

CHAPTER 13 TOWARD A FISSILE MATERIAL (CUT-OFF) TREATY

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Fissile materials are the key elements for nuclear weapons. The simple fission weapons that destroyed Hiroshima and Nagasaki 60 years ago used highly enriched uranium (HEU) and plutonium respectively. The far more powerful thermonuclear (hydrogen bomb) weapons in the arsenals of most nuclear-armed states today typically contain both these fissile materials. Controlling these materials has long been seen as central to both nuclear disarmament and halting proliferation and, more recently, to reducing the risk of nuclear terrorism.

For those seeking nuclear weapons, the production of fissile materials is the main technical challenge. Natural uranium must be highly enriched in the chain-reacting isotope U-235 to be suitable to make a nuclear weapon.¹ Plutonium of almost any isotopic composition can be used to make a nuclear weapon. It is produced in the uranium fuel in nuclear reactors and recovered through chemical reprocessing of the spent fuel. Making a nuclear weapon does not require large quantities of fissile material. The International Atomic Energy Agency (IAEA) defines a “significant quantity” of fissile material as the amount required to make a first-generation bomb of the Nagasaki-type. The significant quantities are 25 kilograms of U-235 contained in highly enriched uranium and eight kilograms of plutonium. Advanced fission weapons may contain perhaps half as much material. A typical two-stage thermonuclear warhead may contain about 25 kilograms of HEU and four kilograms of plutonium.

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Fissile material stockpiles

During their Cold War arms race, the Soviet Union and the United States produced most of the current global stockpile of HEU and about half the global stockpile of plutonium.² The other half of the plutonium stockpile derives from the other nuclear-armed states and civilian reprocessing of spent nuclear power reactor fuel. The nuclear weapon states that are party to the nuclear Non-Proliferation Treaty (NPT)—the United States, Russia, the United Kingdom, France, and China—have stopped HEU and plutonium production for weapons. All of them except China have made explicit public statements to this effect. China has indicated only informally that it has ended production of fissile material for weapons. Israel, India, and Pakistan continue to produce, and North Korea resumed production in 2009 after a brief suspension. India and Pakistan are currently expanding their capacity to produce fissile materials for weapons.

There is no civilian production of HEU, but the civilian stockpile of plutonium is growing at a significant rate because of large-scale reprocessing of spent fuel from nuclear power plants in France, India, Russia, and the United Kingdom. Japan has yet to start commercial operation at its much delayed large reprocessing plant at Rokkasho.

The United States has declared how much HEU and plutonium it has produced, Russia has not. This leads to a great uncertainty in estimates of HEU and plutonium held by Russia and, as result, in estimates of global stocks. Among the other seven nuclear-armed states, only the UK has declared its production.

Highly Enriched Uranium. The current global stockpile of HEU is very roughly 1600 metric tons, more than 99% of which is in the possession of the nuclear-armed states. This includes about 200 tons of excess HEU that the US and Russia together have agreed to blend down to low enriched uranium (LEU, containing 3-5% uranium-235) that can be used for reactor fuel. Almost 500 metric tons of HEU declared excess has already been down-blended. Most of this material was HEU from Russian weapons.

In addition to weapons, HEU is used by France, Russia, the US, and UK to fuel military naval propulsion reactors. Russia also has some HEU-fueled ice-breaker ships. The US has reserved 120 metric tons of HEU for its nuclear navy and Russia may have set aside perhaps as much. These are huge

amounts. For comparison, if the US and Russia reduced their arsenals to 1000 nuclear warheads each, they would require less than about 30 metric tons of HEU for all these weapons.

HEU is not necessary to fuel naval reactors; France is moving to LEU fuel for its nuclear-powered submarines. HEU also fuels many military and civilian research reactors, and there are international efforts to help reduce and end such use, especially in civilian reactors.

Plutonium. The global stockpile of separated plutonium is about 500 metric tons. It is divided almost equally between weapon and civilian stocks, but it is all weapon-usable. For comparison, an arsenal of 1000 nuclear weapons would require only about five tons of weapon-grade plutonium.

Russia and the United States own virtually all of the world's stock of military plutonium. Only Israel, India, Pakistan, and North Korea are still producing plutonium for weapons.

The civilian stocks of plutonium are growing much faster, with France, India, Japan, Russia, and the UK all engaged in large-scale reprocessing of power reactor spent fuel. The United States chose to stop reprocessing in the late 1970s for both economic and non-proliferation reasons. India has declared its reprocessing programme and related plutonium-fueled breeder reactor programme to be of national security significance. Breeder reactors fueled with plutonium from power reactors can produce weapon-grade plutonium in a blanket around the core.

Controlling fissile materials

The effort to control access to nuclear-weapon materials is as old as the effort to make nuclear weapons. During the "Manhattan Project" to build the atomic bomb, it was proposed that the United States try to acquire control of the world's uranium supplies to stop any other state from having access to the raw material from which fissile materials can be produced.

In January 1946, in its first General Assembly resolution, the United Nations established an Atomic Energy Commission "to deal with the problems raised by the discovery of atomic energy." The Atomic Energy Commission's first annual report, issued in December 1946, argued that "effective control of atomic energy depends upon effective control of the production and use

of uranium, thorium, and their nuclear fuel derivatives.” However, there was little progress at the time, largely because of the Cold War.

The UN General Assembly took the initiative again in November 1957, proposing a treaty that would include:

- a) “the cessation of the production of fissionable materials for weapons purposes,”
- b) “the complete devotion of future production of fissionable materials to non-weapons purposes under effective international control,” and
- c) “the reduction of stocks of nuclear weapons through a programme of transfer, on an equitable and reciprocal basis and under international supervision, of stocks of fissionable materials from weapons uses to non-weapons uses.”

Once again, little progress resulted.

With the end of the Cold War, the UN was able to return to this agenda. In December 1993, the General Assembly adopted a resolution calling for negotiation of a “non-discriminatory, multilateral, and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices.”

In March 1995, the Geneva-based Conference on Disarmament (CD), the permanent multilateral body for negotiating arms treaties, agreed to these terms as the basis for negotiations on a fissile material cut-off treaty (FMCT). But many states made clear their concerns about the scope of a possible treaty, including whether and how the treaty would deal with large existing fissile material stockpiles. Put simply, the nuclear-armed states sought to keep their existing stocks of fissile materials outside the scope of the treaty, while many non-nuclear states wanted the treaty to include a mechanism to account for and reduce these stocks. This led some non-nuclear weapon states to talk of a fissile material treaty (FMT) rather than a fissile material cut-off treaty. To reflect this disagreement, it shall be referred to here as an FM(C)T.

This dispute was settled by an agreement that even though the status and future of existing stockpiles was not explicitly mentioned as part of the mandate for the talks, states could raise the issue during the negotiations. But in the CD, work on all issues, including fissile materials, stalled.

The commitment to a treaty banning the production of fissile materials for weapons was reaffirmed by NPT states at the 2000 NPT Review Confer-

ence. The CD was urged to agree on a programme of work that included an FM(C)T that would take into consideration “both nuclear disarmament and nuclear non-proliferation objectives” and to adopt a schedule that involved “the immediate commencement of negotiations on such a treaty with a view to their conclusion within five years.”

As of February 2010, talks still have not started. Originally, a key obstacle was a dispute between the US and some other countries, notably China, over whether to have talks on both nuclear disarmament and prevention of an arms race in space alongside FM(C)T negotiations. The US opposed talks on anything other than an FM(C)T. In 2003, five CD Ambassadors proposed that work on an FM(C)T proceed in parallel with work on three other issues: 1) a treaty to ban on nuclear threats directed at non-nuclear weapon states (“negative security assurances” or NSA); 2) discussions on nuclear disarmament; and, 3) discussions on preventing an arms race in outer space (PAROS). This failed to break the logjam.

In March 2007, it was proposed to appoint four coordinators who would preside over parallel talks on NSA, nuclear disarmament, PAROS, and FM(C)T. However, only the FM(C)T talks would aim at producing a legally-binding treaty. There would only be “substantive discussions,” i.e. talks about talks, on the other issues. In May 2009, the CD finally reached consensus on a similar formulation and adopted its first programme of work in a decade. It was unable to reach agreement on implementing the programme of work, because of objections by Pakistan, and could not begin negotiations before the end of its 2009 session. The effort to organize and start talks began again in January 2010 and was frustrated again by Pakistan, which cites India’s larger fissile material stockpile and insists that any talks include reductions in existing stockpiles.³

Faced with the impasse at the Conference on Disarmament, some states and civil society groups have proposed changing the rules of procedure of the CD, including easing the consensus process, and others have suggested looking for an alternative venue, perhaps direct talks among nuclear-armed states. The advantages of the CD are that it is the only forum in which all nine nuclear-armed states are members and have chosen to participate and have agreed on the rules. Going outside it may permit states that are reluctant to begin talks or reach agreement on an FM(C)T, like Pakistan and Israel, the opportunity simply not to participate.⁴

The minimum goals of an FM(C)T

Given the intense disputes between states over starting talks, it is difficult to predict the structure of a final FM(C)T. It is easier to consider what could be the minimal requirements for an FM(C)T, one that did no more than formalize existing policies and practices. This of course falls short of a comprehensive FM(C)T that most states and civil society groups wish to see, but would be better than nothing.

A minimal FM(C)T could aim to prohibit production of fissile material for nuclear weapons or nuclear-explosive purposes by all parties. This would serve to formalize the existing production moratoria among the NPT nuclear weapons states and, if they became parties, the non-NPT nuclear-armed states. This would place all states in the same position as the non-nuclear weapons states in the NPT as regards production of fissile materials for weapons.

How an FM(C)T could include existing stocks

Some states and many in civil society are concerned that a limited FM(C)T focused only on ending future production for weapons may serve to stabilize the existing situation of nuclear armed states holding large stocks of fissile materials. They also seek to ensure that nuclear arsenals could not grow by tapping into existing stocks of fissile materials that currently are not in weapons.

The NPT nuclear weapon states have already recognized this concern. As part of the Thirteen Steps agreed at the 2000 NPT Review Conference, they committed to “arrangements by all nuclear-weapon States to place, as soon as practicable, fissile material designated by each of them as no longer required for military purposes under IAEA or other relevant international verification and arrangements for the disposition of such material for peaceful purposes, to ensure that such material remains permanently outside of military programmes.”⁵ This can be read as covering civilian stocks as well as fissile material declared as excess for military purposes. There is no reason why this should exclude HEU assigned for naval fuel.

The International Panel on Fissile Materials (IPFM), an independent

group of arms-control and non-proliferation experts from both nuclear-weapon and non-nuclear weapon states, has proposed a draft treaty that seeks to address some of these concerns. The draft treaty has as its basic undertakings:⁶

1. Each State Party undertakes not to produce, acquire, or transfer fissile material for nuclear weapons or other nuclear explosive devices.
2. Each State Party undertakes either to promptly disable and decommission and, when feasible, dismantle its fissile-material production facilities, or to reconfigure and use these facilities only for peaceful or military non-explosive purposes.
3. Each State Party undertakes not to use for nuclear weapons or other nuclear-explosive devices fissile materials:
 - i. In its civilian nuclear sector
 - ii. Declared as excess for all military purposes
 - iii. Declared for use in military reactors.
4. Each State Party undertakes that any reduction in its stockpile of nuclear weapons will result in a declaration of the fissile material recovered from those weapons as excess for weapon purposes.
5. Each State Party undertakes to accept IAEA safeguards to verify these obligations.

This approach would not compel reduction of nuclear weapons or weapons-usable stocks, but it provides a mechanism for bringing under safeguards material that becomes excess due to reductions in warheads and stocks dedicated for weapons use. In this way, it furthers the irreversibility of the disarmament process. As progress on disarmament proceeds, the nuclear weapon and nuclear naval complexes would shrink, and the FM(C)T monitoring system would converge with the NPT monitoring system and lead in time to a non-discriminatory set of safeguards that would apply equally to all states in a nuclear weapon free world.

A fissile material treaty that imposed a requirement of reduction and elimination of materials in warheads and dedicated stocks would directly entail disarmament, and indeed would constitute the core of an abolition regime.

Could an FM(C)T be verifiable?

In the 1990s, states agreed to negotiate a verifiable FM(C)T. From 2004 to 2008, the Bush administration argued that “effective verification” of an FM(C)T could not be achieved. A draft FM(C)T provided by the US to the CD in 2006 contained no provision for verification. The Obama administration has returned to supporting a verifiable FM(C)T.

IPFM has argued that an FM(C)T could be verifiable, and at reasonable cost. All the civilian activities in the nuclear weapon states would be subject to the IAEA safeguards already used in non-nuclear weapon states. These safeguards would address the problems of ensuring that fissile materials were not diverted from peaceful purposes to nuclear weapons programmes and that there were no undeclared fissile material production activities.

The additional verification challenges would be to determine:

1. that legacy fissile material production facilities were shut down and decommissioned or converted to peaceful purposes;
2. that fissile material declared excess, but still in weapon-components, was not diverted to weapons purposes; and
3. that material was not diverted from naval fuel to nuclear weapon purposes. These could be achieved using techniques developed from 1996-2002 as part of the Trilateral Initiative, an arrangement between the US, Russia and the IAEA, that sought to establish the principles for IAEA safeguarding of fissile material from weapons. There would also need to be a system of managed access for inspectors to nuclear weapon sites and military reactor fuel facilities, to ensure that there was no covert fissile material production. Similar practices were successfully developed as part of the Chemical Weapons Convention.

The verification system for the FM(C)T could be negotiated as part of the talks on the treaty, as happened with the Comprehensive Test Ban Treaty, or developed separately in discussions between the IAEA and concerned states, as was the case with the safeguards under the NPT.

Conclusion

A verified treaty that banned future production of fissile materials for weapons and brought under safeguarded all existing stocks not in weapons programmes would be a major contribution to achieving non-proliferation and disarmament objectives. In addition to restraining arms racing, especially in South Asia, such a treaty would help build a stable framework for reduction and elimination of warheads and fissile material stocks; meet a key NPT commitment; institutionalize one of the basic pillars of a nuclear weapon free world; and help secure fissile materials worldwide.

Recommendations

- States should commit at the Conference on Disarmament to implement the NPT 2000 Review Conference decision to begin negotiations on a FM(C)T with a broad scope—taking into account both disarmament and non-proliferation objectives—and complete them within five years. To this end, states need to adopt a programme of work that includes negotiation of an FM(C)T.
- In parallel with an FM(C)T, states should declare a moratorium on all further separation of plutonium and all production of highly enriched uranium (HEU) and agree to phase out all such production for military and civilian use. This will prevent the stockpiling of weapons-usable fissile material as part of naval propulsion and civilian nuclear energy programmes after an FM(C)T comes into force.
- To assist the process of FM(C)T verification and to lay a basis for the future verification of nuclear disarmament, states should make complete and comprehensive public declarations of their HEU and plutonium stockpiles and production histories.