Putting Nuclear Non-Proliferation First

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Introduction.

There is much than can be said in a comprehensive review of all of Australia's nuclear treaty commitments. Focusing narrowly on Australia's role in the nuclear fuel cycle, by proposing a number of reforms to current treaty arrangements, would be timely given the Government's commitment to reviving the International Non-proliferation and Disarmament Commission.

The proposals made here are done by adhering to the primacy of what is, or perhaps rather what should be, an over-riding normative principle. Namely, in its role in the global nuclear fuel cycle Australian policy, and its reflection in treaty arrangements, should adhere to a commitment toward maximising nuclear non-proliferation.

Concerns about commercial gain for resource corporations or proposals for using uranium as leverage to enhance state policy based upon dubious notions of the national interest or concerns for the smooth functioning of the United States-Australia Alliance should not undermine Australia's commitment to this normative principle.

A middle power such as Australia has an enduring structural interest in an international ordering system constructed by states that is rule based and is exhibited by robust international regimes. We should not be misled into thinking that the underlying policy rationale by successive Australian governments on the primacy to be accorded to multilateral trade regimes does not also apply in the security sphere. The nuclear non-proliferation regime is the paradigm example of a security regime whose health naturally accords with the structural interests of a middle power situated within an anarchic state system.

The Prime Minister's initiative on the renewal of a nuclear non-proliferation and disarmament commission should be seen in the context of what the government refers to as "creative middle power diplomacy." A treaty review such as this can serve to contribute to such creative middle power diplomacy by seeking to eliminate anomalies and helping to put Australian diplomacy on more firm ground by addressing the charge of hypocrisy.

The best way to gauge the health of the nuclear non-proliferation regime is by measuring how high a priority the principles that underpin it are adhered to by states. For instance, during the 1980s nuclear non-proliferation in Pakistan was not a high priority for the Western group of states. Some of the warlords that are being engaged by Australian forces in Afghanistan received western aid in the past. In 1986 a decision was made to escalate the conflict in Afghanistan by facilitating the transfer of Jihadi militants from the Arab world to the region.

These two examples, which threaten to become inter-related as pointed out by a recent US congressional study, demonstrate the true costs of putting short term interests ahead of what should be longer term priorities. We may rue this mismatch of priorities at a level orders of magnitude more than we do now.

Nuclear non-proliferation should have the highest priority.

If so, we discover that an issue that recurs throughout is how best Australia can manage a high level of normative commitment to nuclear non-proliferation in the context of global expansion in the use of nuclear energy. Any review of the set of Australian treaty arrangements needs to focus on this as a matter of the highest priority given the possibility that current arrangements may be out of step with global nuclear developments.

Moreover, the issue now no longer just concerns itself with the proliferation of nuclear weapons amongst states. We must now also concern ourselves with the proliferation of nuclear weapons to terrorist groups given the clear intent of some terrorist groups to inflict mass casualty attacks. Australian nuclear policy has been primarily concerned with state proliferation. Australia does not have a consistent non-state non-proliferation policy. This review should recommend that Australia develops such a policy and that this policy be reflected in nuclear safeguards treaties.

In conclusion, a few points are made about the joint Australia-United States of America defence facilities and the nature of United States nuclear deterrence policy, which Australia actively supports and facilitates by virtue of some, but not all, of the functions of these facilities. This means that the issue of nuclear war and these facilities need not necessarily be an existential issue.

1). US Tritium Production and Civil Reactors.

There is a mismatch between the nuclear safeguards treaty that Australia has with the Peoples Republic of China and that with the United States of America. In the treaty with the PRC it is explicitly stated that Australian uranium ought not to be directed toward fueling nuclear reactors that produce tritium for nuclear weapons, no such provision exists in the treaty with the US.

Tritium (H-3) is an isotope of hydrogen that is used in nuclear weapons. It can be used in the primary of a nuclear weapon to increase efficiency by the production of neutrons in fusion reaction with deuterium (H-2). It can also be used in the secondary of a thermonuclear weapon, but is usually produced by the fusion of H-2 and Li-6 within the weapon itself. Tritium has a half-life of 12.3 years and hence nuclear weapons need to be topped up on H-3 in order to operate at their designed explosive yield.

Generally speaking, tritium for nuclear weapons has been produced by bombarding Li-6 fuel rods with neutrons in dedicated (military) reactors. However, the United States no longer maintains its plutonium production reactors in an operative mode and the US has also disabled the reactors at Savannah River that produced tritium. Tritium production now occurs at the civilian reactors managed by the Tennessee Valley Authority as a part of the Watts Bar nuclear power plant.

Tritium production is important for it goes to the basics of Washington's Article VI commitment under the Nuclear Non-Proliferation Treaty. One of the purposes of H-3 production in the US is to maintain a sizable operational stockpile of nuclear weapons, with an associated reserve of tritium, into the indefinite future. If Australia feels that H-3 is a germane issue requiring explicate mention with respect to China then surely the same applies in the case of the US. In fact, it is of much more relevance in the US case given that in this respect tritium production occurs in civilian reactors and is being used to maintain a sizable stockpile of nuclear weapons into the indefinite future.

If the United States were to seriously cut the nuclear arsenal according to its Article VI commitments then tritium can be re-cycled from existing warheads as the arsenal downsizes. However, in 2003 240 Li-6 fuel rods were inserted into Watts Bar and the tritium subsequently produced was diverted to the US nuclear weapons complex in 2005. Another 240 Li-6 fuel rods were thereupon inserted at Watts Bar.

This provides a link between the civil and military fuel cycle in the United States. It also provides precedent for the presence of Australian uranium in a facility that has a dual military and civilian role.

US tritium production policy tells us not only something about the thinking on the indefinitely desired level of US nuclear forces but they also tell us something about its quality. That is, tritium production provides insight on both quantitative and qualitative issues. The US would like its nuclear weapons to be topped up on tritium to maintain the explosive yields of its warheads in order to meet the damage expectancy criteria of the US strategic nuclear war plan, known as USSTRATCOM OPLAN 8010-08. The yields of many of the current stockpile of US nuclear weapons are very high; 100 (W76), 300(W87) and 475 (W88) Kt of TNT (the Hiroshima bomb had a yield of about 16Kt of TNT). They are thereby highly suited for acting as hard-target killers.

Tritium policy thereby informs us that the US seeks to maintain a sizable nuclear arsenal dedicated to a counter-force nuclear strategy into the indefinite future.

When the safeguards agreement with the US was negotiated tritium would have been produced at strictly military run nuclear reactors. Given that it now occurs at civilian reactors managed by the Tennessee Valley Authority the Government should consider reviewing its safeguards treaty with respect to the US to reflect the same concerns that the previous government had in regards to tritium in the case of China. This could be achieved by negotiating appropriate arrangements in a Subsidiary Agreement or by negotiated amendment to the Treaty.

More broadly, the attitude taken with respect to the PRC should become standard Australian policy in safeguards treaties with nuclear weapon states. Failure to do so would not correlate with the stated objectives of the government's commission that has nuclear abolition as a goal.

Recommendation (1): Australia should amend the safeguards treaty with the US to bar the use of Australian uranium at reactors that also produce tritium for nuclear weapons.

(2). Australia and International Uranium Enrichment.

Ever since the development of commercially viable uranium enrichment by way of gas centrifugation the enrichment of uranium has been the focus of increasing proliferation concern. These concerns have played a role in the Iran nuclear case.

These concerns have arisen because gas centrifugation greatly lowers the capital costs of industrial scale uranium enrichment, thereby removing an important cost barrier to the further proliferation of uranium enrichment plants.

It is the isotope of uranium known as uranium (U)-235 that is responsible for nuclear fission when uranium is irradiated with neutrons. Uranium enrichment refers to the process of isotopic separation that enriches the content of U-235 relative to U-238. It is not strictly necessary to enrich uranium for the purposes of fueling a nuclear reactor; however, for light water moderated reactors (the dominant type in the global civilian nuclear fuel cycle) it is necessary to enrich uranium from 0.07% U-235 typically found in nature to 3-5% U-235. This is known as Low Enriched Uranium (LEU).

Highly Enriched Uranium (HEU) refers to uranium enriched to 20% and above in the isotope of U-235. Such uranium is said to be weapons usable but it is Weapons Grade Uranium (WgU), enriched to 90% of U-235 and above, that is typically employed as fuel for the fissile primary of nuclear weapons. HEU can be used in a bomb but it would be most unwieldy at levels appreciably less than that of WgU , even for a terrorist group, given that the lower the enrichment level the higher the critical mass needed to sustain an explosive chain reaction.

It is Australian policy in its safeguards treaty arrangements to allow states to enrich

Australian uranium so long as the enrichment level is less than 20%. Australian permission would be required for enrichment above 20%. Below 20% enrichment Australian consent is given in advance, that is "programmatically", without the need for consent upon a case-by-case basis.

It is widely acknowledged that gas centrifugation poses severe problems for current nuclear safeguards practices and techniques. The purpose of nuclear safeguards, contrary to popular perception that arises from usage of this term, is not to prevent the diversion of fissile materials but to deter diversion by developing a certain risk of timely detection.

The higher the risk of timely detection the greater the deterrent effect.

Gas centrifuges undermine safeguards in significant ways. One mechanism is by the rapid re-conversion of an enrichment plant configured for the production of LEU to the production of WgU. For instance, unlike with a more cumbersome traditional gas diffusion method, a gas centrifuge plant can be so converted by batch recycling in a mere number of days. If a state has a functioning implosion design and the ability to engage in the symmetrical compression of uranium metal hemispheres then it could develop a nuclear deterrent prior to detection and subsequent political reaction by the broader society of states.

It should be noted that this effectively undermines the deterrent effect of safeguards, their primary purpose.

Secondly, gas centrifuges are well suited to clandestine operation. Once again this is contrasted with the gaseous diffusion method of enrichment. This is because a clandestine gas centrifuge plant would use relatively little floor space, a footprint of the order of more mundane industrial facilities is possible, and consumes much less energy than a diffusion plant. This makes a clandestine plant difficult to detect (the Natanz plant in Iran was discovered by US intelligence not the International Atomic Energy Agency) thereby lowering the perception of risk inherent in the deterrent effect of nuclear safeguards.

Clearly, IAEA safeguards did not deter Iran.

It should be stressed that this effect also applies in the case of the Additional Protocol to the classical model safeguards agreement. The Additional Protocol has an emphasis on challenge no-notice inspections and environmental sampling, which was brought into being after the failure of IAEA safeguards in the 1980s (especially with respect to Iraq).

Indeed, the environmental sampling function is critical.

However, in the case of a gas centrifuge plant the pipes operate at below atmospheric pressure so very little process gas leaks into the environment. One would need to be at an order of a few kilometers away to detect these gases, which in the absence of exact knowledge of a plants location, severely hampers the environmental sampling function of the Additional Protocol.

These concerns have seen increasing calls for the development of multilateral or even international control of uranium enrichment. A number of proposals exist, for instance, from Russia, Germany, the International Atomic Energy Agency and Non-Governmental Organisations (NGOs).

Australia should support such efforts, given the above discussion, by foreshadowing the amendment of current nuclear policy in two respects. Firstly, Australia should stipulate that it shall amend safeguards policy to expressly forbid the enrichment of uranium in anything other than a multi-lateral uranium enrichment facility should international control of enrichment become a reality. In fact, Australia could use its uranium reserves as leverage to help bring about such a state of affairs by changing policy on uranium enrichment preemptively.

Secondly, this would require Australia to bite the bullet and reverse its long standing discriminatory uranium export policy. This might be a difficult recommendation for many stakeholders in the debate to swallow. Australia reserves the right to prevent the export of uranium, and to sanction the third party transfer of uranium, to whomever it sees fit.

However, critical to an international uranium enrichment fuel cycle, which some opponents of uranium exports such as the International Campaign to Abolish Nuclear Weapons claim to support, is the matter of assurance of fuel supply. Although enrichment incurs capital costs, nonetheless for a state embarking on a nuclear energy programme enrichment represents a relatively small additional capital impost. This relatively small capital impost, however, leads to the development of a significant degree of energy security.

The economics of the situation demonstrates that international uranium enrichment can only proceed if there exists a strong assurance of supply. If Australia, with its large reserves of high-grade uranium, were to maintain its discriminatory policy on exports and *transfer* then effectively international enrichment will be undercut. For instance, if Australia were to export uranium to an international facility to Russia (say) or China then it should have no qualms with that uranium, after being enriched to LEU, being passed along to Iran should Iran abandon its own enrichment programme as a part of internationalisation.

These are difficult choices to be sure, but they are ones that logically follow from a commitment to international enrichment which even stakeholders traditionally opposed to uranium exports claim they support.

The recent decision by the Government, upon the recommendations of this committee, to suspend its treaty arrangements with Russia are not without their implications in these regards. Although the decision was to be applauded, the reasons cited are cause for concern. Arguments by both Government and Non-Governmental Organisations have most often cited the Russian "invasion" of Georgia.

It is now openly conceded, which should have been obvious to any objective observer from the outset, that the conflict was initiated by Georgia and involved an attack on Russian peacekeepers and the commitment of various atrocities upon occasion of the bombardment of the South Ossetian capital. For wider political and strategic reasons the United States decided to vocally oppose Russian policy, as did Australia, and suspended a nuclear trade accord.

Australia also thereupon also suspended a uranium export treaty with Russia.

This response by Australia would have not gone un-noticed in the world's capitals. Australia's stated reasons for reversing the Russian treaty arrangement likely would have been cited as demonstrating the false promise of fuel supply guarantees and thereby our actions would have served to undermine the case for international uranium enrichment.

The reasons cited for not proceeding with uranium exports can matter just as much as the act itself, and probably has in the Russia case. To repeat, the commissions recommendations are to be applauded but the arguments used to support them by both government and NGOs are to be deplored.

Thus far concern has been directed at the challenge to nuclear non-proliferation posed by isotope separation by gas centrifuge. However, an even more alarming development has recently occurred that involves the enrichment of uranium by laser. Australia has played a key, indeed, decisive role in this process. Upwards of 20 countries have conducted research on the enrichment of uranium by laser. The technique referred to here is known as "SILEX" and its particulars are classified. SILEX is very much an Australian innovation.

However, a number of implications can be drawn from the open literature. The SILEX process appears to be a molecular separation technique that breaks the molecular bond holding the sixth fluorine atom in uranium hexafluoride (UF_6). A laser enrichment technique that uses UF_6 is more compatible with the existing fuel cycle than those techniques that do not.

SILEX LTD, the company behind the SILEX process, has claimed that it has mastered the technology at a cost of only $65 million.

Laser enrichment promises to lower the capital and operating costs of enrichment even further beyond that offered by gas centrifugation. It is widely acknowledged that laser isotope separation with lasers can be achieved with much less stages than with centrifuges thereby employing much less energy and a lower footprint than centrifugation. These factors lower capital and operating costs and would make enrichment even more economic, thereby undermining attempts to internationalise the fuel cycle we should hasten to add.

As with gas centrifugation these factors lower the proliferation barriers faced by a would be proliferant state. They would further lower the deterrent effect of safeguards by lowering the risk associated with a nuclear weapons programme.

In 2008 an important step was made in the development of industrial scale laser enrichment when General Electric announced that it had selected a site for a SILEX based enrichment plant.

As noted SILEX is an Australian innovation and its transfer to the United States was enabled, via treaty, by the previous government. To be specific this was enabled by the "Agreement for Cooperation with the United States of America concerning Technology for the Separation of isotopes of Uranium by Laser Excitation" signed between Australia and the United States. The purpose of this treaty was to enable cooperation on SILEX and the commercialisation of the SILEX process which would have been prohibited by the existing safeguards agreement between Australia and the United States.

The SILEX treaty is of interest because it involves the retrospective amendment of a nuclear treaty to enable the commercialisation of very proliferation sensitive nuclear technology. This demonstrates that a nuclear treaty can be subsequently amended, which has clear implications for the proceeding discussion on the US and tritium production (indeed for this entire process of review).

To be sure SILEX would be an advanced technology, but the very fact that commercial industrial scale enrichment is now possible will act as a spurt for the global nuclear complex to master the underlying technology. Export controls can slow this process but not prevent it. The case of Pakistan and gas centrifugation does not provide a source of optimism about technical diffusion in the case of laser enrichment.

If Australia were to make non-proliferation first it would renounce the treaty that has made SILEX possible on grounds that the SILEX process will fatally undermine the case for international control of uranium enrichment.

More broadly, the development of gas centrifugation and laser isotope separation provides us with an interesting theoretical development, one not fully developed in the literature. The global nuclear industry is a very capital intensive industry that also exhibits high operating costs. It is not a labour intensive industry. This creates a natural bias toward technical innovation in order to lower capital and operating costs. However, this presents us with a contradiction. Safeguards are a method of deterrence that, like any form of deterrence, involves the external manipulation of risk faced by an instrumentally rational actor.

Lowering capital and operating costs also lowers the level of risk involved in nuclear proliferation. Should the benefits of nuclear proliferation outweigh the costs we would expect that an appropriate calculation of the opportunity costs of nuclear proliferation would provide a bias toward proliferation.

Recommendation (2): Australia should formally support the adoption of internationalised uranium enrichment and be prepared to alter its nuclear treaties accordingly by forbidding states to use uranium in their nuclear reactors that are not enriched in internationally controlled uranium enrichment plants should international control come to fruition.

Recommendation (3): Australia should be prepared to adopt non-discriminatory clauses in its uranium export treaty arrangements in order to support international efforts to provide assurance of nuclear fuel supplies in the context of internationalised enrichment plants.

Recommendation (4): In the absence of the international control of uranium enrichment Australia should not provide programmatic consent for the enrichment of Australian uranium and its treaty arrangements should be made to reflect this.

Recommendation (5): Australia should repudiate its treaty commitments enabling the support of the SILEX process for the enrichment of uranium.

(3). Australia and Plutonium Reprocessing.

The possibility of a major expansion in the role of nuclear energy also has important implications for Australia's treaty arrangements as they relate to plutonium.

Over time in a nuclear reactor there is a buildup of plutonium in the spent fuel rods. These spent fuel rods can be extracted and chemically treated, in a process known as reprocessing, to extract the plutonium contained within the fuel rods. Plutonium is a fissile material that is used in nuclear weapons. As with uranium, plutonium comes in various grades depending upon its isotopic composition. Plutonium high in the content of the isotope Pu-239, from 90% and above, is said to be weapons-grade. Plutonium that contains 7% of the isotope Pu-240 is said to be reactor-grade. Pu-240 is more susceptible to spontaneous fission than Pu-239 and is more difficult to handle.

Reactor-grade plutonium has a higher content of Pu-240 than Pu-239 because the fuel rods remain in the reactor for a longer period of time when employed to generate energy than when used to produce plutonium for a nuclear weapons programme. That is, when used to produce electricity nuclear reactors operate at a higher "burn-up."

The Government is advised by its nuclear regulator, the head of the Australian Safeguards and Non-Proliferation Office, that reactor-grade plutonium cannot be used in a nuclear weapons programme to produce weapons with the required reliability and yield as is the case with nuclear weapons that use weapons-grade plutonium for the fissile core.

This advice is manifestly false. According to the US Department of Energy, which overlooks the US nuclear weapons stockpile, reactor-grade plutonium can be used in a nuclear weapon producing all the required military characteristics of a weapon fueled by weapons-grade plutonium. The scientific basis for this can be found in the fact that the deuterium-tritium fusion reactions in a "boosted" nuclear weapon, as mentioned above, produce excess neutrons that increase the efficiency of a nuclear explosion.

Credible reports suggest that India had tested at least one nuclear device using reactor-grade plutonium in 1998.

Currently about 7,500 kilograms of plutonium is produced in the spent fuel of nuclear reactors worldwide. By 2030 this is projected to grow to 100,000 kilograms of plutonium. Currently of the 7,500 kilograms of plutonium produced worldwide about 25 tonnes is separated annually. Of this about 8.25 tonnes is used in Mixed-Oxide fuel and thereby burned up and about 16.75 tonnes is stored in bulk re-processing plants.

As nuclear energy grows, all things being equal, these numbers will grow. The current capacity of the world's nuclear reactors is about 367 GWe (Giga Watts electric). By 2030 this is projected to grow up to 400-600 GWe. Beyond 2030 the Massachusetts Institute of Technology projects that global nuclear capacity will grow to at least 1,000 GWe or at most 1,500 GWe. A good part of this expansion will occur in Asia and in developing states.

It should be stressed that some energy analysts suppose that the economics of nuclear energy are not favourable and that the MIT study over-estimates the rate of expansion. Alternative energy economies can obviate the need for nuclear energy, can be brought online well before nuclear energy could cut into CO-2 emissions, without the same level of corporate welfare, and would do so without posing both proliferation and waste dilemmas.

It should be clear from the above numbers that the expansion of nuclear energy poses a spent fuel disposition problem of great magnitude and will likely significantly increase the amount of spent fuel reprocessed and thereby the amount of separated plutonium produced, assuming the continuance of current practice.

This means that the amount of separated reactor-grade plutonium will greatly outnumber the amount of weapons-grade plutonium produced by the world's nuclear weapon states.

The US nuclear weapons designer Ted Taylor, who played the key role in the design of the most efficient fission bomb built (the super-oralloy bomb), observed that "if a nation wants nuclear weapons, so the argument goes, it can get the nuclear materials 'directly', by building 'dedicated' facilities, perhaps secretly, to produce plutonium or highly enriched uranium, rather than diverting plutonium from 'peaceful' facilities already in operation. But this argument is made in the context of a world in which commercial plutonium separated from highly radioactive materials is not commonplace, as it would be if the planned plutonium economies become a major source of power for the world. A decision to make nuclear weapons could be acted on much more rapidly, and yield much greater numbers of nuclear weapons, in a country that is already producing large quantities of separated plutonium than in a country that is not."

This is a plausible hypothesis to make because it is acknowledged that safeguards at plutonium re-processing plants are characterised by "unavoidable limitations" as the Office of Technology Assessment of the United States Congress has stated in a number of reports. This is because of the large-through puts of plutonium reprocessing plants, which produces error rates higher than an SQ to fuel a nuclear weapon and thereby challenges the effectiveness of material accountancy. The hazardous nature of plutonium also makes it hard to monitor the flow of material in a bulk re-processing plant.

It is ironic that the successful conclusion of a Fissile Material Cutoff Treaty would increase the salience of such diversion scenarios. A FMCT would mean that a proliferant state would need to produce plutonium in a dedicated facility upon a clandestine basis, in order to achieve covert diversion. However, western intelligence agencies have argued that Syria sough to develop a small gas-cooled graphite-moderated reactor for plutonium production. The al-Kibar reactor was said to be discovered, monitored and then ultimately destroyed in an Israeli air strike prior to the introduction of nuclear material. If so, it demonstrates the perils of covert reactor construction and increases the relative merits of plutonium diversion from civil re-processing plants in the presence of a global FMCT.

There exist a number of means and proposals to deal with the issue of plutonium and nuclear energy. In so far as this section of the submission is concerned focus is directed toward the fast breeder reactor. The fast breeder reactor would employ separated plutonium in the core. Plutonium produces 2.91 neutrons per nucleus during fission. Only one of these neutrons is needed to sustain fission in the core of a breeder reactor, the other neutrons are captured by a "blanket" of U-238 that surrounds the core of a breeder reactor.

By absorbing these neutrons more plutonium is produced than is used in the core, hence the reactor "breeds" plutonium. Fast breeder reactors are most disfavourable from a proliferation perspective. The plutonium-239 that is produced by neutron capture in the uranium blanket surrounding the core is weapons grade, in fact can be at a super weapons- grade level (i.e. approaching close to 100% Pu-239), and can be directly diverted to a nuclear weapons programme without further re-processing.

This makes breeder reactors to be very proliferation sensitive technology and very difficult to safeguard. As the stockpile of separated plutonium grows so does the economic incentive for breeding plutonium. This would be especially the case where nuclear energy programmes are highly motivated by concerns for energy security, which looms as a significant structural issue in 21st century international relations.

Japan, India, Russia and China currently have breeder reactor programmes. Needless to say breeder reactors represent problematical and difficult to master and develop technology, but breeding has been a long-term objective of the nuclear industry. The

Howard Government had decided to export uranium to India even though India did not agree to place its fast breeder reactor programme under safeguards as a part of its trade and technology transfer deal with the United States.

It is Australian policy in its treaty arrangements, where applicable, to allow for the programmatic consent of plutonium re-processing involving spent fuel derived from the use of Australian uranium. When the Fraser Government allowed the export of uranium it was Australian safeguards policy to only allow for the re-processing of such spent fuel on a case-by-case basis. As noted, due to pressure from commercial entities, this has shifted to programmatic consent.

Given the unavoidable limitations of safeguards and the looming challenge posed by the continued growth in the amount of separated plutonium to be faced by the international community it is recommended that Australia should review and revise its nuclear treaties to ban the re-processing of spent fuel derived from the use of Australian uranium.

Recommendation (6): Australia should review its nuclear treaty arrangements with the view toward explicit forbidding the reprocessing of spent fuel rods to separate plutonium derived from the use of Australian uranium.

(4). Global Nuclear Energy Partnership.

One proposal for internationalising the nuclear fuel cycle is the Global Nuclear Energy Partnership announced by President George W Bush in 2006. This aspect of the GNEP must be seriously questioned, however.

The previous government had seen Australia accede to the Global Nuclear Energy Partnership. In opposition the Australian Labor Party had expressed a negative attitude toward the GNEP. The dominant concern of the ALP focused on the issue of nuclear waste.

It was supposed that Australian support for the GNEP would see Australia become a repository for nuclear waste. However, the Rudd Government to date has not reversed Australia accession to the GNEP and has continued to participate in GNEP meetings. The Government has announced an internal review of the GNEP accession.

The fact of this committee's review of Australia's nuclear treaties and the Federal Government's own simultaneous internal review of GNEP accession makes this parliamentary review to be a most timely one. It might well be that the parliamentary review could make its most lasting contribution precisely in the GNEP area.

The GNEP has not been highly regarded by the US Congress, partly on proliferation grounds. Should this committee upon review find itself disfavourably disposed toward the GNEP then it should find itself in good company with its parliamentary colleagues in the US.

Indeed, the US Congress explicitly barred funding “for facility construction for technology demonstration or commercialization” on grounds that the GNEP is “s at best premature”. The Congress is also concerned about the proliferation aspects of the GNEP.

The US Congress is right to be concerned about the proliferation potential of the GNEP programme.

The claims for proliferation resistance rest on two main grounds. Firstly, that the development of alternative techniques for reprocessing plutonium are inherently proliferation resistant and secondly, that the deployment of the Advanced Burner Reactor will manage the issue of global nuclear expansion and plutonium production.

The main proliferation benefit, it is argued, comes from new methods of plutonium reprocessing.

Hitherto plutonium has been chemically reprocessed using the PUREX method. The most important feature of the PUREX method to be mindful of for our purposes is that PUREX was developed during the Manhattan Project to separate plutonium for nuclear weapons.

Given this the PUREX method produced plutonium with high purity.

The proposed alternatives, such as UREX, UREX+ and Pyroprocessing all are said to have proliferation resistance because the plutonium reprocessed would have impurities that would render either diversion for proliferation by a state or seizure by a terrorist group to be most problematical given that the final product would be highly radioactive. Moreover, the presence of these impurities means, it is argued, that these processes do not lead to the production of "separated plutonium" as with PUREX.

These purported benefits have been greatly oversold.

But before looking at this we must pause to note an obvious contradiction. If it is the case that the alternatives to the PUREX method posses proliferation resistance then why make the case for the internationalisation of the fuel cycle? If it is the case that the alternatives to PUREX are characterised by high proliferation resistance then why not export the technology to Iran and North Korea?

The technical aspects of the alternative reprocessing techniques have been oversold because most of the uranium from the spent reactor fuel would still be separated by the alternatives to PUREX. It would be fallacious, therefore, to state that the end product is not separated plutonium. Furthermore, the radioactivity level of the final product, despite the presence of impurities, would not be "self-protecting." That is to say, by not being "self-protecting" the final product could still be handled by humans.

In addition to the forgoing it still remains the case that the plutonium so separated, even in the presence of the claimed impurities, could still be fabricated into plutonium metal for use in a nuclear weapon.

The purported proliferation benefits of the proposed reprocessing methods are non-existent. In fact, we might state that there are some interesting detrimental effects of these methods. This is because the presence of impurities would actually make the material accountancy function of nuclear safeguards much more difficult, which already are problematical even in conventional reprocessing plants as discussed above.

The effect of a return to reprocessing would be to legitimise reprocessing and increase the global stockpile of plutonium, a point to which we return.

The purpose of reprocessing is to develop a breeder reactor fuel cycle, the long sort after goal of the global nuclear industry, the centrepiece of which is the Advanced Burner Reactor (ARB). The ARB is a developmental Generation IV nuclear reactor (current Light Water Reactors are Generation III reactors) and actually is a technological system that is severely premature. The development of a fleet of ARB reactors is a very long-term prospect, and is acknowledged as having a high probability of never actually coming online. This aspect of the GNEP makes the whole programme to be a great gamble, one of the reasons behind the concern expressed by Congress.

It is for this reason that a National Academy of Sciences' National Research Council report described the GNEP has possessing a high inherent risk of eventual failure and should not go ahead.

The ABR, it is argued, would burn or consume plutonium (and other elements higher than uranium on the periodic table). The ABR is a fast breeder reactor without a uranium blanket. The ABR programme is seeing greater international cooperation on plans for more fast reactors. For instance the GNEP has seen the United States cooperate with South Korea on research and development for the Kalimer 600 MWe fast reactor.

Failure of the ABR concept would likely result a fallback to a default programme based on conventional fast breeder reactors within the context of a closed fuel cycle.

Given the high risk of failure and the long lead time for the ABR programme the world may be saddled with more reprocessing plants and much greater levels of separated plutonium. This follows because an expansion in the reprocessing of LWR fuel will occur in the meantime. The GNEP, rather than lowering proliferation risks, actually greatly increases them.

If Australia were to put non-proliferation first it would not jump into a problematical programme that appears to be destined for failure. In fact, from a domestic policy perspective, this makes a potential commitment to developing a geological repository for the storage of nuclear waste in Australia to be most irrational.

Australia would be saddled with a nuclear waster storage site for a programme that necessarily possesses a long lead time and appears destined to failure. It appears that one of the objectives behind GNEP is to actually facilitate an expansion in nuclear energy in a way that removes the current waste storage barrier.

It should also be stressed that the purpose of the GNEP is not to internationalise the nuclear fuel cycle, as commonly supposed. The purpose of the GNEP is to monopolise the nuclear fuel cycle within the declared nuclear weapon (and associated) states. That is not internationalisation and makes for a world of difference for what is being proposed is selective monopolisation.

Given that the salience on energy security can only increase in the coming period it is difficult to believe that international society would willingly accede to selective monopolisation of the global nuclear fuel cycle. Therefore, we may state that there exist technical, strategic and economical reasons for the GNEP initiative to fail. It is small wonder then that the US Congress has been loath to fully fund the GNEP.

The GNEP is not motivated by proliferation concerns and will actually increase nuclear proliferation risks. Many of its features are far too premature and may saddle Australia with a nuclear waste storage site even though the programme may ultimately fail. There are good structural reasons to suppose that this will be the case.

Australia should withdraw from its treaty commitment binding it from the Global Nuclear Energy Partnership.

Recommendation (7): Australia should withdraw from its treaty commitment that binds it to the Global Nuclear Energy Partnership.

(5). Nuclear Terrorism and Australian Safeguards Policy.

Australia's non-proliferation and safeguards policy was set when the dominant concern centred upon the proliferation of nuclear weapons amongst states. However, since the September 11, 2001 terrorist attacks upon the United States increasing attention has been directed at the possibility of nuclear terrorism.

In saying this we should stress that terrorist construction of a nuclear weapon, or even detonation of an existing state manufactured nuclear weapon, would be an extremely difficult task. There exists a great deal of misunderstanding, indeed hyperbole, surrounding terrorist capabilities in these regards.

Al-Qaida, the main threat, may well have the intent to inflict mass casualty attacks at a level orders of magnitude above that inflicted on 9/11 but, for the present, it cannot be stated that it has the capability to do this by employing a nuclear device with a true nuclear yield.

However, given terrorist intent it would be wise and prudent to lock down the global stockpile of weapons-grade and weapons-usable fissile materials to the maximum extent possible. Actions by the international community to enhance the domestic and international regimes governing the physical protection of, and material accountancy over, fissile materials are more than justified, even in the absence of robust terrorist capability (at this time).

Australia does not have a formal safeguards policy that takes into account the prospect of nuclear terrorism in its uranium export and safeguards policy. We can see this when we compare and contrast, as we shall below, the safeguards agreements reached with China and Russia.

In so far as Australia's role in the global nuclear fuel cycle is concerned we would be concerned with the physical protection of separated plutonium reprocessed from spent fuel derived from Australian uranium supply. This would include having material accountancy oversight at all times, ensuring that when in storage the material is well secured at all times and that adequate security is provided when the said material is in transit.

To be sure we are here referring to reactor-grade plutonium. This grade of plutonium can magnify the challenge of terrorist nuclear weapon manufacture and, if successful, would likely lead to an unreliable to fizzle yield. In saying this, we might also pause to consider that reactor-grade plutonium may be viewed favourably by terrorist groups precisely because of its relatively high rate of spontaneous fission.

This follows because the relatively high rate of spontaneous fission means that a terrorist group need not manufacture a neutron trigger or initiator for their weapon, which is one of the main challenges of plutonium type bomb manufacture.

It need also be pointed out that even a fizzle yield, as stated by Carson Mark (the head of the theoretical division at Los Alamos National Laboratory for much of the cold war), would still be a sizable explosion and would likely lead to significant casualties if detonated in an area that exhibits high population density.

Having said that let us return to the issue of the inconsistency in Australian policy and its reflection in nuclear treaties. Consider, first, the relevant section of the nuclear treaty with Russia (Article XIII Clause 2)

In addition to its obligations under the Convention on the Physical Protection of Nuclear Material done at Vienna and New York on 3 March 1980, including any amendments that are in force for each Party, each Party shall apply measures of physical protection in accordance with its national legislation which meet levels not less than the recommendations of IAEA document INFCIRC/225/Rev.4 (corrected) entitled "The Physical Protection of Nuclear Material and Nuclear Facilities", as amended from time *to time. Any amendment to or replacement of IAEA document INFCIRC/225/Rev.4 (corrected) shall have effect under this Agreement only when the Parties have informed each other in writing through diplomatic channels that they accept such amendment or replacement.*

In the case of China we have

In addition to its obligations under the Convention on the Physical Protection of Nuclear Material, done at Vienna on 3 March 1980 and as amended from time to time, each Party shall apply, insofar as they are reasonable and practicable, the recommendations of Agency document INFCIRC/225/Rev.4 entitled, "The Physical Protection of Nuclear Material and Nuclear Facilities", as updated from time to time, or any subsequent document replacing INFCIRC/225/Rev.4. Any alteration to or replacement of document INFCIRC/225/Rev.4 shall have effect under this Agreement only when the Parties have informed each other in writing that they accept such alteration or replacement.

We note that there are significant differences here. In the case of Russia it is an obligation to meet physical security standards not less than that recommended by the International Atomic Energy Agency recommendations, that is, INFCIRC/225/Rev.4. In the case of China it is clear that no such hard and fast obligation exists.

China has an uncertain material accountancy system and physical protection regime. Moreover, within China's borders there are al-Qaida allied or affiliated groups known to conduct terrorist operations. The inconsistency between the Russia and China treaties demonstrates that Australia does not have a consistent non-proliferation and safeguards policy that takes into account concerns centred upon nuclear terrorism and that this inconsistency is reflected in existing nuclear treaties.

This should be changed. Australia must adopt in its own policy statements what it considers to be adequate physical protection over nuclear materials. It is indeed the case that INFCIRC/225/Re.4 is the standard international statement, but we must be mindful of what that document ultimately consists of.

The IAEA guidelines remain purely of advisory nature and are most generic such that it is openly acknowledged by analysts that it can be possible for a state to be in full compliance with the recommendations of INFCIRC/225/Rev.4 and not be in possession of a secure physical protection system. This makes current Australian practice not only inconsistent but also inadequate.

We note an interesting correlation. We are informed that terrorist mass casualty attacks employing weapons of mass destruction is the greatest threat faced by international society. When reasons of state or commercial prerogatives are to be advanced (as with the shameful invasion and occupation of Iraq) we observe that the threat is to be promoted. When it impacts on state policy and commercial interests we note that rhetoric does not match policy.

Australia needs to revise its non-proliferation policy to develop an adequate and consistent policy on the protection of Australian obligated nuclear materials. This policy should be more robust than that exhibited by INFCIRC/225/Rev.4. At the centrepiece of such a policy should be an Australian assessment on what level of security, at sensitive points on and along the fuel cycle, is adequate to meet well-planned insider theft or attack by a specified group of armed and tactically trained attackers. In the nuclear security parlance this is known as a Design Basis Threat (DBT).

Australia ought to develop a DBT type approach to physical protection and seek to build that into its nuclear treaties. Indeed, Australia is in a unique position in that it may use its leverage over nuclear fuel supplies to help garner a more robust global regime for the physical protection of fissile materials.

Recommendation (8): Australia should develop a consistent and adequate physical protection policy for fissile material security and this policy should be reflected in all its relevant nuclear treaties. In this way Australia would amend its safeguards policy to also address concerns centred upon nuclear terrorism.

(6). Australia and US Nuclear Strategy.

Over the years the US-Australian Joint Facilities have attracted great controversy. The Facilities in question were Pine Gap, Nurrangar and North-West Cape. From the perspective of nuclear deterrence the two most relevant facilities have been Nurrangar and North-West Cape. Amongst other things Pine Gap is involved in verifying strategic arms control agreements, although the way in which it does this potentially can have a dual purpose.

Nurrangar is no longer in use. The base at Nurrangar would have been used as a part of the US Defense Support Programme which consists of about 5 to 6 satellites in Geo Synchronous Orbit and whose primary purpose would be to monitor for ballistic missile launch in the context of a strategic posture known as "launch on warning" (LOW). LOW has been variously described as a "hair trigger alert" and so on. Whatever we might make of such labels, one thing is clear, LOW is designed to enable US strategic planners to launch nuclear weapons prior to any nuclear weapons landing on US territory.

This may seem innocuous but in fact is highly destabilising. LOW, firstly, enables planners to implement the US nuclear war plan in a crisis. The nature of this war plan will be discussed in due course. LOW is de-stabilising because it would face policy makers with an acute dilemma in a crisis given the relative short flight time of ballistic missiles, especially submarine launched ballistic missiles launched on depressed trajectories. It is recognised that mutual LOW postures leads to the development of a certain risk of accidental nuclear war.

The United States does not have a nuclear weapons employment policy that is based on a "no-first use" doctrine. LOW is a manifestation of this.

The Defense Support Programme will be replaced by the Space Based Infra-Red System High (SBIRS-High). The Pine Gap facility would be involved in providing ground processing for SBIRS as would the associated facility at Menwith Hill in the UK. Australian participation in Launch-on-Warning would thereby continue.

The actual risk of accidental nuclear war that LOW poses is difficult to quantify but relative probabilistic analysis suggests that the risk is much higher than the risk of nuclear terrorism.

The Harold E Holt centre involves communications with US submarines. This would include communication with US Ohio or Trident class Fleet Ballistic Missiles armed with Sea Launched Ballistic Missiles each having a payload of multiple nuclear warheads. The Pacific Fleet of Trident submarines would be involved in the nuclear targeting of Russia and China. Fleet Ballistic Missile Submarines are not configured for a second strike to enhance retaliatory conceptions of deterrence. For instance the most numerous warhead on US SLBMs is the W76. The W76 has been undergoing a Life Extension Programme that has seen the fuse on this warhead type being configured for ground burst, not just air burst detonation. It is openly acknowledged that this enhances the hard-target kill capability, and thereby the first strike capability, of US Fleet Ballistic Missiles.

These capabilities must be seen within the context of US nuclear strategy. In so far as major nuclear weapon powers are concerned, that is Russia and China, the US adopts a strategy of "damage limitation" and "escalation control." Essentially that means that the US seeks to limit damage to itself by retaining a capability to strike first in a counter-force nuclear strike and to control escalation on terms favourable to the US, that is, to prevail in nuclear war.

Both the early warning capability and the submarine communication capability functions of present arrangements means that Australia supports and facilitates this nuclear strategy. Australia plays no role in the framing of US nuclear strategy and simply takes for granted the dangerous implications that it has for global security. This stands in complete contrast to the sentiments expressed by the Prime Minister upon the launch of his renewed International Nuclear Non-Proliferation and Disarmament Commission.

It should be stressed that not even the US Congress supports the current approach to nuclear strategy to the extent that it has refused to grant the Executive branch with funding for the Reliable Replacement Warhead and Complex 2030. Congressional leaders have often cited the lack of consensus on nuclear strategy as the main reason for their recalcitrance.

As noted, Nurrangar no longer is in operation but its functions have been transferred to Pine Gap. The Harold E Holt Facility continues to operate, however. Indeed, on July 15

2008 the Rudd Government signed a treaty extending these arrangements for another 25 years.

The treaty arrangements for the remaining facilities in existence should explicitly bar the use of these facilities in the context of nuclear war planning. The Committee should consider a review of these treaties that would enable these facilities to conduct those activities that it does without at the same time continuing their dangerous role in the US Strategic War Planning System.

In so far as non-proliferation is concerned these aspects of US nuclear planning, combined with Ballistic Missile Defence (the role that the monitoring of telemetry played by Pine Gap means that this facility may be a part of the US Ballistic Missile Defence System), leads to what is referred to as vertical proliferation. This form of proliferation is not limited to the number of nuclear weapons possessed by a nuclear weapon state. It would also include such matters as expanding the scope of deterrence, lowering the bar on nuclear weapons use and qualitative improvements to nuclear weapons and their associated delivery systems.

US policy is contributing to such vertical proliferation and greatly endangers global security. Australia retains no strategic benefit from the impact that US nuclear weapons policy has on regional and global security.

A recent scientific study has attempted to stimulate the global ecological consequences of a nuclear war between Russia and the US at current force levels. The study finds that the level of soot is at about the same level as that of similar studies in the 1980s (a reflection of what was called “overkill” during the Cold War) and that these levels of soot threaten large-scale climate change and the failure of agriculture. It cannot be excluded that such a conflict would lead to casualties measured in the billions, the study finds.

Recommendation (9): Australia should repudiate its treaty arrangements that sees Australia facilitate US nuclear war planning through the Joint Facilities so long as that war planning is based on robust and permissive conceptions of nuclear deterrence. The Joint Facilities should be made to conduct operations that are in no way related to nuclear war planning.

(7). Statement of Recommendations.

In sum if Australia were to put nuclear non-proliferation first as a normative principle underpinning its nuclear treaty arrangements the Government would surely at least seriously consider the adoption of the following recommendations.

Recommendation (1): Australia should amend the safeguards treaty with the US to bar the use of Australian uranium at reactors that also produce tritium for nuclear

weapons.

Recommendation (2): Australia should formally support the adoption of internationalised uranium enrichment and be prepared to alter its nuclear treaties accordingly by forbidding states to use uranium in their nuclear reactors that are not enriched in internationally controlled uranium enrichment plants should international control come to fruition.

Recommendation (3): Australia should be prepared to adopt non-discriminatory clauses in its uranium export treaty arrangements in order to support international efforts to provide assurance of nuclear fuel supplies in the context of internationalised enrichment plants.

Recommendation (4): In the absence of the international control of uranium enrichment Australia should not provide programmatic consent for the enrichment of Australian uranium and its treaty arrangements should be made to reflect this.

Recommendation (5): Australia should repudiate its treaty commitments enabling the support of the SILEX process for the enrichment of uranium.

Recommendation (6): Australia should review its nuclear treaty arrangements with the view toward explicit forbidding the reprocessing of spent fuel rods to separate plutonium derived from the use of Australian uranium.

Recommendation (7): Australia should withdraw from its treaty commitment that binds it to the Global Nuclear Energy Partnership.

Recommendation (8): Australia should develop a consistent and adequate physical protection policy for fissile material security and this policy should be reflected in all its relevant nuclear treaties. In this way Australia would amend its safeguards policy to also address concerns centred upon nuclear terrorism.

Recommendation (9): Australia should repudiate its treaty arrangements that sees Australia facilitate US nuclear war planning through the Joint Facilities so long as that war planning is based on robust and permissive conceptions of nuclear deterrence. The Joint Facilities should be made to conduct operations that are in no way related to nuclear war planning.