
Conference on Disarmament

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Suggestions for the substance of the Fissile Material Cut-Off Treaty

I. Introduction

1. Australia believes that the Fissile Material Cut-off Treaty (FMCT) has the potential to deliver substantial security benefits, furthering the twin goals of nuclear disarmament and nuclear non-proliferation. By capping the amount of fissile material available for weapons use the FMCT would be an essential step towards irreversible nuclear disarmament. A cut-off treaty would further tighten controls on fissile material, reducing the risk of fissile material leaking to proliferators or terrorists. The FMCT will complement the CTBT. The CTBT impedes development of nuclear weapons by prohibiting testing – the FMCT will impose a quantitative limit on the amount of fissile material available for weapons use.

2. In accordance with the negotiating mandate for the Conference on Disarmament (CD), the FMCT is to be:

“... a non-discriminatory, multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices.”

3. Following agreement of the CD to begin negotiations on the FMCT, the objective must be to achieve substantive and expeditious progress in these negotiations. This paper outlines what the substantive provisions of the FMCT might cover.

II. Objectives and Scope of the FMCT

Treaty commitments

4. It is suggested that the basic provisions of the FMCT should be as follows:

(a) A commitment by each party not to produce fissile material for nuclear weapons or other nuclear explosive devices;

(b) Definitions relevant to the scope of the treaty, including the fissile materials that are the subject of the FMCT commitments, and a definition of “production”. The definitions might also clarify non-proscribed activities;

(c) An entry-into-force formula that establishes the date from which the commitment not to produce fissile material for nuclear weapons or explosive devices applies;

(d) Provisions on the status of pre-existing stocks of fissile material, and possibly a parallel mechanism for States to declare all pre-existing fissile material and to voluntarily submit excess fissile stocks to irreversible peaceful use and verification commitments;

(e) A commitment to negotiate/accept appropriate verification arrangements. The FMCT would set out the principal verification commitments. It is suggested that detailed verification provisions would be set out in IAEA safeguards agreements, modified as necessary – see section III below;

(f) Institutional arrangements – including a general conference and an executive council (to be decided whether these would be specific to the FMCT, or would use IAEA organs – see section IV below);

(g) Institutional arrangements could include a mechanism for parties to review the operation of the FMCT at regular intervals;

(h) Institutional arrangements could also include mechanisms for parties to bring to the attention of all other parties issues of concern in relation to the operation of the FMCT – either in general or in the case of suspected non-compliance with FMCT commitments, including mechanisms for consultation on and clarification of concerns between States (either directly or through the verification agency);

(i) Provisions for settlement of disputes;

(j) Provisions dealing with non-compliance – determination of non-compliance and reporting to the Security Council;

(k) An amendment mechanism.

Fissile material

5. “Fissile material” is not a term formally used in current verification agreements, and this term will need to be defined for the FMCT. The fissile materials to be covered by the treaty should be those relevant to the manufacture of nuclear weapons. Broadly speaking, these are high enriched uranium (HEU) and plutonium. The materials regarded by the IAEA for safeguards purposes as “direct-use materials” – nuclear material that could be used for the manufacture of nuclear explosive devices without transmutation or further enrichment – are as follows:

(a) HEU, i.e. uranium enriched to 20% or more in the isotope U-235;

(b) Plutonium containing less than 80% of the isotope Pu-238;

(c) Uranium-233.

6. These would seem an appropriate basis for definitions in the FMCT, with the following qualification. Plutonium in irradiated fuel cannot be used for nuclear explosive devices without first being separated from uranium, fission products and other radioactive materials by reprocessing. It is suggested that for the purposes of the FMCT, “production” of plutonium would be defined as reprocessing. In this case the form of plutonium defined as fissile material for the purposes of the treaty would be separated plutonium.

7. Likewise, U-233, which is produced through irradiation of thorium, cannot be used for explosive purposes without being separated from thorium and fission products by reprocessing. So the form of U-233 defined as fissile material for the purposes of the FMCT would be separated U-233.

8. It is necessary to consider whether the FMCT should also cover other *fissionable* materials that could be used to produce nuclear weapons. The IAEA has identified neptunium and americium as “alternate nuclear materials” having potential proliferation significance. Of these, neptunium is the most significant, in terms of quantities potentially available in spent fuel and its suitability for explosive use. The IAEA’s description of americium as an alternate nuclear material was contentious, due to major technical problems confronting explosive use of this material, but experts of some governments insisted that americium also has proliferation potential.

9. Based on this discussion, the FMCT would apply to the following materials, produced after entry-into-force:

- (a) High enriched uranium;
- (b) Separated (unirradiated) plutonium;
- (c) Separated U-233;
- (d) (Possibly) separated neptunium;
- (e) (Possibly) separated americium.

10. An issue to be considered is whether, for verification to be effective, there may also be a need to allow for a right of verification (to be exercised as considered necessary) on materials which can be readily used for production of fissile material, such as LEU in the form of uranium hexafluoride, or irradiated material containing weapons grade plutonium. It is recognised that differentiation of plutonium on the basis of isotopic composition is a very sensitive subject – but there is no doubt that weapons grade plutonium would be the most attractive for diversion to nuclear weapons.

Production

11. Production of fissile material, as defined above, requires three processes:

- (a) To obtain HEU – uranium enrichment;
- (b) To obtain plutonium – irradiation of uranium in a reactor, and reprocessing to separate the plutonium from uranium, fission products and other radioactive materials;
- (c) U-233 and “alternate nuclear materials” involve similar considerations to plutonium, i.e. these materials are produced through irradiation and are separated by reprocessing.

12. For the treaty to encompass irradiation would be to give it an extremely broad scope – essentially, all reactor operations. But plutonium (or U-233) produced in reactor fuel is available for weapons use only if it is separated through reprocessing. Accordingly, as discussed above, for plutonium, the term “production” in the treaty should not encompass irradiation, but only reprocessing.

13. Thus, for the purposes of the treaty, “production” would mean enrichment (isotopic separation) and reprocessing (separation of plutonium, U-233, and other elements as defined, from irradiated material).

14. One issue to consider is the status of advanced spent fuel treatments such as electro-metallurgical processing. The objective of these technologies is to enable plutonium to be recycled as fuel in fast neutron reactors without the plutonium being fully separated from fission products and minor actinides. Hence the question arises whether these technologies should be regarded as “reprocessing”.

15. Although, as currently envisaged, electro-processing would not directly produce separated plutonium, this technology is not entirely free of proliferation risk – it could form

part of a proliferation acquisition path, through substantially reducing the volume of material that would have to be diverted to a plutonium separation process. Accordingly, it is suggested any separation of materials from irradiated material should be regarded as “reprocessing” for FMCT purposes and subject to verification to assure against diversion of plutonium.

16. Based on this discussion, the FMCT would apply to the following facilities:

- (a) Enrichment facilities;
- (b) Reprocessing facilities;
- (c) Facilities in which HEU subject to the treaty is processed, used or stored;
- (d) Facilities in which separated plutonium subject to the treaty is processed, used or stored;
- (e) (Possibly) facilities in which separated neptunium or americium subject to the treaty is processed, used or stored.

17. Although production of HEU for non-weapons purposes is permitted under the current FMCT negotiating mandate, an issue for consideration is whether, in view of the very limited use of HEU in civil programs, and the very large stocks of HEU currently held by a number of States (which should be sufficient to meet naval propulsion needs for many decades), there is an argument for proscribing high enrichment in this treaty. Another issue that might be considered is proscribing the separation of weapons grade plutonium.

Stocks

18. The FMCT negotiating mandate, being directed at the banning of production, implicitly means further production. The treaty cannot ban production that has already occurred. On this basis, the treaty would not apply to fissile material pre-dating entry-into-force.

19. To this general position there is a point of clarification, as follows: if the definition of production of fissile material means, in the case of plutonium, reprocessing, then the exemption from the treaty of pre-existing stocks could apply, in the case of plutonium, only to separated plutonium. In the case of irradiated plutonium existing when the treaty enters into force, reprocessing of such plutonium would be new production, subject to the treaty commitments.

20. That said, the treaty negotiators will need to decide how the question of pre-existing stocks is to be treated. On the one hand, it is recognised that some States would oppose the inclusion of pre-existing stocks. On the other hand, it must also be recognised that as long as there remain significant fissile stocks that can be drawn on to produce new nuclear weapons, there will be concerns about the durability of limits agreed (in disarmament treaties) on the number of nuclear weapons.

21. A way forward to prevent this issue from holding up negotiations would be to deal only with new production in the FMCT itself, but to develop a parallel mechanism for States to declare all pre-existing stocks of fissile material, and to voluntarily submit excess fissile stocks to irreversible peaceful use/safeguards commitments.

Non-proscribed activities

22. The FMCT would not proscribe production of fissile material *per se*, only production for nuclear weapons or nuclear explosives. Reprocessing for civil use would not be proscribed. Nor would production of HEU for civil use or for non-explosive military use

(e.g. naval propulsion) – though, as discussed above, consideration could be given to proscribing high enrichment and separation of weapons grade plutonium.

23. A further non-proscribed use would be clean-up of military plutonium to remove americium build-up. Since this does not involve production of further stocks of fissile material (and in fact arises through decay of fissile material), clean-up is quite different to reprocessing and should be recognised accordingly. This aspect will need to be looked at in the definition of “production”. A complication will arise if americium is defined as a fissile material subject to the FMCT – in this case, americium recovered through clean-up of separated plutonium pre-existing the treaty would probably have to be exempted from the treaty.

III. Verification

Basic principles

24. The basic commitment would be for FMCT parties to conclude with the treaty’s verification agency, an agreement setting out detailed arrangements for verifying the commitment in the treaty not to produce fissile material for explosive use.

25. In contrast with other treaties negotiated in the CD, such as the Chemical Weapons Convention, there is no need to develop detailed provisions, such as a verification protocol, for the FMCT. This is because there is an existing and well-established verification system, namely the IAEA safeguards system, which meets most of the verification objectives likely to be specified for the FMCT. The IAEA safeguards system, which has been developed over some five decades, provides an ideal foundation for the FMCT’s verification arrangements.

26. Every state with significant nuclear activities already has a safeguards agreement with the IAEA – albeit requiring, in the case of the nuclear-armed or “nuclear capable” States (the five nuclear-weapon States recognised by the NPT and the States outside the NPT), to be extended to ensure the coverage required to meet FMCT objectives.

27. At this stage it has not been agreed that the IAEA will be the verification agency for the FMCT, and some States have commented this should not be a foregone conclusion. However, it would not be realistic not to take advantage of the IAEA safeguards system. Without doubt the most efficient basis for FMCT verification is to build on existing safeguards agreements, supplementing these as necessary. This is without prejudice to the question of the appropriate decision-making organs for the FMCT, discussed in section IV below.

28. While existing safeguards agreements can be used as the starting point for meeting FMCT commitments, they would need to be amended as necessary by supplementary agreements or protocols, or could be amended directly by the FMCT itself, to meet the FMCT’s objectives. Indeed, the FMCT provides an opportunity to address some important issues facing the IAEA safeguards system. Important principles to be set out in the FMCT, requiring modification of existing safeguards agreements, might include:

(a) Irreversibility: A concern with NPT safeguards agreements is that their duration is tied to the state remaining a party to the NPT. If the state withdraws from the NPT, the safeguards agreement lapses. The FMCT could contain an irreversibility provision, that once nuclear material and facilities become subject to non-explosive use and verification commitments they would retain this status in perpetuity.

(b) Challenge inspections: Another improvement over current safeguards agreements would be introduction of a challenge inspection mechanism. Disappointment over the IAEA’s lack of use of the special inspection mechanism in safeguards agreements

– by which investigative inspections are supposed to be initiated by the Agency – means States are unlikely to have confidence in such a mechanism for FMCT purposes. It is likely that a challenge inspection mechanism, which can be initiated by a party, will be required for the FMCT, either instead of, or as well as, special inspections.¹

(c) Verification against undeclared production of fissile material: This is an essential element in comprehensive safeguards applying to non-nuclear-weapon States (NNWS) NPT parties, but currently does not apply to nuclear-weapon States (NWS) and the non-NPT parties. As discussed below, this principle will need to apply to all FMCT parties – inspectors must have the right to investigate possible proscribed nuclear activities.

29. An important part of the verification architecture may well be bilateral or regional transparency and confidence-building arrangements, complementing the FMCT’s verification arrangements. It is for consideration whether the FMCT would make any reference to the possibility of such complementary arrangements.

30. Developing the details of verification for the FMCT will require careful technical analysis of existing safeguards agreements and how they would need to be amended or supplemented to meet the technical objectives of the FMCT – this work will be most effectively progressed in an expert working group rather than in the principal treaty negotiation.

NNWS party to the NPT

31. NNWS party to the NPT have an existing commitment not to produce fissile material for weapons purposes and to accept IAEA safeguards to verify this commitment. This commitment corresponds to the basic objective of the FMCT. So, in principle no separate verification system should be needed to verify NNWS commitments under the FMCT, provided the States concerned have in force a comprehensive safeguards agreement (based on IAEA document INFCIRC/153) and an additional protocol (based on IAEA document INFCIRC/540) – though, as discussed above, these agreements may need to be amended or supplemented.

Other States – NWS and non-NPT parties

32. The principal effect of the FMCT – and its verification requirements – relates mainly to the NWS and the three (or four) nuclear-weapon capable States outside the NPT. While one approach would be to leave the verification negotiation largely to these States as the States most affected, the international community as a whole has an interest in ensuring that what is established has the necessary degree of integrity and effectiveness. Further, the negotiating mandate for the FMCT calls for the treaty to be non-discriminatory – so the verification arrangements for the NWS and non-NPT parties should be similar to the arrangements for the other FMCT parties.

33. This points in the direction of also using IAEA safeguards agreements as the basis for the FMCT verification arrangements for these States, adjusted as necessary to meet FMCT objectives. The NWS have safeguards agreements based on the same model as the NNWS (INFCIRC/153), except in the case of the NWS the agreements are “voluntary” and apply only to nuclear material in designated (“eligible”) facilities. The NWS would have to accept the commitment for safeguards to apply to all fissile material subject to the FMCT and all relevant facilities, and to designate material and facilities accordingly.

¹. For an example of a safeguards challenge inspection mechanism, see the Tlatelolco Treaty, Article 16.1.(b).

34. The non-NPT parties have IAEA safeguards agreements based on INFCIRC/66. These too could meet FMCT objectives if these States accepted the commitment for safeguards to apply to all subject fissile material and relevant facilities, and to designate material and facilities accordingly.

35. As noted above, the NWS and non-NPT parties would also have to accept verification aimed at providing assurance of the absence of undeclared nuclear material and activities – i.e. nuclear material and activities that are required to be declared under the FMCT. This would be a substantial departure from the current situation.

36. Currently, by definition, the NWS and non-NPT parties have nuclear material and facilities outside any safeguards coverage. Under the FMCT, they will continue to have some unsafeguarded material, and locations where this material is stored and processed (e.g. processing for stockpile stewardship). However, it will be essential to allow for verification activities to counter, and to investigate, possible undeclared production of fissile material, which would be a violation of the FMCT. This could be effected through the additional protocol (INFCIRC/540), but it will be essential to ensure that the provisions of each additional protocol give the necessary coverage.

37. All the NWS, and also India, have an additional protocol, but for most of these the provisions fall short of what would be required for the FMCT. All the NWS and non-NPT parties would have to modify/conclude additional protocols that provide the IAEA with the necessary information and access rights. Managed access, to protect sensitive locations, would be very important – and is already provided for under INFCIRC/540.

38. An alternative to use of INFCIRC/540 would be the development of an equivalent instrument, tailored more specifically to the circumstances of the nuclear-armed States and their legitimate interest in protecting national security information (this interest is shared by all parties – it is essential to ensure that verification activities do not result in leakage of proliferation-sensitive information).

Naval propulsion programs

39. This is a complicated issue for the FMCT, but it is also a potential issue under current comprehensive safeguards agreements. These agreements allow NNWS to remove from safeguards nuclear material intended for non-proscribed military use, under arrangements to be agreed with the IAEA. To date this provision has not been used in practice.

40. Some NWS operate naval reactors with HEU fuel, so there is the possibility that HEU production could continue under the FMCT for this purpose – although it would be an advantage in terms of verification tasking if the States concerned concluded that their existing HEU stocks were sufficient and they had no need for ongoing HEU production.

41. The problem for verification arises because States with naval reactors regard the design of naval fuel, and factors such as core loadings and range between refuelling, as highly classified. While concern about security is understandable, it is essential to develop appropriate verification arrangements so that naval programs don't present an opportunity for diversion. Diversion is not an issue just for HEU fuel – because LEU could be used as feedstock for high enrichment in an undeclared facility, verification arrangements would also be needed for LEU-based naval programs.

42. Because of the sensitivities, verification for naval programs will require novel approaches. However, the problems are not insurmountable - the Trilateral Initiative between the US, Russia and the IAEA demonstrated the practicability of innovative approaches to verifying fissile material of sensitive composition, shape and mass. Formal

verification may be complemented by transparency arrangements, e.g. it is easy to check that a vessel is at sea (and therefore has been fuelled).

43. It would be an extremely valuable contribution, as part of the preparatory work for the FMCT, for experts from one or more NWS and other interested States to conduct a study of appropriate verification arrangements for the naval fuel cycle.

IV. Institutional arrangements

44. The institutional arrangements for the FMCT will be an important focus for the FMCT negotiations. It is not necessarily the case that a separate FMCT organisation would be required.

45. If verification for the FMCT is based on IAEA safeguards, it follows that the IAEA safeguards inspectorate would be tasked with carrying out FMCT verification. The inspectorate could carry out this responsibility on behalf of an FMCT organisation. But if there is a separate FMCT organisation, this would raise a number of major issues – e.g. what would be the relationship between the IAEA Board of Governors and the FMCT executive body on questions of non-compliance?

46. To avoid these complications, and reduce costs, an alternative to a separate organisation would be to give the IAEA the mandate to exercise decision-making functions under the FMCT. For this to be acceptable to the nuclear-armed/nuclear capable States, no doubt it would be necessary to amend the procedures of the IAEA Board of Governors to ensure that all of these States are able to participate in Board deliberations on FMCT matters.

V. Conclusions

47. It is imperative to progress negotiation of the FMCT as soon as possible, to formalise the moratoria of those States that have ended production of fissile material for nuclear weapons and to avoid a dangerous arms race by those States that have not yet ceased such production. This paper outlines a practical approach for development of this treaty.
