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Nuclear Proliferation

Fifth in the series on the *Debate on Nuclear Policy in Australia, 2005-2006*

Brian Lloyd



Northern Territory Government
Department of Local Government, Housing and Sport

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GPO Box 42, Darwin, NT, 0801.

email: parlibrary.dlghs@nt.gov.au

phone: 08 8999 1776

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Abstract

This paper considers ‘proliferation’: that is, the degree to which links between civilian and military applications of nuclear materials, and technology, may contribute to an increase in risk from nuclear weapons. Key questions are: can nuclear material supplied for peaceful purposes be used to fashion nuclear weapons? Does increasing the supply of uranium for avowedly civilian purposes lead, necessarily, to an increase in levels of risk from nuclear weapons? If Australia raises its levels of uranium export, will that lead to higher levels of risk from nuclear weapons overall? Given the entry of North Korea to the nuclear weapons ‘club’ in recent months, and the discomfort and alarm this has occasioned, it is clear that these are important questions within the larger debate on nuclear policy.

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Introduction

This is the fifth in a series of papers on the present nuclear debate in Australia. This paper considers 'proliferation': that is, the degree to which links between civilian and military applications of nuclear materials, and technology, may contribute to an increase in risk from nuclear weapons. Key questions are: do civilian applications of nuclear technology make a direct contribution to the prevalence of nuclear weapons? Is it possible to prevent nuclear material supplied for peaceful purposes being used to fashion nuclear weapons? Does increasing the supply of uranium for avowedly civilian purposes lead, necessarily, to an increase in levels of risk from nuclear weapons? Simply put: if Australia raises its levels of uranium export, will that lead to higher levels of risk from nuclear weapons overall? Given the entry of North Korea to the nuclear weapons 'club' in recent months, and the discomfort and alarm this has occasioned, it is clear that these are important questions within the larger debate on nuclear policy ("Nightmare comes to pass", 2006; Hilsum, 2006; Wright, 2006).

As for other papers in this series, the arguments considered here are drawn from selected submissions to an inquiry of the House of Representatives Standing Committee on Industry and Resources (HRSCIR), the *Inquiry into the Strategic Importance of Australia's Uranium Resources*.¹ Arguing in favour of an expansion in nuclear activity, and discussed under the heading 'For', are submissions by the Uranium Information Centre (UIC), the Australian Nuclear Scientific and Technology Organisation (ANSTO), and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Arguing against such an expansion, discussed under the heading 'Against', are submissions by the Medical Association for the Prevention of War (MAPW), Friends of the Earth (FoE), and anti-nuclear activist Richard Broinowski. These are followed by a section, 'Correspondences', which draws links between these arguments and those aired in the news media, and then by a Conclusion, considering the merits of arguments considered here, and drawing deductions from them.

'For'

Nuclear proponents display a high degree of confidence that uranium supplied for peaceful purposes will remain in the civilian domain. This is based on the idea that military and civilian applications of nuclear technology involve quite different materials, that 'the type of uranium ... needed for bombs is different from that in a nuclear power plant ... bomb-grade uranium has to be highly enriched' (Uranium Information Centre, 2005, p.32). A similar case is made for plutonium, a key component of nuclear weapons: 'bomb-grade plutonium [is] fairly pure ... and [is] made in special reactors' (Uranium Information Centre, 2005, p.32). The proposition is that plutonium must be of a distinctive type and purity before it can be used for military applications (ANSTO, 2005, p.[19]).² If it is only 'reactor-grade plutonium' it is 'of a nature quite different from

¹ The Committee's report was released in November 2006, and will be discussed in a later paper. See House of Representatives Standing Committee on Industry and Resources (2006)

² ANSTO's submission is unpaginated. Pages are cited in sequence, in square brackets.

what goes into the making of weapons [and] it is quite unfit to make a bomb' (Barnaby, 2005).³

We will consider counter arguments to these propositions below. However if, for the sake of argument, we accept this position, there are further questions that need to be answered. For this only deals with the distinctiveness of materials once they have been subjected to processing: questions remain as to how uranium ore — prior to differentiation — is to be prevented from becoming raw material for military applications. On this side of the debate, the answer to this question comes in a number of parts.

The main line of argument joins two strands: that international safeguards are indeed effective, and that Australia, by virtue of its influence as a uranium exporter and signatory to regulatory regimes, makes a significant contribution to their effectiveness. This includes Australia's involvement with the Nuclear Non-Proliferation Treaty, in the context of which, since its advent in 1970, 'Australia has been an important international influence in ensuring that uranium has been used only for peaceful purposes' (Uranium Information Centre, 2005, p.2). Further protection comes through the bilateral agreements Australia signs with its customers for uranium ore. As a result, and because of the 'extent of the world's uranium resources it controls', 'Australia is uniquely placed to exercise even greater international influence to maintain the safety and security of the nuclear fuel cycle' (Uranium Information Centre, 2005, p.3). The argument is that Australia, by participating in the nuclear fuel cycle, can exert influence for the good.

Nuclear proponents go on to indicate a further layer of control specifically applied to Australian uranium: bilateral agreements between Australia and its export clients, resulting in 'Australian Obligated Nuclear Material' ('AONM'). Despite Australian uranium ore being indistinguishable, in any chemical or radiological sense, from materials sourced elsewhere — a recognised characteristic of the international uranium market — proponents argue that accounting mechanisms keep track of AONM to a sufficient degree, able to trace nuclear material through changes of location and 'flag-swapping'. This last is the practice, under the international accounting system for uranium, where uranium from one source is re-badged against another equal body of material in another location, to reduce the need for further movement of material (Uranium Information Centre, 2005, p.34). In the view of nuclear proponents, these practices do not undermine checks and balances on uranium use: rather, this contributes to higher levels of oversight and transparency, making it less possible for nation states to acquire nuclear weapons under conditions of secrecy (Uranium Information Centre, 2005, pp.33-34).

A subsidiary line of argument appeals to more recently-developed 'proliferation-resistant' reactor designs, claiming that they will prevent 'the diversion or undeclared production of nuclear material, or misuse of technology, by the host State in order to acquire nuclear weapons or other nuclear explosive devices' (ANSTO, 2005, p.[19]). However, ANSTO's submission makes it clear

³ Ryukichi Imai, former Japanese Ambassador for Non-Proliferation, quoted by Barnaby (2005).

that these are technologies in an experimental stage, as are other arrangements associated with 'Generation IV' reactor design (ANSTO, 2005, pp.[18, 20]; Wikipedia, 2006).

In summary, nuclear proponents express confidence in an effective separation between civilian and military uses of nuclear materials: in the first instance, by virtue of inherent differences they propose between civilian and military-grade nuclear materials and, in the second instance, on the basis of a view that international treaties and regimes are effective. They suggest that these are successfully enforced by current accounting systems, and are made stronger by Australia's own involvement in them, including agreements with export clients. In addition, they cite technologies which, they say, promise to reduce the potential for civilian nuclear fuel to be diverted to non-peaceful purposes in the future. Since, in their view, the present non-proliferation system works well, the situation offers no impediment, or cause for concern, that would discourage Australia from exporting higher quantities of uranium ore, or prevent an expansion of its nuclear involvement in other ways.

'Against'

In response, nuclear opponents deny suggestions of a reliable separation between the civil and military applications of nuclear materials, and raise questions as to the integrity and effectiveness of current regulatory regimes — both of international treaties and Australian bilateral agreements. These lines of argument are closely related: if nuclear opponents are able to prove that there are few substantive differences between civilian and military materials, then there are consequences for how we should view the non-proliferation regime. For, as one source suggests, 'the bedrock of the Nuclear Non-Proliferation Treaty' is that 'peaceful and military uses of nuclear energy can be separated', and if that is called into question, so must current safeguards (Morton, 2005). Hence, nuclear opponents draw the deduction that an 'expansion of uranium mining in Australia will inevitably add to the global danger of nuclear weapons proliferation and use', and should not be implemented as policy (MAPW, 2005, pp.4-5).

In addressing the central question of the distinctiveness or otherwise of civilian and military uranium, nuclear skeptics emphasise similarities, saying that:

The same processes and facilities can be used to enrich uranium to fuel commercial light water reactors — that is, to make LEU (Low-Enriched Uranium) ... as to make HEU (Highly Enriched Uranium) for nuclear bombs (MAPW, 2005, p.5).⁴

In this view, not only is LEU more similar to HEU than it is different: it represents a significant stepping stone to the more highly-refined form, and not much more processing is required to achieve weapons-ready uranium (MAPW, 2005, p.5). As a result, 'stockpiles of low enriched uranium, if maintained in a form suitable for enrichment ... can provide the base material to more easily and more rapidly manufacture HEU for use in nuclear weapons' (UN HLP, cited in MAPW,

4 Here MAPW quotes the UN Secretary General's High Level Panel on Threats, Challenges and Change (MAPW, 2005, p.5).

2005, p.5). This amounts to a situation in which 'nuclear power programs constitute a form of "latent" nuclear weapons proliferation' (MAPW, 2005, p.6).

Similar points are made about plutonium. Where nuclear proponents assert an inherent separation between types of plutonium suitable or not for nuclear devices, nuclear skeptics say that history has proved this a by no means reliable distinction. Frank Barnaby, a UK-based radiation expert argued, in a paper presented to a MAPW conference in 2000, that:

for an unsophisticated proliferator, making a crude bomb with a reliable, assured yield of a kiloton or more — and hence a destructive radius about one-third to one-half that of the Hiroshima bomb — from reactor-grade plutonium would require no more sophistication than making a bomb from weapon-grade plutonium (Barnaby, 2000).⁵

Barnaby went on to observe that the proposition that 'reactor-grade plutonium can be used to fabricate nuclear weapons' had been proved when 'the British ... exploded such a device in Australia in 1956' and that 'the Americans [had] exploded at least one such device in the 1960s' (Barnaby, 2000). In that paper, he agreed with a US nuclear researcher, whom he quoted, who suggested that 'all plutonium can be used directly in nuclear explosives', and that 'the concept of [a] plutonium which is not suitable for explosives is fallacious' (Barnaby, 2000).⁶

Further grounds on which nuclear opponents say the reliability of the international anti-proliferation regime may be questioned are: the 'affirmation' of nuclear weapons in national security policies; the acquisition of nuclear weapons by states that are potentially unstable and have not signed the Non-Proliferation Treaty; the 'widespread [and] clandestine' spread of 'nuclear technology and weapons designs'; a high number of 'confirmed' cases of 'nuclear material diversion' and documented 'incidents of illicit trafficking in nuclear materials' over the last decade; the development of new, de-stabilising weapons technologies by leading nation states; and an absence of current nuclear disarmament negotiations (MAPW, 2005, pp.2-3).

If these arguments were to be sustained, it would lead necessarily to the conclusion that the international nuclear non-proliferation regime, in its present form, is in poor shape. Clearly, similarities between civilian and military nuclear materials are a substantive issue. However, nuclear skeptics also argue that problems with the current regime go further in the sense that it is not only the radioactive material, nor the technology, that is inherently dual-purpose: they say that this is also true of the non-proliferation regime itself. The crux of the matter is that

the simultaneous roles of the IAEA in discouraging actual proliferation, while assisting and promoting the spread of know-how, materials and technology relevant to weapons development is inherently contradictory ... [and a] similar contradiction is embodied in Australia's position ostensibly opposing nuclear proliferation, while at the same time undertaking and promoting uranium exports (MAPW, 2005, p.6).

⁵ Barnaby is quoting Matthew Bun, Chair of the US National Academy of Sciences.

⁶ Robert Seldon at this time was a researcher at Lawrence Livermore National Laboratory, a nuclear research establishment in the US.

Hence, in MAPW's view, the unauthorised use of radioactive materials in nuclear weapons is more than a *potential* outcome of the international control regime. Rather, due to the access it provides to the nuclear fuel cycle, the regime represents an established avenue to nuclear weapons acquisition, and a number of countries have followed this path:

Of the 60 countries which have built nuclear (power or research) reactors, over 20 are known to have used their 'peaceful' nuclear facilities for covert weapons research and/or production (Friends of the Earth, 2005, p.16).

The ability of apartheid-era South Africa to acquire nuclear weapons is one instance of this, as is the acquisition of nuclear weapons first by India, and then Pakistan (MAPW, 2005, p.6). To this we can now add the more recent, dramatic, example of North Korea, and with questions over whether Iran may join it in the not too distant future (Hilsum, 2006; Wright, 2006; Australian, 2006). Nuclear skeptics say that in each case 'research and civil nuclear power programs were integral to nuclear weapons acquisition' (MAPW, 2005, p.6). Indeed, this linkage is demonstrated not only for nation states with new or emergent nuclear weapons capabilities, but also in the 'declared' states (the US, Russia, the UK, France, and China), suggesting a broader principle that 'civil programs provide pools of expertise from which military programs draw' (Friends of the Earth, 2005, p.17). It is, consequently, 'no coincidence' that 'the five declared nuclear weapons states account for almost 60% of global nuclear power output' — reinforcing the sense that this is more the rule than the exception (Friends of the Earth, 2005, p.17).

What then of the 'proliferation-resistant technologies' cited by nuclear proponents as a potential support to nuclear security in the future? Voices on this side of the debate argue that work on so-called 'proliferation-resistant reactors and regimes' centres on 'fast-breeder reactor concepts involving large-scale production of plutonium with significant proliferation risks', and as such are more likely to increase than to reduce problems with proliferation (Friends of the Earth, 2005, p.17). That 'civilian' plutonium can be used to build nuclear bombs is significant because the world's stockpile of plutonium is both considerable, and steadily increasing (Edwards, 2005). For this reason, many sources — including those proposing a role for nuclear power in the future — recommend a 'once-through' fuel cycle, that avoids reprocessing, or technologies that rely on it such as fast-breeder reactors or their successors (Ansolabehere, 2003, p.x). Again, this puts claims by nuclear proponents — that these are avenues through which levels of safety and security could be improved — under challenge.

These are all criticisms and concerns raised over the *international* safeguards regime. In relation to Australia's role specifically, nuclear opponents argue that successive Australian governments have down-graded effective control over the use of Australian uranium in order to facilitate sales (Broinowski, 2005, p.2). There have been episodes in which Australia has sold uranium to countries that had not signed the Non-Proliferation Treaty (in the case of France); negotiated contracts for sale before bilateral agreements were signed (in the case of Japan); and allowed sales from 'off-shore warehouses outside Australian jurisdiction and through off-shore

brokers' (Broinowski, 2005, p.2). Broinowski's view, contrary to that of nuclear proponents, is that the introduction of 'equivalence' is part of an overall decline in Australia's capacity to control use of its exported uranium ore, and he describes flag-swapping as a 'sophistry ... that [has] weakened the identity of Australian uranium held abroad, and thus Australian ability to ensure that our safeguards continued to attach to it' (Broinowski, 2005, p.3).

The combined arguments on this side of the debate amount to a very different picture from that of nuclear advocates. We are again faced with a choice between believing one side or the other. And yet there are some brute facts — such as India, Pakistan and North Korea's acquisition of nuclear weapons — that bear out assertions made by nuclear skeptics, and these may amount to a 'case to answer' for nuclear proponents.

Correspondences

In press coverage it seems that proliferation has had a low profile relative to other elements in this debate — such as the economic benefits expected from greater uranium exports, and the potential for nuclear power to reduce greenhouse gas emissions. However, closer inspection reveals some signs of a greater level of concern than was initially apparent.

In some quarters, as above, there is a willingness to rely on formal assurances that the proliferation regime is effective, and that the government takes its obligations in this regard seriously (Steketee, 2005; Trounson, 2005). If one is disposed to trust governments' assurances, this would be perhaps sufficient to allay fears on a connection between uranium exports and the number of nuclear weapons world-wide. However, discussion on the opening up of new uranium markets to India and China brings new and increased uncertainties. There are reports that in response to the promise of these markets, the US administration has shown a willingness to negotiate uranium deals (with India) outside the non-proliferation framework, thus throwing a shadow over the future regime (Nason, 2005). Other stories detail China's reluctance to expose its nuclear facilities to scrutiny: a condition sought as a prelude to uranium sales (Armitage, 2005). The combined effect could be to weaken Australia's capacity to apply firm conditions on uranium sales, and this highlights uncertainties as to how Australia can achieve a successful balance between the competing imperatives of economic gain and nuclear security. Press reports note the 'controversy' surrounding the question of supply to these markets, and raise concerns over the International Atomic Energy Agency's ability to regulate the use of nuclear materials sold into them (Murphy, 2006; Kerr, 2006).

Some have proposed that it is not only sales of uranium that are at issue, but the wider 'push' for nuclear power itself, as security concerns come to the fore due to the associated spread of expertise in nuclear technology (Hodge, 2005). In doing so, they echo the position of nuclear skeptics. But while some have proposed that greater sales of Australian uranium should be conditional on 'plugging gaps in safeguards' (Steketee, 2005), others suggest that problems with treaties should *not* be considered a barrier to an 'atomic power payoff' at all, signalling the

presence of more 'robust' positions amongst nuclear proponents (Dodd, 2006). This provokes the question of whether Australia would go ahead with an expanded role as a uranium exporter while disregarding effects on proliferation — a direction quite at variance from the formal commitment to safeguards expressed to so far.

Discussion

Overall, arguments on proliferation exhibit a notable lop-sidedness. The affirmative case relies on a concept of the proposed efficacy of international safeguards with surprisingly little further investigation. Proponents also appear to make few attempts to debate those instances, cited by opponents, where the non-proliferation regime has failed, or to discuss in detail the challenge of managing plutonium. Proponents may wish, in response, to portray the arguments of skeptics's as emotive. But this would do little to alter plutonium's significance in the debate, or to reduce its potential role as an embarrassment to the nuclear industry. Nuclear skeptics, on the other hand, offer a detailed account of the fuel cycle, including descriptions of the relative degrees of enrichment required for various purposes, and the history of nation states' acquisition of nuclear weapons, to support their case. In so doing, they offer a more comprehensive picture than that assembled by nuclear proponents, more able to account for known events in the real world, and this encourages serious consideration of their concerns.

Conclusion

On the basis of arguments presented here, it seems that nuclear proponents have more of a case to answer. A number of countries have been able to acquire nuclear weapons in spite of international controls, and it is noteworthy that they have done this under the auspices of apparently 'civilian' nuclear programs. India and Pakistan had been the most famous examples of this until North Korea's recent nuclear test.

It would seem, in light of this evidence, that proliferation, together with radioactive waste, remains one of the most intractable problems besetting plans to expand nuclear activity. We may wonder, then, why it has received comparatively little attention within the larger debate: perhaps it is simply because it is important, complex, and not easily solved. In any case, the arguments considered here raise doubts as to whether Australia can, under current conditions, expand its uranium export business while retaining a meaningful commitment to non-proliferation, and may give us cause to look again, critically, at any assumptions we may have made that we could easily do so.

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