor in the increasing fortunes of uranium was the 1973 oil-based supply side shocks. As Broinowski points out, the mining companies were none too enthusiastic about an international safeguards regime that would inhibit sales.[88] Safeguards are a cost to business and there will always be an imperative to lower costs to the maximum extent possible.

This is an important point firstly because, although nuclear matters were initially dominated by states, over time commercial entities have increasingly entered and shaped the nuclear business. Secondly, it will be a significant point to consider in the context of the decision to export uranium to China.

As the price went up, the mining industry placed pressure on the Whitlam government to allow the mining and export of uranium. However, the government was required by the 1974 *Environmental Protection (Impact of Proposals)* law to conduct an inquiry into the environmental impact[89]. The government duly set up a commission toward this end in relation to uranium mining chaired by Justice Russell Fox. The incoming government of Malcolm Fraser inherited this inquiry and decided not to proceed with the export of uranium until this commission delivered its report[90]. The Senate Uranium Mining and Milling Committee acknowledged that "policy governing control of international aspects of exporting uranium again had its recent origins in the Fox Report."[91]

3.1) The Fox Report

The commissioners examined the proposal to mine and export uranium with respect to environmental, Indigenous and international issues. In the preface to their report the commissioners note:

> *it was submitted also that extension of the nuclear power industry involved increased risks of nuclear war, flowing from the availability of plutonium, or highly enriched uranium, for atom bombs. It was submitted that because of all those considerations, and others as well, Australia should not sell its uranium, or mine it.*[92]

The Fox Report's discussion of safeguards can be divided into two parts, those that discuss the international safeguards regime and recommendations as to what safeguards should be attached to Australian uranium.

The Fox Report begins its discussion of international safeguards by noting:

> *IAEA safeguards have been shaped by the nature of specific problems and by the degree to which countries will permit their nuclear industries to be regulated ...these safeguards normally apply to particular facilities rather than to all facilities in a country …experience with IAEA safeguards demonstrates that countries have not been prepared to accept continuous surveillance of nuclear activities by an external authority… [Therefore] the control system established*

[87] Alice Cawte, Atomic Australia 1944-1990 (Sydney: University of New South Wales Press, 1992), p137.

[88] Richard Broinowski, Fact or Fission? The Truth About Australia's Nuclear Ambitions (Melbourne: Scribe Publications, 2003), p102.

[89] Cawte, Atomic Australia, p151.

[90] Cawte, Atomic Australia, p151. Broinowski, Fact or Fission, p125.

[91] Senate, Uranium Mining and Milling, p137.

[92] Justice Russell Walter Fox, Ranger Uranium Environmental Inquiry First Report (Canberra: Australian Government Publishing Service, 1976), p v.

by the Agency involves accounting methods augmented by regular 'on the spot' inspections.[93]

Crucially, the commissioners note:

the NPT requires safeguards to be applied to all 'source' or 'special fissionable material' used in all peaceful nuclear activities within the territory of a country" but "in fact, as described later, safeguards are not applied to source material….

Hence:

if Australia, being party to the NPT, were to sell a quantity of yellowcake to a non-nuclear weapon state also party to the Treaty, such as Japan, there would be an obligation on each to report the transfer to the IAEA, but no accounting or other safeguards would be imposed. … a state can, in this way, acquire quantities of material which are not subject to any significant controls, and which may be diverted to weapons production.[94]

For these reasons, the report stated that IAEA safeguards may provide only an "illusion of protection."[95]

Having provided an outline of the system of safeguards as they then existed, the classical system as discussed above, the commissioners proceed to discuss some of the serious weaknesses inherent within them. They do so by first providing an interesting overview of Article IV of the NPT. While advocates of uranium mining argue that Article IV obliges Australia to sell uranium, the commissioners stated, "we have been advised, and we accept, that this Article does not create a binding legal obligation, and in particular does not bind Australia to mine its uranium and sell it to any particular country, or at all."[96] However, in the section of the report that adopts a favourable position on mining it states, "a total refusal to supply would place Australia in clear breach of Article IV of the NPT and could adversely affect its relation to countries which are parties to the NPT."[97] A clear contradiction. The decision to proceed with the sale of Australian uranium is based on faulty analysis.

The liberal withdrawal provisions of the NPT particularly exercised the commissioners. They argued that "this is undoubtedly a serious limitation on the operation of the NPT and of most safeguards arrangements." They point out "there are in existence, however, an increasing number of agreements which provide additional or 'back-up' safeguards if the state which has received nuclear materials or facilities does withdraw from NPT and IAEA safeguards."[98] We will return to this point later, which is of relevance in relation to China.

The Fox Report notes that "the NPT does not prohibit the further transfer of materials by a receiving state to a third state, and is not entirely satisfactory in the provision it makes for safeguards on such retransfers."[99] If a NNWS party to the NPT decides to re-transfer yellowcake to another such state, no safeguards need be attached to this transaction, the commissioners note alarmingly.

The report also makes a number of interesting remarks on demand side issues, for instance, "for many states in Africa, Asia and the Middle East, there is a genuine fear that the United States might actively interfere upon their territory."[100] A consistent Australian non-proliferation policy would seek to dampen this aspect of the proliferation problem. Instead, Australia continues to contribute to the problem as a willing partner of such active interference, and structures its military capacity with a view to making it inter-operable with forwardly engaged US forces.

The commissioners finally conclude by pointing out that "not only must Article IV be more restrictively inter-related, but Article III must be replaced by a more complete set of safeguards requirements."[101]

The Fox Report therefore recommended:

any nuclear resources transferred by one state to another should be subject to international safeguards. …safeguards should be extended in practice to cover source material (including yellowcake). …Australian

[93] Fox, Ranger, p119 - 120.
[94] Fox, Ranger,p131.
[95] Fox, Ranger, p147.
[96] Fox, Ranger,p126.
[97] Fox, Ranger, p180.
[98] Fox, ranger,p128.
[99] Fox, Ranger, p130.
[100] Fox, Ranger, p139.
[101] Fox, Ranger, p147.

> *uranium should not be retransferred by a recipient state to a third state under conditions less stringent than those imposed by Australia on the first recipient state. …we conclude that nuclear materials should be supplied to a state only on the basis that its entire industry is subject to back-up safeguards that cannot be terminated by unilateral withdrawal.*[102]

Australia should not "supply countries which are not parties to the NPT."[103], [104] The commissioners recommended:

> *Export should be subject to the fullest and most effective safeguards agreements, and be supported by fully adequate back-up agreements applying to the entire civil nuclear industry in the country supplied. Australia should work to the adoption of this policy by other suppliers.*[105]

The commissioners also recommended that controls and regulations governing sale of uranium should "enable discretion to be exercised in the selection of the countries to be supplied and in the extent to which they should be supplied. …we recognise that the exercise of such discretion may create problems in international relations."[106] Recognising that discrimination is not allowed by the terms of the NPT (Article IV). So, the recommendation for mining is based on a desire to avoid Australia being "in clear breach" of Article IV by precisely violating Article IV.

There is much to be said for a discriminatory policy from a non-proliferation perspective but notice that once a decision is made to supply nuclear material at all, such as uranium, one cannot discriminate to remain compliant with the NPT. To avoid the dilemma it would be best not to mine and export at all.

3.2) The Fraser Government's Response

In 1977 the Fraser Government both formally responded to the Fox Report and announced its decision to allow the mining and export of Australian uranium. In so doing it announced a number of safeguards policies that have formed the philosophical core of Australian policy since.

Mr Fraser stated to Parliament: "the Government has taken its decision with a deep sense of international responsibility. …commercial considerations were not the dominant motive in our decision. In themselves they would not have been sufficient."[107] Fraser cited the contradictory passage of the Fox Report cited above to note, falsely, that the export of uranium would give effect to Australia's obligations under Article IV.[108]

However, in so doing:

> *the Government accepts that uranium is a special commodity, the export of which would involve important considerations of a kind not involved in the export of other commodities. This implies a requirement for selectivity in the choice of customer countries and the closest attention to ensuring adequate safeguards.*[109]

In his speech Fraser went on to claim, "regarding existing nuclear weapon states, they are not obliged under the NPT to renounce nuclear weapons or accept international safeguards."[110]

The Government falsely claimed Australia must supply uranium because it is obligated by Article IV but that it would do so in a selective fashion, thereby violating Article IV, whilst operating under the assumption that Article VI does not exist at all. The legal position adopted by the Government was highly questionable.

The specific components of the Government's policy of particular significance were:

[102] Fox, Ranger, pp148-149.

[103] Fox, Ranger, p179.

[104] Fox, Ranger, p185.

[105] Fox, Ranger, p 185

[106] Fox, Ranger, p182.

[107] Malcolm Fraser, "Statement by the Prime Minister the Right Honorable Malcolm Fraser" in Uranium: Australia's Decision (Canberra: Commonwealth of Australia, 1980), p3.

[108] Fraser, "Statement", p2

[109] Malcolm Fraser, "Government Policy on Nuclear Safeguards" in Uranium: Australia's Decision (Canberra: Commonwealth of Australia, 1980), p2.

[110] Fraser, "Government Policy", p3.

• Sales of uranium would be made to non-nuclear weapon states party to the NPT and to nuclear weapon states that provide assurance that Australian uranium would not be diverted for military use.[111] Note that the Fox Report recommended that only states party to the NPT should be eligible for Australian uranium.

• Australian uranium should attract IAEA safeguards as soon as it leaves Australian ownership

• Australia would require that a recipient country of Australian uranium sign a bilateral safeguards agreement with Australia. "These bilateral agreements will provide a framework for direct and binding assurances by importing countries to the Australian Government in relation to the use and control of uranium supplied by Australia or nuclear material derived from its use."[112] Bilateral agreements are to have a provision dealing with fall back safeguards in case of NPT withdrawal.

• Australian uranium or material derived from its use should be safeguarded throughout the full life of the material.

• The transfer of Australian uranium to a third party would require Australian consent. By not stimulating that the third party should have safeguards at least as stringent as the recipient party,[113] this would, in principle, enable a NNWS to transfer Australian material to a NWS with a more permissive safeguards regime.

• Uranium is not to be enriched beyond 20 per cent U-235 without Australia's consent. No verification procedures are attached to this clause, other than IAEA safeguards that, as shown, have too high SQ objectives. The provision is symbolic only, as a likely proliferator would not seek Australia's consent to engage in weapons manufacture.

• Any reprocessing of nuclear material derived from the use of Australian uranium is to be conducted only on the basis of Australia's prior consent. It should be stressed that this occurs in the context of a Government policy that opposes "excessive stockpiling of plutonium in a way that could pose future proliferation dangers."[114] The capacity to reprocess is an important commercial consideration. If this were to be enforced on a case-by-case basis it would have negative impacts commercially.

• Importing countries are to put in place adequate physical protection and control measures

• Contracts between commercial entities are to contain a clause stating that the export of uranium is subject to Australia's safeguards policy as contained in bilateral agreements; and the relevant government to government safeguards agreement should be concluded before negotiation of commercial contracts.

These provisions provide the principles that underpin Australia's bilateral safeguards policy.

3.3) The 1984 ASTEC Review

The newly-elected Labor Government of Prime Minister Bob Hawke in 1983 commissioned a report by the Australian Science and Technology Council on Australia's Role in the Nuclear Fuel Cycle. The report was unremarkable, serving to buttress the export policy of the previous Government within a deeply divided Labor Party, at least as far as uranium policy was concerned.

The Australian Science and Technology Council (ASTEC) Review concluded that the:

> *overall 1977 policy is comprehensive and meets the objectives of providing a high degree of assurance that Australia's uranium will not be used for nuclear explosives or diverted to military use and that it will remain within the jurisdiction of those countries with which we have a bilateral safeguards agreement in force.*[115]

Given this contention the review did not recommend any significant changes to Australia's safeguards policy.

However, there is a fascinating discussion about Administrative Arrangements (AAs) that is surely of relevance in the China context. The review notes: "the Administrative Arrangement is a little known aspect of Australia's safeguards approach, although the development of detailed

[111] Fraser, "Government Policy", p3.

[112] Fraser, "Government Policy", p3.

[113] Fraser, "Government Policy", p4.

[114] Fraser, "Statement", p6.

[115] Australian Science and Technology Council (ASTEC), Australia's Role in the Nuclear Fuel Cycle (Canberra: Australian Government Publishing Service, 1984), p171

arrangements is an Australian idea."[116] These AAs are government to government agreements of less than treaty status. They are also a manual of procedures that, "ensures that each party knows what it must do to meet its obligations and that the other party will be satisfied with this."[117] In essence AAs "specify in detail how the relevant safeguards agreement is to be implemented."[118]

Of concern is "they are also working documents which can be changed at short notice as the practices and processes they address are changed."[119] AAs are little known because they are *"classified as safeguards in confidence."*[120] That is, they are state secrets.

The ASTEC Review recommended that AAs should be made public, arguing that neither non-proliferation nor commercial reasons should prevent public disclosure.[121] That being the case the only plausible reason for non-disclosure must be fear of public opinion. AAs are still secret documents. Governments have claimed that this is at the unfortunate insistence of Australia's bilateral partners but Canberra has always claimed that uranium should be exported because this gives Australia leverage to advance non-proliferation goals.

The continued secretive nature of Administrative Arrangements, if indeed at the insistence of Australia's uranium trading partners (most especially Japan), suggests where leverage really lies.

3.4) The Nuclear Non-proliferation (Safeguards) Act 1987

The 1987 Nuclear Non-Proliferation (Safeguards) Act gives legislative effect to Australia's domestic obligations under the NPT, under its safeguard's agreement with the IAEA, Australia's bilateral agreements on the transfer of nuclear material and the Convention on the Physical Protection of Nuclear Material.[122] It does not alter the philosophical core of the 1977 safeguards policy and places the Director of Safeguards in the Department of Foreign Affairs and Trade on a statutory footing.[123]

3.5) The Operation and Effectiveness of Australian Safeguards Policy

The physical basis of Australian safeguards policy can be found in two principles; the principles of equivalence and proportionality. The Australian Safeguards Office (ASO) in its submission to the Senate Uranium Mining and Milling Committee provided detailed description of the workings of these principles. It bears quoting at length from this submission.

The ASO declared:

> *the large scale physical and chemical processes which nuclear material from a variety of sources must undergo at a limited number of processing facilities means that it is impossible to track the identity of individual atoms or quantities of nuclear material. …this circumstance has led to the development of two principles used universally in the industry and in the application of safeguards: equivalence and proportionality.*

The equivalence principle:

> *provides that where Australian Obligated Nuclear Material (AONM) loses its separate identity because of process characteristics, e.g., mixing, an equivalent quantity is designated as AONM, based on the fact that atoms or molecules of the same substance are indistinguishable, any one atom or molecule being identical to any other of the same substance.*

The principle of proportionality "provides that where AONM is mixed with other nuclear material, and is processed or irradiated, a proportion of the resulting material will be

[116] ASTEC, Australia's Role, p168.
[117] ASTEC, Australia's Role, p168.
[118] ASTEC, Australia's Role, p168.
[119] ASTEC, Australia's Role, 170.
[120] ASTEC, Australia's Role, p168.
[121] ASTEC, Australia's Role, p170.
[122] The Act is online at http://www.austlii.edu.au/legis/cth/num_act/nnal987a81987391/
[123] Anderson, "Nuclear Safeguards", p227.

regarded as AONM corresponding to the same proportion as was AONM initially."[124]

In the ASTEC Review's terms, "if a core loading of a light water reactor compromises half Australian uranium and half of another origin, then half the spent fuel is designated to be Australian origin and any products separated from such spent fuel are apportioned in the same manner."[125]

The submission goes on to state:

> *a simple banking analogy illustrates these principles. Individual depositors use an accounting system to be sure that they are correctly credited with their share of a bank's assets, but they do not expect to withdraw the exact notes and coins they originally deposited. Nuclear materials accountancy tracks exports of Australian uranium in the same way. …the application of the equivalence and proportionality principles provides Australia with the assurance that at all times a quantity of nuclear material precisely equivalent to the quantity exported is identified as being subject to Australian safeguards and treated and accounted for as AONM.*[126]

Thus, under the principles of equivalence and proportionality, it is not Australian uranium or Australian Sourced Nuclear Material (ASNM) which is actually tracked, but an amount equivalent to the amount exported, hence the phrase "obligated nuclear material". One would not notice this by looking at the public record as Leaver points out "ever since the export of uranium was permitted by the Fraser Government, all statements on the issue of safeguards by successive governments have created the impression - wrong though it now turns out to be - that 'physical tracking' of AONM is possible and is ensured through safeguards policy."[127] Undoubtedly the over-selling of safeguards has occurred under the backdrop of great public concern about the international implications of uranium mining.

Nothing has changed in this respect. So, the Howard Government's own public memorandum (what is called here "the talking points memo") on the export of uranium to China states that the agreements "ensure that any nuclear material transferred between Australia and China will be used solely for peaceful, non-military purposes."[128] Clearly the principles of equivalence and proportionality do not provide for this, as the above discussion outlines. Only an amount equivalent and proportional to that exported, allegedly, is to be safeguarded. The actual material transferred itself cannot be characterised in the above terms. AONM is defined as "Australian uranium and nuclear material derived from it, which is subject to obligations pursuant to Australia's bilateral safeguards agreements." AONM, according to the ASO's own submission to the Senate, is not Australian uranium.

David Anderson, the Senate Committee's researcher, pointed out:

> *it does seem that Australian governments have been, on occasions, simplistic in major public statements on this matter of peaceful use, and have given unrealistic assurances…. it is likely that most people interpret the 'peaceful purposes' requirement in literal terms, and believe that uranium mined in Australia could never enter a weapon.*[129]

The 1984 ASTEC review stated that, because of equivalence and proportionality, the argument, "that Australian uranium cannot be accounted for as such. This view is understandable. However, in practical terms, the argument is not sustainable".[130]

Contrary to the ASTEC report, the argument is quite sustainable. Australian origin uranium cannot be accounted for as such. In May 2004 the United States alleged, based on uranium forensics, that Libya obtained uranium from North Korea. This was based on the analysis of the isotope U-234. Although the ratio of U-235 and U-238 is the same for virtually all natural uranium the "abundance of U-234 varies among uranium mines, allowing the origin of the uranium to be determined, in principle." However, "the concentration of U-234 can be varied enough to obscure the origin of the uranium."[131]

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[124] Senate, Uranium Mining and Milling, p143.

[125] ASTEC, Australia's Role, p170.

[126] Senate, Uranium Mining and Milling, p143.

[127] Leaver, "The NUKEM Scandal", p45

[128] Department of Foreign Affairs and Trade, "Australia-China Nuclear Cooperation Agreement: Frequently Asked Questions", online at http://www.dfat.gov.au/geo/China/treaties.faq.html

[129] Anderson, "Nuclear Safeguards", p223.

[130] ASTEC, Australia's Role, p169.

[131] Lucas Royland, "Commentary on Uranium Forensics", Federation of American Scientists at www.fas.org/main/content.jsp?formAction=297&contentId=489

The way in which the principles of equivalence and proportionality work are set out in the AA's. This means that their application in relation to Australia's uranium exports are secret and can be changed at short notice.

In the 1980's a scandal involving Australian uranium, known as the "NUKEM scandal", exposed serious deficiencies in the operation of Australia's safeguards principles.[132] NUKEM is a German based corporation. The scandal contains a number of important lessons of direct relevance to the export of uranium to China. During the course of the political fallout surrounding this scandal, the Hawke Government was forced to elaborate on the principle of equivalence for the first time.[133]

The scandal involved a number of NUKEM practices that were brought to light via leaked internal documents. NUKEM had a contract to supply a joint British-French research reactor with highly enriched uranium. NUKEM was interested in finding some nuclear material to facilitate this contract. Now, NUKEM's Luxembourg affiliate had 2.9 tonnes of uranium scraps, essentially a mixture of uranium oxides enriched to 2.25% U-235 and which were due to be converted to Uranyl Nitrate Hexahydrate. It was proposed that these scraps be loaned to NUKEM, and exchanged for 1.29 tonnes of Australian origin uranium hexafluoride (UF_6) and 2.4 tonnes of un-enriched uranium. However, the obligations attached to these materials were also to be swapped so that NUKEM's quantity of Australian UF_6 was no longer covered by Australian safeguards. NUKEM sought to do this because it did not want to gain Australian consent for the transfer because of the 20% enrichment clause in Canberra's safeguards policy. This was done purely for commercial reasons. In exchange, Australian safeguards were to be applied to the uranium scraps rather than to the Australian UF_6.

When this and other aspects of the scandal were brought to public attention by diligent Parliamentary activism on the part of Australian Democrats Senator Sanders, the Hawke government sought to restore confidence in Australia's uranium export policy via the principle of equivalence.[134] The principle was invoked because at all times, it was maintained, an amount equivalent to the amount exported was subject to Australian safeguards.[135] Very early on in the debate surrounding the scandal the Government maintained that the French civil and military fuel cycles (France was the ultimate destination for the Australian UF_6) were separate, but after probing questions by Senator Sanders, was forced to admit that no such distinction applies.[136]

The Howard Government repeats the mantra in relation to the export of uranium to China.[137] In relation to the NUKEM scandal this coupling between the military and civil fuel cycles means that one cannot guarantee that the Australian UF_6 was not used in the French military programme even though some other amount of uranium was designated as Australian under the principle of equivalence.

The NUKEM scandal does have important lessons directly bearing on the China case. The scandal was brought to light by an internal whistleblower and via the German news periodical *Der Spiegel*. China is an authoritarian state with a poor track record on human rights. Any internal whistleblower is likely to face serious consequences for revealing what Chinese authorities would regard to be as state secrets. It is quite possible that any Chinese person who should reveal the secretive AA's with Australia could face the death penalty. Media restrictions in China are severe; the likelihood is low that any information or documents revealing corrupt practices or breaches of safeguards in relation to AONM in China would be made public or available for independent scrutiny. Those involved in releasing such information could expect to face extreme repression and personal danger.

It is interesting to reflect that the head of the Australian Safeguards and Non-proliferation Office, John Carlson, claims that the Australian safeguards system ensures that AONM is always accounted for, never used for weapons purposes and in no way contributes to military programmes[138] In reality, the only perfect safeguards policy that meets Carlson's three criteria is refusal to mine and export Australian uranium.

[132] See Campaign for Nuclear Disarmament on NUKEM at http://www.cnduk.org/pages/bioinfo/nukem.html

[133] Leaver, "The NUKEM Scandal", p9.

[134] Leaver, "The NUKEM", p34

[135] Leaver, 'The NUKEM", p35.

[136] Leaver, "The NUKEM", p39.

[137] In its talking points memo. See note 144.

[138] Broinwski, Fact or Fission, p257.

3.6.) Australian Safeguards and Commercial Considerations

Despite the fact that Australia's decision to export uranium was couched in moralistic terms in reality commercial considerations have always been a dominant concern, to the detriment of safeguards policy.

One can see this clearly in the first pillar of Australian safeguards policy announced by Malcolm Fraser. Recall that this stipulated that uranium is to be exported to NNWS states party to the NPT and to NWS that have a safeguards agreement with the IAEA. The Fox Report called for uranium to be exported only to states party to the NPT. This policy of diluting the Fox recommendation was made clearly with the aim of allowing the sale of uranium to France.[139] France had a large scale nuclear power industry, and therefore it was always going to be one of the main buyer states on the world uranium market. Adopting the Fox recommendation would have excluded Australia from this market.

One of the most serious dilutions of Australian safeguards policy occurred in relation to reprocessing. The clear implication of the policy announced by the Fraser Government was that the spent fuel resulting from the use of Australian uranium was to be reprocessed to extract plutonium (Australian Obligated Plutonium or AOPu) only with Australia's consent on a case-by-case basis. Although sensible from a non-proliferation viewpoint, a ban on reprocessing would have been more appropriate and effective. In 1981 the Fraser government decided to provide advanced consent for reprocessing, known as *programmatic consent*, following pressure from recipient states, especially Japan.[140]

Programmatic consent to reprocessing has enabled Japan, supplied with Australian uranium, to stockpile plutonium. This is widely regarded as a grave proliferation risk. It is in fact a form of proliferation itself. Stockpiling plutonium can be seen to constitute a virtual nuclear arsenal, seriously complicating the strategic planning of neighbouring states who perceive that they are in a position of existential deterrence with the stockpiling state. It is quite possible that this is a factor in the development of the North Korean nuclear programme. For Japan, there was a deliberate policy from the late 1960s to acquire fissile material for nuclear weapons, along with the means to deliver them.[141] In 2005, Japan's stockpile of plutonium was 45 (metric) tons, sufficient for over 1000 nuclear weapons – a five-fold increase from the early 1990s. With the recent licensing of the Rokkasho-Mura reprocessing plant, Japan's plutonium stockpile could potentially reach 145 tons by 2020.[142]

By exporting large amounts of uranium to Japan and allowing for the stockpiling of plutonium Australia has made an important contribution to nuclear proliferation in Asia and deleteriously impacted the security environment in Northeast Asia.

Although the issue of the mid-1980s terms of trade crisis and the sale of uranium to France has attracted great attention and debate over the years, another case is of direct relevance to China. Broinowski points out that, "driven by a parlous current account deficit, Australian ministers wanted every possible option for selling uranium to Taiwan examined."[143]

A Foreign Affairs Department interdepartmental committee recommended a number of ways to sell uranium including "a framework safeguards agreement with China embracing provisions for Taiwan."[144] However, the then Minister for Foreign Affairs, Bill Hayden, wrote to the Trade Minister, John Dawkins, that he could find no way to export uranium to Taiwan that was "neither contrary to the law nor a blatant evasion of our legal obligation."[145]

On 4 April 2006, *The Financial Times* reported that "two Australian mining companies have signed contracts to sell uranium to Taiwan, it was revealed Tuesday, a day after Canberra had sealed an agreement paving the way for uranium exports to China."[146] In a press release announcing the decision to allow the sale of uranium to Taiwan the Minister for Foreign Affairs, Alexander Downer, announced that, "Australia does not recognise Taiwan as a state and it is therefore not possible to negotiate a bilateral safeguards agreement with Taiwan."[147]

[139] Brioinowski, Fact or Fission, pp144-145, p150-151 and p179.

[140] Brionowski, Fact or Fission, pp150-151 and p179.

[141] Frank Barnaby & Shaun Burnie. Thinking the unthinkable. Japanese nuclear power and proliferation in East Asia. Oxford: Oxford Research Group and Tokyo: Citizens' Nuclear Information Center, August 2005:p6-7. www.oxfordresearchgroup.org.uk

[142] Frank Barnaby & Shaun Burnie. Thinking the unthinkable. 2005, p6-8.

[143] Broinowski, Fact or Fission, p181.

[144] Broinowski, Fact or Fission, p182.

[145] Broinowski, Fact or Fission, p182.

[146] "China 'Comfortable' with Australia-Taiwan Nuclear Ties", The Financial Times April 4, 2006.

[147] Alexander Downer, "Safeguards Arrangements for Uranium Exports to Taiwan 13 August 2001", Media Release. Online at http://www.dfat.gov.au/media/releases/foreign/2001/fa124_01.html

Taiwan is not a party to the NPT and Australia has refused to sign a bilateral safeguards agreement with Taiwan. These are two basic violations of Australian safeguards policy. They provide another example of commercial considerations outweighing non-proliferation concerns in relation to China. Canberra has refused to sign a bilateral safeguards agreement with Taiwan in order to appease Beijing, given China's strong stance on any form of recognition of Taiwan.

It also sets precedent for the much speculated possibility of proceeding with the sale of uranium to India. *The Age* has reported that "competition between the super-charged growth economies of India and China for long-term secure uranium supplies is heating up, with India's state owned Nuclear Power Corp revealing it has approached uranium companies in Australia and Canada."[148] Furthermore, Prime Minister John Howard has recently suggested, "that Australia's ban on sales to India could be lifted, because of US plans for India to come under international supervision." This would require a further basic repudiation of long standing Australian safeguards and non-proliferation policy.[149] The recent nuclear co-operation agreement between New Delhi and Washington seriously dents the global nuclear non-proliferation regime.

One interesting aspect of the deal that weakens the non-proliferation regime is the provision of the Nuclear Suppliers Group (NSG) that calls for nuclear trade only with NNWS that accept full scope safeguards. The US has announced that it will seek to obtain clearance from the NSG to exempt India from this rule. Australia could block the deal by voting against it at the NSG. It will be interesting to see how Australia will eventually vote on the issue.

In relation to exporting uranium to India one must consider, for instance, Article III of the NPT, that is, the safeguards provision of the treaty. It states under Article III (2):

> *…Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this article…*

Article III (1) states in part:

> *…The safeguards required by this article shall be applied to all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere…*

In other words Australia, to be NPT compliant, can only export uranium to a non-nuclear-weapon state (India is not a recognised nuclear-weapon state under the NPT) if it accepts full scope INFCIRC/153 safeguards. India has rejected this and has called for "India specific safeguards" in negotiations with the United States.[150]

Secondly, the US deal with India will entail sweeping changes to a whole raft of US non-proliferation laws. Most importantly, however, under the deal India would be treated as a de facto nuclear-weapon state outside of the NPT. Recall that the NPT calls for the nuclear weapon states to pursue disarmament. As Butfoy points out the aim of the Treaty was to restrict nuclear weapon status to "an exclusive club of members". With the US-India deal the NPT would have failed to even achieve this limited objective.

The selective and inconsistent approach being taken in relation to India has significant negative implications for the already seriously strained integrity and status of the NPT, and for the erosion of the incentives for states to adhere to it. The Australian government's push towards uranium sales to India can only contribute to this potentially fatal undermining of the NPT.

3.7) Conclusion

Australian safeguards policy in the first instance relies upon the "illusion of protection" provided by the IAEA. Australia's system of bilateral safeguards does little to enhance IAEA safeguards; for instance they are associated with no effective verification or enforcement capacity. They cannot and do not safeguard Australian uranium, and have been progressively weakened in the face of commercial pressures.

The only reliably effective Australian safeguards policy which is commensurate with the magnitude of the dangers posed by nuclear weapons and proliferation is to rapidly phase out mining and export of uranium.

[148] "India, China Vie For Fixed Slice of Australian Yellowcake", The Age 31 May 2006.

[149] George Perkovich, India's Nuclear Bomb: The Impact on Global Proliferation (Berkeley: University of California Press, 1999).

[150] Wade Boese, "Bush, Singh Advance Nuclear Deal", Arms Control Today Vol 36 No 3 (April 2006).

Chapter 4

Australian Non-Proliferation Policy and the Export of Uranium to China

On 16 August 2004 the Vice-Chairman of China's National Development and Reform Commission, Zhang Guobao, told the Australian Minister for Foreign Affairs that he wanted to raise an issue, "that might be sensitive for Australia."[151] That issue was the export of Australian uranium to China. On 1 December 2005 the Chinese Ambassador to Australia, Madame Fu Ying, indicated to a mining conference in Melbourne that while China has enough uranium resources for its military programs, China would need to import uranium to meet its nuclear power program.

On 3 April 2006 the Government of Australia and the Peoples Republic of China signed a bilateral safeguards agreement that opened the door for the export of Australian uranium to China. The Dow Jones Energy Service reported that, "while Australia's policy of not selling its uranium for weapons had been mooted as a likely stumbling block to the deal, safeguards that proved acceptable in Canberra were formed in just 18 months, instead of five years as first suggested by the Government."[152]

Four days after the agreement was signed, the Governor of China's Development Bank toured BHP Billiton's Olympic Dam uranium mine in South Australia which is expected to become the primary source of uranium exports to China.

4.1) The Bilateral Agreements With China

Australian safeguards in the first instance will rely upon IAEA safeguards in China. Beijing is an NPT recognised nuclear weapon state so it does not necessarily have to sign a safeguards agreement with the Agency. It may voluntarily submit to limited safeguards.

The Australian Safeguards Office, in its submission to the Senate Uranium Mining and Milling Committee, acknowledged that one of the main purposes that a NWS state has in signing a Voluntary Offer Agreement (VOA) with the IAEA is to facilitate nuclear imports. It states, "this emerges most clearly in the case of China … whose nuclear cooperation agreement with Japan requires the application of safeguards. … Similar considerations are understood to have applied to the supply of the Daya Bay nuclear power station to China by France."[153]

In other words, China does not see its safeguards arrangement with the IAEA in terms of non-proliferation policy. The arrangement is entered into primarily for trade and commercial reasons, as the Australian Safeguards Office concedes. This means that for Beijing safeguards are principally a cost to business to be minimised to the maximum extent possible. China hardly need fear whistle-blowing or investigative journalists, providing greater potential for the spirit and the letter of the Australian safeguards agreement to be breached without this being detected, documented and made public.

China has a powerful economic incentive to dilute safeguards. This is of significance when one takes into account that, as outlined, the way in which Australian safeguards in China are to operate will be subject to a secret Administrative Arrangement, yet to be negotiated. Beijing is likely to drive a hard bargain. The history of Australian diluting of safeguards in favour of commercial considerations suggests that Canberra is likely to oblige.

In 1988 China signed a safeguards agreement with the IAEA, which still remains in force. Article 1(c) stipulates "China may, in accordance with the procedures set forth in this Agreement, withdraw nuclear material subject to safeguards under this agreement."[154] In Article 33 the agreement stipulates that safeguards are not to

[151] "China's Secret Uranium Bid", **The Age** 17 October, 2005.

[152] "Uranium Deal Fuels Speculation", **Dow Jones Energy Service** 25 April 2006.

[153] Submission by the Department of Foreign Affairs and Trade and The Australian Safeguards Office to The Senate Uranium Mining and Milling Committee,p33, 1996.

[154] "Agreement of 20 September 1988 Between the Peoples Republic of China and the International Atomic Energy Agency for the Application of Safeguards in China", p2. Online at http://www.iaea.org/Publications/Documents/Infcirc/Others/infcirc369.pdf

be applied to nuclear material "in mining or ore processing activities" nor to uranium until it has reached the stage of the fuel cycle where it may be fabricated or enriched.[155]

Article 5 b (I) stipulates that the Agency will not communicate to any party whatsoever any information, which it should obtain during the course of its activities in China. This would of course limit information available to the Australian Government.

The provisions of China's agreement seriously limit the jurisdiction and application of IAEA safeguards in comparison to those applied to non-nuclear weapons states. While China has 'signed' the Additional Protocol, two of the four fundamental measures are not to be applied to China. The IAEA does not have access to facilities other than a limited number of listed sites and cannot conduct environmental sampling at other nuclear facilities or undeclared sites across the country.

How many facilities are safeguarded in China? According to the latest IAEA Annual Report only three facilities are actually subject to Agency safeguards in China. These are a power reactor, a research reactor and a uranium enrichment plant.[156] This list has been confirmed to the author (MB) by the IAEA as being accurate as of June 2006. In its talking points memo on the deal with China the Australian Safeguards and Non-proliferation Office (ASNO) states that a number of (unspecified) Chinese nuclear facilities are subject to IAEA safeguards. ASNO states that this will most likely increase. The current situation does not provide any assurance that all relevant Chinese facilities will become governed by IAEA safeguards and subsidiary arrangements.

What is more, not all of these facilities attract a subsidiary arrangement with the IAEA. It is possible for a facility to be listed as safeguarded yet not have a subsidiary arrangement in place. On this basis both Beijing and Canberra could declare that a facility is safeguarded, and is duly recorded in the IAEA report as being so, but without the facility being subject to a subsidiary arrangement. This is an unacceptable state of affairs from a non-proliferation perspective.

As far as China's three safeguarded facilities are concerned, only one of them currently has a subsidiary arrangement in force, that being the nuclear power reactor. Neither the research reactor nor the enrichment plant have subsidiary arrangements in force. A research reactor may use uranium enriched to greater than 20% U-235. It is of concern that of the three facilities, the two that are of most relevance from a proliferation standpoint do not have IAEA subsidiary arrangements in force.

Australia has signed two agreements with Beijing, a safeguards agreement and a nuclear cooperation agreement, that require Ratification by the Federal Parliament before they can come into effect. The proposed Australian safeguards agreement recognises that China "concluded a safeguards agreement with the Agency on 20 September 1988 for the application of safeguards in China." This refers to the agreement cited above.

Article III[b] encapsulates the principle of equivalence for it stipulates that the Agreement shall apply to:

> *all forms of nuclear material prepared by chemical or physical processes or isotopic separation from nuclear material subject to the Agreement; if nuclear material subject to the Agreement is mixed with other nuclear material, the quantity of nuclear material so prepared which falls within the scope of this Agreement shall be an amount equivalent to the proportion which the nuclear material subject to this Agreement bears to the total quantity of nuclear material.*

Article III [c] similarly encapsulates the principle of proportionality for it applies to:

> *all generations of nuclear material produced by neutron irradiation of nuclear material subject to the Agreement: if nuclear material subject to the Agreement is irradiated together with other nuclear material, the proportion of nuclear material so produced which falls within the scope of this arrangement shall be equal to the proportion of the nuclear material irradiated that is subject to this Agreement.*

In Article V China provides assurance that:

> *nuclear material subject to this agreement shall not be used for, or diverted to, the manufacture of nuclear weapons or other explosive devices, research on or*

[155] Ibid., p11.

[156] International Atomic Energy Agency, **Annual Report: The Agency and the World in 2004**, (Vienna:IAEA, 2005). See the relevant table in the annex to this report especially table A20 "facilities under safeguards" at http://www.iaea.org/Publications/Anrep2004/annex_tables.pdf p8.

development of nuclear weapons or other nuclear explosives, or be used for any military purpose.

Article VI (2) stipulates:

where nuclear material subject to this Agreement is within the territory of China, compliance with Article V of this Agreement shall be ensured by a system of safeguards in accordance with the Safeguards Agreement concluded on 20 September 1988 between China and the Agency for the application of safeguards in China.

Article VII states that if *"for whatever reason at any time"* the Agency *"is not administering the safeguards referred to in Article VI of this Agreement"* the Parties *"shall forthwith arrange for the application of safeguards"* that would *"provide reassurance equivalent to that intended to be secured by the safeguards system they replace."*

Article VIII deals with the physical protection of nuclear material subject to the agreement, applying the recommendations specified in the IAEA's INFCIRC/225/Rev.4.

Article IX outlines a number of other aspects of Australian safeguards policy. Article IX (1) is a clause that provides no retransfer of nuclear material without the consent of the supplier. Article IX (2) provides that nuclear material shall not be enriched to greater than 20%, or reprocessed, without the prior written consent of the supplier state. Article IX (3) stipulates that nuclear material shall be used (a) "only within the Delineated Chinese Nuclear Fuel Cycle Program defined in accordance with Annex B."

The relevant provision in Annex B shall be *"by mutual decision of the designated authorities."* These facilities would be included in the list of facilities given by China in accordance with its agreement with the IAEA. These facilities would include those for enrichment, for conversion to UO2, for fuel fabrication, reactors, development and demonstration projects, storage and "others". Facilities for reprocessing are not mentioned specifically.

Article X provides for the parties to *"establish an Administrative Arrangement to ensure the effective fulfilment of the obligations of this Agreement."* Furthermore, *"the Administrative Arrangement established pursuant to this paragraph may be changed with the mutual consent in writing of the designated authorities of both Parties."*

Article XV states that *"the Agreement shall remain in force for an initial period of thirty years."* However, according to Article XIV *"the terms of this agreement may be amended at any time by arrangement of the parties."* Canberra's record of compromising non-proliferation policy in favour of commercial considerations makes Article XIV seem rather ominous.

Although Article IX (2) speaks of prior written consent for reprocessing the effect of the Annexes to the treaty, which Article XV (4) states, *"form an integral part of this Agreement"*, is to seriously dilute this clause. Annex C specifically states, *"the Parties acknowledge that the separation, storage, transportation and use of plutonium require particular measures to reduce the risk of nuclear proliferation."*

In addition it is noted that, *"Australia also recognises the interest of China in reprocessing as part of its civil nuclear energy program in order to ensure efficient energy use and management of substances contained in spent fuel."* As we will see in the section on China's energy strategy this represents a significant diminution of Australia's non-proliferation policy.

Given this, *"Australia shall provide consent on a long term basis to reprocessing."* That is programmatic consent rather than case-by-case consent. Long term presumably refers to the life time of the Agreement of 30 years. Annex C (b) provides that such reprocessing shall occur in facilities subject to the agreement.

It is important at this point to consider how the bilateral safeguards agreement will work in practice. Australian safeguards are essentially a book-keeping device that relies upon knowledge of the fissile material accountancy system and the nuclear fuel cycle in the importing state.

Of central importance therefore is the effectiveness and nature of China's fissile material accountancy system. However as a nuclear weapon state China is not subject to IAEA regulations on fissile material accountancy. There is no international accountability or independent verification of fissile material accountancy in China.

As Nathan Busch explains: "Material Control and Accountancy (MC&A) systems are designed to detect a theft of nuclear materials by closely measuring the amounts of materials in each facility and ascertaining whether any materials are moved or taken."[157] The first thing to take into consideration in relation to China's MC&A system is that it is characterised by "rigorous laws but lax enforcement."[158]

Furthermore, "the international arrangements to which China has committed itself are of relatively limited use in establishing uniform, rigorous and enforceable MC&A standards in China, and do not apply to military use material at all."[159] Busch goes on to observe that, "because Chinese nuclear facilities were probably not designed to take reliable physical inventories, China may not even have a precise inventory of the amount of nuclear materials in its facilities. This is the most basic step in any MC&A system, for without this knowledge there is no way to detect the disappearance of any material." Indeed a state's MC&A system, "will be seriously defective unless its facilities are designed to measure the amount of fissile materials accurately, easily, and frequently. Given its apparent reliance on designs and procedures derived from those used in the Soviet Union, there is no reason to believe China has designed its facilities in this manner."[160]

In sum, China's system of fissile material accountancy is characterised by lax enforcement and does not fully meet IAEA criteria. It would seem that China does not even have an adequate physical inventory of fissile materials within its territory, thereby seriously eroding the veracity of the book-keeping exercise of Australian safeguards policy.

If Beijing does not have a precise inventory of nuclear material it becomes difficult to accept the proposition that Canberra can do better. In fact, China's nuclear facilities more likely than not have not even been designed to allow the effective accounting of fissile materials.

These factors will have their consequences for how the bilateral safeguards agreement with China will be implemented and how effectively and accurately the Australian Safeguards and Non-proliferation Office will be able to track Australian Obligated Nuclear Materials in China.

Under Article XV (3):

Unless otherwise agreed in writing between the Parties, termination, suspension or expiration of this Agreement or any cooperation under it for any reason shall not release the Parties from obligations under this Agreement in respect of nuclear material transferred while the Agreement was in force.

While this may sound reassuring, the major limitations of the whole international safeguards regime, combined with the limitations in material identification, accountancy, verification and enforcement capacities, it is improbable that this provision would count for much over the extensive timeframes for which uranium and plutonium persist. It is highly improbable that the nation states of Australia and China, the IAEA, or any other institution, will persist over these geological timeframes, at least hundreds of thousands of years. Whether the required extraordinarily high levels of security over fissile and highly radioactive materials could be consistently maintained over such periods is entirely speculative.

4.2) China's nuclear weapons and non-proliferation record

In an analysis of the proposed sale of uranium to China it is important to consider precisely to whom we are selling. In this regard one would want to know the nature of China's energy policy, the role of nuclear power therein, the nature of the Chinese nuclear industry and the Chinese nuclear fuel cycle. One should also know the current status and future plans of China's military programme and the potential for conflict in Northeast Asia, and Australia's relationship with Beijing. China's record regarding nuclear non-proliferation is an important component of this examination.

Though slowly modernising its strategic forces, China has the least advanced nuclear arsenal of the five declared nuclear weapons states, and in nuclear matters has generally been at the less belligerent end of the spectrum. It is the only one of the NWS to have given, in 1995, an unconditional negative security assurance (NSA), a pledge not to use nuclear weapons against a non-nuclear-weapon state. It has reiterated

[157] Nathan Busch, "China's Fissile Material Protection, Control and Accounting: The Case for Renewed Collaboration", The Non-proliferation Review Fall/Winter 2002, p9

[158] Busch, "China's Fissile Material", pp95-9.

[159] Busch, "China's Fissile Material", pp91-94.

[160] Busch, "China's Fissile Material", p96.

its pledge not to be the first to use nuclear weapons (termed as no-first-use).[161] It is not known to have deployed nuclear weapons on the territory of any other state. China has signed but regrettably not ratified the Comprehensive Test Ban Treaty. The WMD Commission called on China to be more transparent about its policies and nuclear capabilities, and to unilaterally declare, pending an FMCT, that it will refrain from producing fissile material for weapons purposes.[162] Of the five NPT nuclear weapon states, only China has not yet officially declared that it is no longer producing such material for weapons. China's large stockpile of weapons-usable fissile material is of proliferation concern – it is estimated to have produced between 3-7 tons of weapons-grade plutonium (requiring an average of 3-4 kg per Pu weapon); and 15-15 tons of HEU, on which Chinese weapons are believed to rely heavily (using 20-30 kg per HEU weapon).[163]

Little is known about the state of China's nuclear material protection, control and accounting system, but it is considered vulnerable to insider theft, "questions remain about the level of protection at China's nuclear facilities", and the China National Nuclear Corporation "produces, stores, and controls all fissile material for civilian as well as military applications".[164]

China has been a major supplier of sensitive nuclear (and missile) technology to many countries. The 2005, *Deadly Arsenals* report from the Carnegie Endowment for International Peace documents how China's behaviour, both in the past and in an ongoing way, has been of significant proliferation concern.[165] Despite commitments in 1992, 1994 and 1998 to uphold the non-proliferation regulations of the Missile Technology Control Regime, Chinese state-owned corporations continued to engage in illicit nuclear arms transfers to Pakistan, Iran, North Korea and Libya. *Deadly Arsenals* states "the continuing nature of China's role as an international supplier of nuclear technology for weapons programs is in question." The authors point out that a 2004 US intelligence survey concluded "the proliferation behavior of Chinese companies remains of great concern."

In the past, China sold nuclear materials to Argentina, India, Pakistan, and South Africa, without requiring that the items be placed under IAEA safeguards.[166] In relation to Pakistan, China's assistance may have been critical to Pakistan's nuclear weapons breakthroughs in the 1980s. In addition to assistance with Pakistan's civilian nuclear program, Chinese military nuclear assistance to Pakistan since the 1980s has included:

- plans for a nuclear weapon and possibly sufficient HEU for two such weapons. Chinese nuclear bomb designs were obtained by Libya via the AQ Khan illicit nuclear black market network
- assistance with the construction of an unsafeguarded plutonium production reactor at Khusab, producing 8-10 kg of weapons-grade plutonium per year since 2000; and the completion of a plutonium reprocessing facility at Chasma
- in 1995, sale of ring magnets used for uranium enrichment centrifuges[167]

The authors point out that the Chinese do not appear to have supplied any new nuclear weapons technology to Pakistan in recent years, but the point here is that it really does not need to. The damage has been done.

China has also been a principal supplier of diverse nuclear technology to Iran, including assistance with uranium mining and processing, fuel fabrication, uranium hexafluoride production and a research reactor. China's nuclear cooperation with Algeria, beginning in 1983 with the secret construction of the Es Salam 15-MWt research reactor, has also been of concern in light of Algeria's development of a hot-cell plutonium separation facility and past lack of candor regarding its nuclear program[168].

This poor non-proliferation record and lack of transparency – and indeed active contribution to horizontal nuclear proliferation – warrant disqualification of China as an appropriate recipient of Australian uranium.

China's poor track record on nuclear proliferation occurs in an authoritarian political context, with virtually absent parliamentary, media, non-

[161] Weapons of Mass Destruction Commission. Weapons of Terror. Stockholm, Sweden, 1 June 2006 p72. www.wmdcommission.org

[162] Weapons of Mass Destruction Commission. Weapons of Terror .p95. www.wmdcommission.org

[163] Cironcione et al Deadly Arsenals. p168.

[164] Cironcione et al Deadly Arsenals. p168-9

[165] Cironcione et al Deadly Arsenals. p163-4.

[166] Cirincione et al, Deadly Arsenals ,p171.

[167] Cirincione, Deadly Arsenals, p172.

[168] Cirincione, Deadly Arsenals, p172-4.

government and civil society involvement, debate and scrutiny. Such 'social safeguards' can play an important role in facilitating competent and accountable good governance. Good governance in the security sector and nuclear sectors, as in other areas, benefits from substantive and effective civilian oversight, democratic control and accountability[169]. In relation to Chinese governance of nuclear weapons, SIPRI states:

> *There is no publicly available evidence of legislation or parliamentary debate on the subject of nuclear weapons. As for the public at large, China has neither an informed civil society nor non-governmental organisations capable of offering policy alternatives. Moreover, the media remain under the direction of the CCP [Chinese Communist Party]. As a result, nuclear affairs in China remain subject to extreme secrecy. This is amplified by the fact that China has never engaged in international disarmament talks...*[170]

4.3) China's Energy Strategy

In 1978 the Communist Party of China began an economic reform programme that promised to not only change China but also to have wider implications for international relations.[171] China's real GDP has increased by some 10% per year since 1978, although per capita GDP remains relatively low. Accompanying this economic growth has been greater industrialisation, urbanisation and motorised transportation all of which significantly increase internal energy demand. As Chao Yang Peng notes, "such increases in energy demand have emerged as severe strains for China's development." Peng further notes that in 1993 China became an oil importer rather than an oil exporter.[172]

A Lawrence Berkeley National Laboratory study points out that Chinese policymakers are increasingly alarmed at China's oil deficit.[173] In 2000 China imported 37% of its oil. It is predicted by 2020 that this level will rise to some 63-70%. As Peng argues, a point conceded by the Berkeley study, this would result in a tighter link between China (and East Asia more broadly) and the Middle East, the world's major source of oil.

The Chinese White Paper on sustainable energy outlines the "major components of China's strategy for sustainable development" that "include changing present energy production and consumption patterns, diversifying energy sources and the structure of power production." One means by which this can be achieved, the White Paper outlines, is by expanding China's nuclear power industry.

These factors have important implications for non-proliferation.

The Washington Post reports "a new alliance is emerging between Iran and China that threatens to undermine US ability to pressure Tehran on its nuclear program".[174] This "emerging relationship is reflected in two huge oil and gas deals between the two countries that will deepen the relationship between the two countries for at least the next 25 years." These deals refer to a $70-100 billion Chinese purchase of Iranian oil and assistance to develop the Yadavaran oil field and a $20 billion liquefied natural gas deal. The article notes, "China's trade with Iran is weakening the impact on Iranian policy of various US economic embargoes." The report goes on "Beijing has also provided Iran with advanced military technology, US officials say." It would seem that "the Iran-China ties may be partly in response to the United States."[175]

Daniel Pinkston observes in testimony to the US Senate that in 2004 Chinese firms were sanctioned 50 times by the Bush administration for proliferation reasons.[176] Pinkston notes that the upsurge has occurred because of the Iran Non-Proliferation Act of 2000; 38 of these

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[169] Born H. National governance of nuclear weapons: opportunities and constraints. In: Stockholm International Peace Research Institute. SIPRI Yearbook 2006. (Oxford: Oxford University Press, 2006), pp225-42.

[170] Born H. In: SIPRI Yearbook 2006. Oxford: Oxford University Press, 2006, p232.

[171] Department of Foreign Affairs and Trade, China Embraces the Market: Achievements, Constraints and Opportunities (Canberra: AGPS, 1997).

[172] Chao Yang Peng, Challenges to China's Energy Security (Adelaide: The University of Adelaide Chinese Economy Research Unit, 1996) p7.

[173] Lawrence Berkeley National Laboratory. Evaluation of China's Energy strategy options. The China Sustainable Energy Program, 2005, p1.

[174] "Iran's New Alliance With China Could Cost US Leverage", The Washington Post, 17 November 2004.

[175] Ibid.

[176] "Testimony of Daniel A. Pinkston Before the US-China Economic and Security Review Commission Hearing on China's Proliferation Practices and Its Role in the North Korean Crisis. 10 March 2005.

50 sanctions apply to violations of this Act. During the entire eight years of the Clinton administration Chinese firms were sanctioned 17 times. It would seem that China's energy demands and Iran's status as a source of oil not subject to US control are increasingly seeing the emergence of a strategic relationship similar to that which existed between China and Pakistan.[177]

China's energy situation is a cause for concern, both for their future international performance on non-proliferation and their accountability to the safeguards terms of the Australian bilateral agreement. China has an increasingly voracious appetite for global energy resources, especially from developing areas such as Iran. One need not be well versed in the theory of comparative advantage to see where the economics of this may lead.

4.4) China and Nuclear Energy

The Energy Information Administration of the United States Government points out that no nuclear industry is as difficult to write about as China's.[178] The global debate on energy supply has a particular focus on China and on India as the only countries proposing major expansion in nuclear power. However this expansion is still of a limited scale with the Australian Department of Foreign Affairs acknowledging that nuclear power is only proposed to increase from at present two per cent to four per cent of Chinese electricity supply by 2020.

There exists a great deal of interest and competition among the world's nuclear supplier nations and companies to win Chinese contracts for nuclear materials, technology and reactors. The Bush Administration is lobbying on behalf of US corporations, Westinghouse and GE, to sell their reactor technologies, and BHP Billiton and Rio Tinto are lobbying to sell Australian uranium to China.

The US Energy Information Administration points out that between 1996 and 2003 not a single new reactor was brought on line in the United States, whilst since the start of 2002 China has brought six reactors on-line in China and one in Pakistan. The Japanese *Yomiuri Shimbun* reports that China is planning to construct 30 nuclear reactors "in a quest for energy security for its booming economy."[179] Ron Sinard, of the Nuclear Energy Institute, states "looking at the market over the next decade, it's probably the biggest piece of the pie."[180] Jean-Christophe Delvallet of the French energy company EDR points out, "the stakes are huge. These are big contracts with a lot of implications."

The Energy Information Administration points out that nowhere in the world other than in China can one observe as large a variety of commercial nuclear technologies, with Canadian (CANDU reactors), French reactors, Russian reactors and of course Chinese reactors.

China's existing mainland reactors are as follows (with capacity in Megawatts, reactor type, and country of origin of reactor design):
Two enrichment plants, the Lanzhou enrichment plant in Gansu province and an enrichment plant at Hanzhong, Shaanxi province, service these reactors. The Lanzhou enrichment plant was first used for military purposes and was based on Russian gaseous diffusion technology but has since been replaced with Russian gas centrifuge technology. It is not under IAEA safeguards. The Hanzhong facility is a smaller gas centrifuge plant, supplied by Russia. It is one of the three facilities subject to IAEA safeguards, but attracts no subsidiary arrangement. According to the Nuclear Threat Initiative,[181] Chinese officials have announced that only Chinese origin uranium will be enriched at Hanzhong.

The OECD 2005 survey of the world uranium market notes that uranium was produced in 19 countries, although less than half of these produced significant quantities. It lists the seven leading producing countries as Canada (29%), Australia (22%), Kazakhstan (9%), Russia (8%), Niger (8%), Namibia (8%) and Uzbekistan (5%).[182] Together these seven

[177] Mary D. Davis, The Military-Civilian Nuclear Link: A Guide to the French Nuclear Industry (London: Westview Press, 1988).

[178] Department of Energy Energy Information Administration, "China's Nuclear Industry", online at http://www.eia.doe.gov/cneaf/nuclear/page/nuc_reactors/china/china.html

[179] "China Seeks Nuclear Powered Energy Security", Yomiuri Shimbun 8 May 2006.

[180] "US Wrestles Its Rivals for China Nuclear Deal: Proliferation Concerns Take a Back Seat With Contract for 4 Power Plants", The New York Times 10 March 2004.

[181] Claimed at http://turnerfund.org/db/china/uenrich.htm

[182] Organisation for Economic Cooperation and Development (OECD), Uranium 2005: Resources, Production and Demand: A Joint Report By the OECD Nuclear Energy Agency and the International Atomic Energy Agency (Paris: OECD, 2005),p60.

countries account for 89% of world production; Australia and Canada together account for 51% of world production. The OECD points out that only Canada and South Africa produced sufficient uranium to meet domestic demand.[183]

China's uranium deposits are relatively small and are low to middle grade so that (along with other factors) "the mining costs turned out to be much higher than those acceptable to the commercial nuclear reactor operators."[184] China will only be able to meet the demand of its nuclear reactors from domestic sources of uranium in the short term, with uranium use currently at 1500 tons a year. The Department of Foreign Affairs cites projected Chinese demand for uranium at 8000 tonnes a year by 2020.

Consider the level of 'Reasonable Assured Resources' (in tonnes) of uranium that Australia has in comparison with China. For Australia we have:

US$40/KgU	701 000
US$80/KgU	714 000
US$130/KgU	747 000

The OECD's 2003 uranium survey lists these figures for China as:

US$40/KgU	36 900
US$80/KgU	49 200
US$130/KgU	49 200

These figures demonstrate why China has sought to purchase, explore, mine and invest in Australian uranium.

As China's Ambassador to Australia Madame Fu Ying has indicated, Beijing does not have enough uranium to meet *both* its potential military program and the projected expansion in its nuclear power industry. Australian uranium exports would at a minimum facilitate further diversion of China's limited domestic uranium supply to their military and thus indirectly support their nuclear weapons program.

The Chinese nuclear fuel chain

At a 1987 IAEA conference, China announced that it was formulating a closed nuclear fuel cycle which involves the reprocessing of spent nuclear fuel and the separation of plutonium.[185] Analysts refer to a closed nuclear fuel cycle as a "plutonium economy" which carries staggering proliferation risks. China's commitment to a plutonium economy follows on from its energy policy.

Analyst, Paul Eavis states that large reprocessing plants pose grave dangers because of the large amounts of plutonium dealt with per year. The IAEA can only account for 97% of this plutonium. At a large reprocessing plant such as the THORP facility in the UK (7000kg throughput of Pu per annum) this amounts to 210kg of Pu unaccounted for, enough to manufacture more than 50 nuclear weapons per year.[186]

In conjunction with this closed nuclear fuel cycle strategy, China is building an experimental fast breeder reactor on the outskirts of Beijing. A fast breeder reactor would produce plutonium from a blanket of natural uranium and potentially provide additional nuclear fuel and as fissile material for a nuclear weapons program.

Any use of plutonium-containing reactor fuel would be associated with dramatically increased proliferation risks. For example, the UK Environment Agency has stated that: "It would be a relatively straightforward matter to undertake chemical separation of plutonium from MOX fuel."[187] [Mixed oxide fuel contains both uranium and plutonium oxides.]

The Chinese nuclear fuel cycle currently has a UF_6 conversion plant at Lanzhou, two enrichment plants mentioned previously, and two fuel fabrication plants, at Yibin and at Baotou.[188] None of these, bar one of the enrichment plants, are under IAEA safeguards. A reprocessing facility is under construction in Lanzhou.

The World Nuclear Association estimates that based on claimed projected expansion targets of 20GWe by 2010 and 40GWe by 2020, the amount of spent fuel arising annually would be 600 tonnes in 2010 and 1000 tonnes in 2020; with the cumulative amounts increasing to 3800

[183] OECD, Uranium 2005, p66.

[184] OECD, Uranium 2005, p138.

[185] International Atomic Energy Agency, Country Nuclear Fuel Cycle Profiles", (Vienna: IAEA, 2005),p1.

[186] Paul Eavis, "The Case Against Reprocessing" in Frank Barnaby (ed), Plutonium and Security: The Military Aspects of the Plutonium Economy (New York: St. Martin's Press, 1992), p24.

[187] UK Environment Agency, "Document Containing the Agency's Proposed Decision on the Justification for the Plutonium Commissioning and Full Operation of the Mixed Oxide Fuel Plant", 1998, para A7.20.

[188] Taken from China's profile in International Atomic Energy Agency, Country Nuclear Fuel, pp34-36..

tonnes and 12 300 tonnes respectively. That represents a very large amount of significantly dangerous material, from both safety and proliferation perspectives.

The above figures should put all this in perspective. If China achieves its declared goals, the large quantities of spent fuel arising will ensure that China's reprocessing facilities will have large annual throughputs of plutonium and the error rates resulting from inevitable accountancy errors would represent potential fissile material for many nuclear weapons per year, even at the IAEA's significant quantity of 8kg of plutonium.

No safeguards policy can reliably prevent proliferation on these volumes, other than a decision not to mine and export uranium to China. That Australia's proposed bilateral safeguards agreement has given prior "programmatic" consent to the reprocessing of Australian Obligated Nuclear Material (AONM) on a long-term basis is contrary to Australia's claimed non-proliferation aims, and is incompatible with adequate long-term safeguarding of AONM in China.

The way in which the nuclear industry is organised in China is also of concern. The IAEA nuclear fuel cycle evaluation of China shows that the China National Nuclear Corporation controls all aspects of the nuclear fuel chain in China. All of the facilities across uranium conversion, enrichment and fuel fabrication plants and also uranium exploration and mining, reprocessing nuclear waste disposal, research and development and nuclear engineering design are under the control of the CNNC.[189]

It is clear that the CNNC is all pervasive as far as the nuclear industry in China is concerned. According to *Deadly Arsenals*, which gained its information from US National Laboratory sources, the CNCC "produces, stores, and controls all fissile material for civilian as well as military applications."

The Australian Government's 'talking points' memo on the proposed agreement has claimed that the civil and military aspects of the nuclear industry in China are distinct. This claim is clearly false. In reality, we may say that Australia has signed a bilateral safeguards agreement with the CNCC.

4.5) The Balance of Leverage and Safeguards

According to the Department of Foreign Affairs and Trade, China is Australia's second largest trading partner, our second largest export market and our second largest source of imports. By contrast Australia is China's eleventh largest trading partner, eleventh largest import source and thirteenth largest export destination. Chinese economic growth has played a large part in rising global commodity prices, a factor that has been crucial in recent Australian economic performance.

The Chinese leadership would expect that these relationships would have political and strategic implications for Australian policy. Macroeconomic indicators demonstrate that, on balance, greater leverage would lie in Beijing rather than Canberra.

A Department of Foreign Affairs and Trade fact sheet informs us that the value of Australia's merchandise trade with China in 2005 was exports of A$16,054 million, a 45.8% increase over 2004, and imports of A$21,347 million, a 19.1% increase over 2004.[190] If a similar rate of increase in exports were to continue China could in time become Australia's leading trading partner.

By category (top four respectively) the major exports in A$million were:
- Iron Ore 5721
- Wool 1327
- Copper Ores 628
- and Coal 531

and the major imports were:

- Clothing 3055
- Computers 2406
- Toys & Games etc 1095
- and Telecommunication 1073[191]

It would be difficult from the above figures to discern which is the developing state and which is the developed state.

The New York Times reports that "China's rapid growth is sucking up resources and pulling the region's varied economies in its wake" but "more and more China is leveraging its economic clout

[189] World Nuclear Association, Information and Issue Briefs: Nuclear Power in China, online at http://www.world-nuclear.org/info/inf63.htm

[190] Department of Foreign Affairs and Trade Fact Sheet available online at http://www.dfat.gov.au/geo/fs/chin.pdf

[191] Ibid.

to support its political preferences".[192] The Times warns, "Beijing is pushing for regional political and economic groupings it can dominate, like a proposed East Asia community grouping that would cut out the United States and create a global bloc to rival the European Union." Evidence for this is that China is "dispersing aid and in ways not seen before, pressing countries to fall in line on its top foreign policy priority; its claim over Taiwan."[193]

Taiwan provides a fascinating test case to examine the question of leverage in Australia-China relations. A day after China approached Australia for a deal on uranium the Minister for Foreign Affairs and Trade, Alexander Downer, said that the ANZUS treaty between Washington and Canberra did not apply in a Taiwan contingency, opening up the prospect of US forces fighting in the Pacific without Australian assistance.[184] For the ANZUS treaty which has been regarded as a non negotiable pillar of Australian strategic and foreign policy to be sidelined in this way is a startling downgrade. The Prime Minister rebuked the Minister but the whole affair raised eyebrows in Washington and provides powerful insight into the leverage that Chinese economic growth is buying in Canberra.

The anticipated increase in uranium demand in China could be supplied through the proposed expansion of BHP Billiton's Olympic Dam uranium and copper mine, which accounts for some 30% of the world's known uranium reserves, and this proposed $7 billion mine expansion could be underwritten by long term supply contracts with China.

Clearly, BHP Billiton stands to profit from the large scale export of uranium to China. Moreover, trade with China underwrites BHP Billiton's recent financial performance. BHP Billiton estimates that some 80% of its recent growth comes from commercial activity in China. The sale of Australian uranium to China means that BHP Billiton will in effect sell uranium to the China National Nuclear Corporation. The leverage here clearly lies with Beijing.

Even if large scale uranium sales were to go ahead, Canberra will continue to be in a weak position in the balance of leverage over safeguards with Beijing as China will not be solely dependent upon Australian uranium and is expected to diversify its sources of supply.

Australia will be dependent upon China to provide the demand for the projected greater level of output from Australia's uranium mines, the prospects for which are fuelling the increasing price of uranium equities in the Australian share market. In other words, the Australian nuclear (ie. uranium) industry will be more dependent upon China than the Chinese nuclear industry will be on Australia.

This question of relative influence over uranium is of long term importance as the bilateral agreement does not lock China into a set system of safeguards over the 30 year term of the agreement. It has been demonstrated that successive Australian Governments have eroded safeguards in favour of commercial considerations. The balance of leverage in the relationship with Beijing means that, should the safeguards agreement be revised, as the agreement itself allows for, it is to be expected that the revision will again continue the trend of weakening Australian safeguards policy in favour of commercial interests.

4.6) The Potential for Conflict

US strategic policy, and China's response, may increase the threat of a nuclear war between the US and China, whether accidental, by uncontrolled escalation, or otherwise.

The size and nature of China's nuclear forces are uncertain and much analysed and discussed. China's ICBM missiles are of vintage design, are not armed with Multiple Independently Targetable Re-entry Vehicles (MIRV) or multiple nuclear warheads, and are approaching a point of diminished strategic utility in the face of US military modernisation and the continuing risk of war over Taiwan.

According to the latest Pentagon report on Chinese military power, China has 20 silo-based liquid fuelled missiles (the CSS-4 ICBM) for deterring the United States and 20 intermediate range liquid fuelled missiles (the CSS-3 ICBM) for attacking targets in Asia. China also has a number of theatre nuclear forces (intermediate and medium range ballistic missiles).[195] Robert Norris and Hans Kristensen, writing in The

[192] "Across Asia, Beijing's Star is in Ascendance", The New York Times, 28 August 2004.

[193] Ibid.

[194] "Downer Flags China Shift", The Age 18 August 2004.

[195] Department of Defense, Military Power of the People's Republic of China 2006: Annual Report to Congress , p26. Online at http://dod.mil/pubs/pdfs/China%20Report%202.06.pdf

Bulletin of the Atomic Scientists, estimate that in total Beijing has 200 nuclear warheads.[196]

China has an ICBM modernisation program centred on introducing two new ballistic missiles, a road mobile DF-31 solid fuelled missile with a launch time of some 10-15 minutes, able to hit targets on the US west coast, and a longer range DF-41 missile able to hit targets across the US.

A problem complicating Chinese planning however is US plans to construct a Ballistic Missile Defense system. A ballistic missile defence system would seek to intercept incoming ballistic missiles in flight and destroy any nuclear payload before hitting the United States. The Chinese take this to be a threat to their deterrent force and to their national security, on the grounds that ballistic missile defence would act as a shield operating under the rubric of escalation dominance enabling the United States to throw its weight around in East Asia, especially in contingencies involving Taiwan.[197]

Many aspects of US strategic planning no doubt alarm defence force officials in Beijing.[198] Traditionally the US nuclear war plan, the Single Integrated Operational Plan (SIOP), had been directed against Soviet, now Russian, targets. The SIOP had always consisted of a number of Major Attack Options[199] involving the desired destruction of key targets with a view to successfully achieving a disarming first strike. It also had a number of Limited Attack Options (LAO) against Russian targets that were less than an all-out attack, reflecting dubious thinking about waging a controlled nuclear war. US nuclear war planning is not, and never has been, concerned with "deterrence". It has been concerned with war fighting.[200]The US nuclear war plan is now known as OPLAN 8044 Rev 05. China historically has also figured in US nuclear war planning, but following the split between the Soviet Union and China and the thawing of US relations with Beijing, China was taken out of the war plan. During the Clinton administration China was again placed in the SIOP in the form of two Limited Attack Options which targeted China's leadership, nuclear capabilities and key industries.[201] It should be stressed that these are in reality Major Attack Options for that is how they would be perceived in Beijing, given their own limited nuclear capabilities.

Given these facts, considerable thinking has occurred in Beijing concerning the status of its nuclear doctrine. China increasingly perceives the need to deploy a force that reflects a credible minimum deterrent.[202] The former deputy commander of China's nuclear force, Major General Yang Huan, outlined that to meet this doctrine Beijing requires a nuclear force that is survivable, including "highly automated mobile missiles", credible in the sense that they are highly accurate, and able to penetrate ballistic missile defences and other space weapons. As he stated:

> *in an era when space technology is developing rapidly and a defense system with many methods and many layers is appearing, we should pay special attention to the study of break-through technology.*[203]

Plans from the US to construct a multi-layered ballistic missile defence system and deploy offensive weapons in space increase the threat of nuclear war as:

> *the only risk that China's current nuclear arsenal poses to the United States is an unauthorized nuclear launch - something the intelligence community has concluded is highly unlikely under China's current operational practices. That might change, however, if China were to adopt the hair trigger nuclear postures that the United States and Russia maintain even today to demonstrate the credibility of their nuclear deterrents. China might also increase its strategic forces or deploy theatre nuclear forces that could be used early in a conflict-developments that might alarm India,*

[196] Robert S. Norris and Hans M. Kristensen, "Chinese Nuclear Forces 2006", The Bulletin of the Atomic Scientists May/June 2006, pp60-63.

[197] Robert S. Ross, "Navigating the Taiwan Strait: Deterrence, Escalation Dominance and US-China Relations", International Security Vol 27 No 2, pp48-85.

[198] See Karl A Lieber and Daryl G. Piers, "The Rise of US Nuclear Primacy", Foreign Affairs March/April 2006.

[199] For supercomputer simulations see Matthew G McKinzie, Thomas B Cochran, Robert S. Norris and William Arkin, The US Nuclear War Plan: A Time for Change, Natural Resources Defense Council http://www.nrdc.org/nuclear/warplan/index.asp

[200] Desmond Ball and Jeffrey T. Richelson (eds), Strategic Nuclear Targeting (Ithaca, NY: Cornell University Press, 1986).

[201] Marko Beljac, US Nuclear Deterrence and International Security: Extended Deterrence, Escalation Dominance and World Order (Monash University), p225.

[202] Evan S. Medeiros, "Evolving Nuclear Doctrine" in Paul J. Bolt and Albert S. Willner (eds), China's Nuclear Future (Boulder: Lynne Rienner, 2006), p53.

[203] General Yang Huan, "China's Strategic Nuclear Weapons", online at http://www.fas.org/nuke/guide/china/doctrine/huan.htm the original text appeared in Defence Industry of China 1949-1989 (Beijing: National Defence Industry Press, 1989).

with predictable secondary effects on Pakistan.[204]

The potential for China to upgrade its missiles, modernise its warheads and change its force doctrine, has direct relevance here to issue of production of fissile materials. In its talking points memo on the bilateral nuclear deal with China the Department of Foreign Affairs and Trade states that "open sources" suggest that China has ceased to produce fissile materials for nuclear weapons and that the sale of Australian uranium to China would not free up China to use its own uranium for military purposes because of this.

It must be stressed that during the negotiations with Beijing on the uranium deal, Australia directly asked China whether it in fact had ceased to produce fissile material. John Carlson, appearing before the Senate, stated that China refused to pass on this information.[205]

However, there exists further uncertainty. Albright and Kramer write that, "China's military plutonium stock remains highly uncertain. It reportedly continued to produce plutonium in at least one military reactor after Chinese officials unofficially acknowledged that plutonium production for weapons ceased in 1991."[206]

Because China's nuclear modernisation partly reflects a desire to penetrate US spaced based weapons China will need to place multiple warheads on its DF-31 and DF-41 missiles. Most likely it will deploy three warheads per missile should Beijing go down this road, although much uncertainty exists as to how China will actually do this. US "miniaturised" warheads, such as the W 88, have a beryllium reflected plutonium fissile core for the primary. So we would expect that any Chinese warhead modernisation programme would shift from highly enriched uranium to plutonium as the key fissile material for its nuclear weapons.

Wright and Gronlund write in the journal Science and Global Security that:

the size of China's plutonium stocks could have implications for future expansion of its nuclear arsenal, either as part of its modernization plans or in response to a US deployment of a ballistic missile defence system. For example, if China were to increase the number of warheads on long range missiles from the current level of roughly 20 to a level of 75-100, as suggested by the December 2001 US National Intelligence Estimate, that could require 0.2 to 0.4 tonnes of plutonium, assuming these warheads contained 3 to 5 kilograms of plutonium each. A buildup to 200 warheads on long range missiles - a number reportedly suggested by the 2000 NIE - would require 0.6 to 0.9 tonnes of plutonium.[207]

These numbers "place an upper bound on how much" China "could expand its long range arsenal without restarting plutonium production. This may be an important consideration to China if it wants to keep open the option of expanding its strategic nuclear forces in response to possible US missile defense deployments."

In fact the situation is worse than this analysis would suggest. The Bush administration's National Security Presidential Directive 23 (NSPD23) states,

the Defense Department plans to employ an evolutionary approach to the development and deployment of missile defenses to improve our defenses over time. The United States will not have a final, fixed missile defense architecture. Rather, we will deploy an initial set of capabilities that will evolve to meet the changing threat and to take advantage of technological developments.[208]

As other states respond to the US system by increasing their forces, so the US will counter this by expanding the ballistic missile force. In this way the US would effectively have created a dynamic for a new arms race and Beijing may argue that they are presented with a powerful incentive to resume the production of weapons-grade fissile materials.

The sale of Australian uranium to China would at a minimum free up China's uranium for military production, as China does not have enough uranium to both meets its ambitious nuclear energy plans and to modernise its strategic nuclear forces.

[204] Jeffrey Lewis, "The Ambiguous Arsenal", The Bulletin of the Atomic Scientists, May/June 2005 pp 52-59.

[205] Hearing of the Senate Foreign Affairs, Defence and Trade Legislation Committee 29 May 2006. Transcript online at www.aph.gov.au/hansard/senate/committee/S9349.pdf.

[206] David Albright and Kimberley Kramer, "Plutonium Watch: Tracking Plutonium Inventories". Institute for Science and International Security Global Fissile Material Inventories June 2004. Online at http://www.isis-online.org/global_stocks/plutonium_watch1004.html

[207] David Wright and Lisbeth Gronlund, "Estimating China's Production of Plutonium for Weapons", Science and Global Security Vol 11 No 1, p25.

[208] NSPD23 online at http://www.fas.org/irp/offdocs/nspd/nspd-23.htm

In fact, China may seek to divert nuclear materials derived from its civil programs to its military programs in order to retain its status as a state credited with maintaining a moratorium on fissile materials production for nuclear weapons, whilst pursuing warhead modernisation. In this way China could seek to maintain its non-proliferation credentials but still modernise nuclear warheads. This is a possibility that cannot be discounted.

Australia, in both providing key backing for US policies on missile defence and space weapons, and selling uranium to China, would not only contribute to proliferation in Asia but would contribute to increasing the likelihood of nuclear war, the "major hazard" of the uranium industry according to the Fox Report. This is especially so when one considers that Taiwan provides a potential flashpoint between Washington and Beijing. The Limited Attack Options of the US SIOP directed against China assume a conflict over Taiwan.

What is more the well informed analyst, William Arkin, writing recently for *The Washington* Post, has revealed that the Pentagon has just finished constructing a full fledged conventional war plan directed at China (OPLAN 5077). Arkin writes, "the 5077 plan to defend Taiwan from a Chinese attack dates back from the Reagan administration, and has been successively updated and expanded over the years".

Moreover, "Pacific Command OPLAN 5077-04, as it is currently known, includes air, naval, ground/amphibious, and missile defense forces and excursions to defend Taiwan. Options include maritime intercept operations in the Taiwan straits, attacks on Chinese targets on the mainland, information warfare and non-kinetic options, even the potential use of American nuclear weapons."[209] It would be naïve to assume that Beijing does not have similar plans. The sensitive and potentially explosive nature of Chinese concerns over Taiwan were starkly highlighted by remarks reported in July 2005 by Chinese Major-General Zhu Chenghu, who warned that in the event of conflict over Taiwan:

> *If the Americans draw their missiles and precision-guided ammunition onto the target zone on China's territory, I think we will have to respond with nuclear weapons … We Chinese will prepare ourselves for the destruction of all the cities east of Xi'an. Of course, the Americans will have to be prepared that hundreds of cities will be destroyed by the Chinese.*[210]

What this means is that strategic interaction between Beijing and Washington is escalating the threat of nuclear war by accident or inadvertence precisely at a time when both states are planning for a potential war over Taiwan. The sale of Australian uranium in such a strategic environment flies against the spirit and tenets of the Fox Report and is contrary to Australia's national interest.

4.7) Conclusions

Australia has signed a bilateral safeguards agreement with China that encapsulates all the limitations and flaws of both IAEA and Australian safeguards policies. China's ambitious nuclear plans flow directly from its broader energy strategy. The large amount of uranium proposed to be exported to China and potential large throughputs of spent reactor fuel to extract plutonium increase the risks that Australian nuclear material could be diverted to military programs, and that this would not be detected. The capacity to verify that such diversion has not occurred is lacking.

The nature of the strategic and economic relationship between Australia and China demonstrates that China has greater leverage over Canberra than vice versa. One practical implication of this balance of leverage is that claimed safeguards assurances in the bilateral agreement cannot be relied upon in practice.

US missile defence plans have given China incentive to resume the production of fissile materials for warhead modernisation. The potential for nuclear war involving China and the US over Taiwan is real.

The proposed export of uranium to China is not in Australia's national interest.

[209] William Arkin, "America's New China War Plan", http://blog.washingtonpost.com/earlywarning/2006/05/americas_new_china_war_plan.html

[210] The Age, 25 July 2005.

"…the Nuclear Non-proliferation Treaty disintegrates before our very eyes … the current non-proliferation regime is fundamentally fracturing. The consequences of the collapse of this regime for Australia are acute, including the outbreak of regional nuclear arms races in South Asia, North East Asia and possibly even South East Asia. The impact on Australia's long term national security interests is immense"

Kevin Rudd, Shadow Minister for Foreign Affairs, Trade & International Security.
"Leading, not following. The renewal of Australian middle power diplomacy." Sydney Institute, 19 Sep 2006.

The full report and executive summary of **An Illusion of Protection: *The unavoidable limitations of safeguards on nuclear materials and the export of uranium to China*** is available at the ACF and MAPW websites www.acfonline.org.au and www.mapw.org.au

ACF is Australia's leading national not-for profit environment organisation and is funded almost entirely by individual membership and donations. Since 1966, ACF have focussed on the most important and urgent environmental problems, seeking change with lasting political, economic and social support. ACF works with the community, business and government to protect, restore and sustain our environment.

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The Medical Association for Prevention of War (MAPW) Australia is a national organisation of health professionals dedicated to the prevention of armed conflict and the abolition of nuclear, biological and chemical weapons. MAPW is affiliated with and shares the aims of the International Physicians for the Prevention of Nuclear War (IPPNW), an international federation with affiliates in 58 countries around the world. IPPNW was awarded the Nobel Peace Prize in 1985.

www.mapw.org.au

"In the eight years I served in the White House, every weapons proliferation issue we faced was linked with a civilian reactor program."

Al Gore
Guardian Weekly 2006;
174 (25):17-18 (9-15 June 2006)

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