

Introduction

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Within the last few years, the disposition of the production of weapon grade fissionable material, i.e. plutonium and highly enriched uranium (HEU), has become the major point of concern in this transitional era of nuclear disarmament and dismantlement. The issue of managing nuclear warhead material and banning the production of fissile material for military purposes has been approached time and time again over the last fifty years. Only since the early 1990s, however, has it entered the international agenda as an item for forthcoming negotiations.

The proposal to ban the production of fissionable materials has been considered by the international community various times within the last half of this century. The aftermath of the atomic bomb in Hiroshima and Nagasaki, ending World War II in 1945, generated the first attempt at banning atomic fissile materials production. Beginning with the Lilienthal-Achenson Report in 1945, United States President Harry Truman introduced the concept of controlling nuclear energy and fissionable material for either “peaceful or military” purposes. This report activated its follow up in 1946 with the Baruch Plan, which ultimately prescribed that atomic energy should be used for peaceful purposes and that an international body on atomic energy development should be created.

As a consequence, United States President Dwight D. Eisenhower in 1953, proposed in his famous ‘Atoms for Peace’ speech the creation of an atomic energy agency whereby, “fissionable material would be allocated to serve the peaceful pursuits of mankind...mobilized to apply atomic energy to the needs of agriculture, medicine...and provide abundant electrical energy in the power-starved areas of the world”.¹ Soon after, the International Atomic Energy Agency (IAEA) was established and assumed the position of supervising suitable inspections of safeguarded nuclear stockpiles.

¹ General Assembly Official Records (GAOR), 8th Session, 470th Plenary Meeting, 8 December, 1953, 450pp.

During the Cold War in the 1950s and 1960s, different proposals were discussed for progressive nuclear disarmament and cut-off of the production of fissile material. However, due to the confrontation between the United States and the former Soviet Union, nuclear tests and fissile material production proceeded between the dominant players of the bipolar nuclear game. While Moscow rejected cut-off proposals by the United States during the late 1950s, the late 1980s saw the reverse with the opposition of the Bush administration despite President Mikhail Gorbachev's optimism. Ultimately, the 1990s brought the demise of the Soviet Union and the end of the Cold War, along with the revival of nuclear disarmament agreements by both nuclear superpowers enabling a *de facto* cut-off of production of plutonium and HEU for weapons purposes. Likewise, international support has slowly evolved among other nuclear weapons states (NWS), announcing a moratorium on their progressively unnecessary production of fissile materials. It seemed, thus, that transforming the *de facto* into a verified cut-off treaty would induce an irreversibility in the disarmament process.

Welcoming the significant progress induced by substantive bilateral agreements between the Russian Federation and the United States in the context of the disposition of fissile materials for weapons purposes, the Clinton Administration proposed a mandate at the United Nations General Assembly in September 1993, calling for "...an international agreement that would ban production of these materials forever".² Supported by many states, including Canada (a major proponent of the idea), the United Nations General Assembly on 16 December 1993 endorsed the Resolution A/RES/48/75L, and declared that a "...non-discriminatory, multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons and other explosive devices"³, would be a significant contribution to nuclear non-proliferation in all its aspects. It respectively recommended the negotiation of a cut-off treaty and asked the IAEA to provide assistance in safeguarding and in verification procedures.

For the implementation of this resolution, Special Conference on Disarmament (CD) Coordinator, Ambassador G. Shannon of Canada, sought elaborate views and held numerous consultations with CD members and

² General Assembly Official Records (GAOR), 48th Session, 4th Plenary Meeting, 27 September, 1993, 7p.

³ United Nations General Assembly Resolution A/RES/48/75L. *See Annex A.*

national experts in preparation for an agreement on the most appropriate arrangement to negotiate the treaty. At the beginning of the 1994 CD session, Ambassador Shannon proposed that an *ad hoc* committee should be eventually established; however, the CD session failed to reach an agreement for a mandate regarding the scope of the future convention. Differences remain most acute over the interpretation of the term “production” of future and existing stocks. On 23 March 1995, the CD session incorporated the directive to establish the *ad hoc* committee calling for an appropriate negotiation of a mandate to “...ban the production of fissile material for nuclear weapons or other nuclear explosive devices...” and conclude with the negotiation of a final treaty.⁴ Disagreements over other special issues have detained the progress of the *ad hoc* committee in 1996 regarding issues of scope and verification, technical and financial matters, and the role of the IAEA.

In spite of such differences, many delegations had hoped that the negotiations would be carried out in parallel with the ongoing negotiations on the Comprehensive Test Ban Treaty, whereby in principle, a global and verified ban on the production of fissile materials would be of direct benefit to such a comprehensive treaty. The arguments in favor have stressed that banning the production of fissile material for weapons purposes would limit nuclear arsenals in NWS and threshold weapon states, as well as halt the build-up of unsafeguarded fissile material stockpiles.

It is in this context that the United Nations Institute for Disarmament Research (UNIDIR) has undertaken to contribute to the debate on the cut-off of the production of fissile material. In cooperation with the Oxford Research Group, UNIDIR has initiated a seminar aimed at assessing the possible scope of a fissile material agreement with particular attention to the role of HEU in research reactors and the importance in negotiating a cut-off agreement. This gathering provided an informal forum for diplomats, technical experts and others in the research community to address the ongoing debate.

The seminar should contribute to the investigating possibilities of synergies between negotiating diplomacy, security perceptions, as well as energy and scientific requirements. This, in turn, will strengthen the efforts to convey a treaty for the final elimination of all fissionable materials used for

⁴ *Conference on Disarmament*. “Final Record of the Seven Hundred and Third Plenary Meeting”. CD/PV 703; 23 March, 1995, pp. 17. See *Annex B*.

weapon purposes, focusing on the efforts by the international community to keep alive the benefits of global security.

In view of the topic's likely future importance, UNIDIR has accordingly chosen to produce the present bibliographical survey and source list. This is intended to provide an access route for interested parties, be they from the research or diplomatic communities, into a range of political sources on issues related to fissile material. These are organized into nine main headings, as detailed below.

PART I. Fissionable Materials Production and Stockpiles

The Role of Plutonium, HEU and Tritium within a Fissile Material Production Cut-Off

Fissile materials - plutonium and HEU - are the fundamental ingredients of all nuclear weapons. To better understand the role of fissile materials and tritium, this section of the bibliography comprises technical references as well as diplomatic issues, explaining the basic functions of nuclear fissionable materials and the significance of unsafeguarded stockpiles. Here, various references are gathered regarding general fissile material information and the role of plutonium use in civilian and military operations.

For technical reasons, HEU has come to be more extensively used than plutonium in the manufacturing of nuclear weapons. The use of HEU in civilian research reactors is thus an issue for immediate debate. Among the questions currently under discussion are diluting HEU into LEU, and transforming plutonium into MOX fuel for use in power reactors. The case of tritium raises very particular issues since it is not a fissile material as such, but an ingredient of thermonuclear or "boosted" nuclear weapons.

PART II. Cut-Off of the Production of Fissile Material: The Debate

Approaches for a More Comprehensive Control of Fissionable Material: Issues of Scope, Safeguards and Verification

The proposed cut-off convention would make an essential contribution to the process of nuclear disarmament by dealing with the production of fissile materials and with existing surplus materials. It would reliably limit the size of

potential nuclear arsenals only if fissile materials were disposed under international safeguards. A cut-off would also strengthen the non-proliferation regime by submitting all states to international verification and safeguard inspections of their nuclear facilities. It would then reduce the discriminatory aspects of the non-proliferation regime by halting the production of unsafeguarded fissile materials by the NWS.

The content of the proposed cut-off convention will be the deciding factor for a negotiating mandate. The mandate agreed by the *ad hoc* committee at the Conference on Disarmament maintains that the convention should be non-discriminatory, multilateral and internationally verifiable. One major issue to be resolved is the scope of the treaty, wide or limited, with regard to pre-dating stocks. Likewise, the problem of the extent of verification and safeguards on facilities and fissile materials will pose unique challenges when approaching certain States who might otherwise withhold their information.

An important aspect within the negotiation of the mandate is the position taken among NWS and threshold States, who assert that the convention should be *non-discriminatory*. Consequently, some parties object to the inequality of the convention if it excludes stocks of the NWS but not those of the other states. By such standards, an effective verifiable treaty must also ensure a reliable monitoring system which is transparent, providing an acceptable degree of predictability, while avoiding being cumbersome or exposing either commercial or industrial secrets. Essentially, complementary confidence-building and transparency measures could fulfill an important function not only in complementing the IAEA's role under the convention, but also in alleviating tensions and creating an environment favorable to further disarmament.

This section of the bibliography presents many articles that have contributed to research on a cut-off convention, even though the literature is in its genesis, awaiting forthcoming advancements on the stagnated issue. Nevertheless, included are not only specific articles that look at verification and scope measures needed for a comprehensive cut-off agreement, but also surveys of experts who contribute to the scientific research.

PART III. Dismantlement and Management of Weapons and the Disposal of Civil Surplus Nuclear Material

*Coping with the Heavy Metal:
Disposition Options and Their Implications
for (Inter)National Security*

The demise of the Soviet Union has left a dangerously abundant amount of dispersed nuclear materials throughout the former Republics (Belarus, Kazakhstan, and Ukraine, for example). In one sense, efforts to reduce the world's stockpile of nuclear weapons have created many difficulties: the dispersion of nuclear materials; the growing incidence of nuclear theft; and the problematic concern over fissile material smuggling. In addition, bilateral agreements to dismantle un-needed equipment have boosted the volume of surplus nuclear materials. Several considerations have influenced different methods for the dismantling and disposal of military surplus equipment.

Of the diverse criteria for the choice for the most suitable method of dismantlement, it has been pointed out that they should 1) be easily verifiable; 2) make military use more difficult or impossible; 3) prevent the theft of military weapon materials in the dismantling process; and 4) comply with international or local safety and environmental standards.⁵ Other significant approaches to be considered in the disarmament process rely on both the supervision of the nuclear materials stockpiles found in the Commonwealth of Independent States (CIS), and the monitoring of nuclear weapon materials being transferred to the Russian Federation.

Unfortunately, these types of innovations have an impact on the cost of dismantlement, disposal and verification of a fissile production cut-off, such as the concern of the IAEA's annual safeguards budget. Costs and procedures of environmental standards are of particular interest, for it also renders the public an international awareness of the existing situation. Nevertheless, some attempts at dismantlement have been reconfigured for civilian tasks. In most cases, disposed armaments provide some financial benefits even though civilian re-use has little value. But in others, much becomes waste material to be discarded, thus, environmentally hazardous.

⁵ Susanne Kopte, et. al. "The Cost of Disarmament: Dismantlement of Weapons and the Disposal of Military Surplus". *The Nonproliferation Review*, Vol. 3, Num. 2, Winter 1996, 33p.

Hence, this bibliography covers the dismantlement and disposition of nuclear weapon surplus material in the different regions of the world that are currently exposed to such predicaments. Most, of course, are residues found in the United States and in the former Soviet Union States, while countries of southern Africa, southeast Asia, Western Europe and the Middle East also present major nuclear dismantlement concerns - and fears. Notwithstanding, the apprehension of nuclear smuggling and the dangers of terrorist bombs, gives the international community an un-easy pinch over *easily* made “non-state” nuclear weapons.

PART IV. Political Aspects of the Cut-off Debate

The Political Roads Taken for a Comprehensive Treaty: Policies, Discussions, and (Unfinished) Debates

The importance of understanding the political situation of some selected countries is a vital element in prospects for signature and ratification of a cut-off fissile materials treaty. Therefore, this bibliography seeks to provide a clearer understanding of the political situation of countries directly involved in the debate. To ensure a final cut-off agreement, it is essential to be in close contact with the political decision makers who are involved in the negotiating arena. It is important to comprehend the political demands of the various countries involved by regarding their past objectives and their compromises. However, the lack of availability of public and distributable material has not allowed for a complete compilation of the position of all other countries.

PART V. Conference on Disarmament (CD) : The Negotiations

The Negotiating Body of the Cut-Off Debate

It goes without saying that a crucial aspect of understanding the direction taken for a cut-off treaty is in the negotiating process taking place at the Conference on Disarmament. UNIDIR has decided to include CD references for those interested in searching official speeches made by different delegations on the subject of the fissile material production cut-off. One may find that different countries have contributed to the discussion regarding the subject, however, we

have decided to include them in this special CD section instead of in the 'Political Aspects of the Cut-Off Debate' by country category.

PART VI. International Organizations

The Role of Specialized Organizations and Their Efforts to Address the Challenges of the Cut-Off Debate

These challenges, those of strengthening the future role of safeguards or monitoring verification activities, directly influence the role the IAEA constitutes in the reinforcement of the cut-off agenda. By these mandated initiatives, (recalling the 16 December 1993 UN mandate which "...requests the IAEA to provide assistance for the examination of verification arrangements")⁶, the IAEA supports the international non-proliferation regime in applying international inspections on safeguards and verifying existing stockpiles used for military and civilian use. Furthermore, the IAEA will reinforce its role by segregating fissile materials retained for military purposes, whether in the form of HEU, spent fuel, residues, or plutonium. Adequate verification of civilian and military surplus nuclear materials, for example, will be a crucial challenge in capping the spread of nuclear materials other than for peaceful purposes. It is hoped that all States will take the initiatives necessary to exchange detailed information on stockpiles, plutonium and HEU inventories, and other unsafeguarded fissile material. This not only needs particular attention for the prevention of clandestine and other illegal uses of smuggled material, but again for environmental reasons.

In addition, references by (or to) the United Nations allow easier access to official documents on the cut-off issue. These include draft resolutions on the prohibition of the production of fissile materials indicated by the UN A/C reference number, along with various countries involved in the drafting process. Accordingly, United Nations Special Committee (UNSCOM), provides background information for lessons learned in their verification activities (such as in the case of Iraq) and their experiences in the field of disarmament.

⁶ United Nations General Assembly Resolution A/RES/48/75L. *See Annex A.*

PART VII. References

In perspective, it is beneficial to know that today's information highway system has become an essential instrument allowing the expansion and exchange of faster information. Various organizations have now supplied their data through the *Internet* and the *World Wide Web*, as well as other support systems such as CD ROM.

For this reason, the last section of this bibliography is devoted to a collection of nuclear statistics covering inventories of fissile materials, nuclear weapons and power reactors information world wide. Other statistical references (from the IAEA, for example), embody the role of agencies providing safeguard information. The databases allow access into various non-proliferation and nuclear studies of areas such as the Commonwealth of Independent States. A final feature is the home pages of several *World Wide Web* servers which can help diplomats and researchers alike to access information on fissile material world wide. However, it should be noted that within the home pages lies a world of web links to other resources. Not all accessible home pages relate directly to the issue of fissile material cut off, given the limitation of the subject. However, they can provide an easier access to many contacts and special departments related to the issue.

PART VIII. Annexes

The purpose of including the Annexes of the General Assembly Resolution A/RES/48/75L, is to provide the official document by the General Assembly that declares the objective of seeking the prohibition of the production of fissile material for nuclear weapons. This bibliography has taken the following resolution (signed in December 1993), as a point of departure for the literature written thereafter which tries to assert the negotiation of an international and effectively verifiable treaty banning the production of fissile material. Likewise, the Conference on Disarmament cut-off report, CD/PV.703 indicates the initiative taken by the *ad hoc* committee in 1995, under the Special Coordinator, Ambassador Shannon, to seek the proper forum for the treaty and establish a consensus by the delegations to begin with the negotiations and the scope of the convention.

PART IX. Author Index

The last section of the bibliography, the author index, was included in order to facilitate the search for a specific author or organization by including the (P-0) number next to it. It is hoped that this will enable easier use of the present bibliography.