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Working Paper

Elements of an Approach To Dealing With Stocks of Fissile Materials for Nuclear Weapons or Other Nuclear Explosive Devices

Canada indicated in its statement of March 18, 1999, concerning the negotiation of a "non-discriminatory, multilateral and internationally verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices" its considered view as to how the issue of fissile material stockpiles should be addressed by those states possessing such stockpiles. This should be separate from but parallel with the negotiation of that treaty. In an effort to outline elements of such an approach, the following information and recommendations are put forward. It is emphasized that this approach is, in Canada's view, an integral part of a comprehensive nuclear disarmament and nuclear non-proliferation programme directed to the elimination of nuclear weapons and of any associated stockpiles of fissile materials for that purpose.

The suggested approach is composed of four categories of measures:

a) increasing transparency;

b) declarations of excess fissile material;

c) placing excess fissile material under verification;

and,

d) disposition of excess fissile material.

Each category is briefly expanded upon in the following sections.

A. Increasing Transparency

The collection and release of information about the size of current plutonium and highly enriched uranium (HEU) inventories is necessary in addressing the issue of excess stocks. Aggregate quantities of stocks are needed as a baseline to measure the progress of establishing controls and disposition programmes on these stocks. Accurate accounting of these stocks also serves an important disarmament and nonproliferation objective for each state possessing such stocks by ensuring that fissile materials have not been stolen or diverted. In that context, efforts to establish production histories will increase confidence that the measured inventories are correct.

Both the United States and the UK have released data about their stocks, and have promised to release more. France's nuclear programme is regarded as having as sophisticated a nuclear material accounting system as the United States and the UK, and should, with relative ease, be able to compile and release similar information about its stocks. Little is known about the accounting systems used by China. Whether the Russian Federation has compiled or is now compiling this information is unknown. The impression is that the Russian Federation needs to develop a modern, nation-wide system to account for its fissile materials; it may be several years before one is developed.

Nonetheless, it is important that states in possession of stocks begin the process of collecting data about their stocks and their production histories. The U.S. and British experiences show that over the passage of time, it becomes more difficult to compile this information as facilities close, records are destroyed, and key personnel who understand the inventories retire or pass away.

Recommendation:

(1) An agreement among the five nuclear-weapon states to create, regularly update and publish information about their fissile stocks should be concluded as an important transparency measure. Negotiating such an agreement also would focus attention by these governments on the need to thoroughly audit their own stocks.

B. Declarations of Excess Fissile Material

As nuclear arms reductions take effect, or as the nuclear-weapon states decide unilaterally to reduce the size of their nuclear arsenals, the fissile materials contained in these nuclear weapons becomes excess to weapons programmes. Excess stocks may also arise from materials in the nuclear weapons production process as decisions are made to shut down production facilities. By declaring these materials excess, these states would undertake a political commitment to refrain from using these materials in weapons.

The United States, the UK and the Russian Federation have declared about one-third of their stocks to be excess, i.e. the United States has declared approximately 227 tonnes (metric tons) of fissile material (including approximately 176 tonnes of HEU and 50 tonnes of plutonium) to be excess; the UK has declared 4.4 tonnes of plutonium to be excess, but has not declared any HEU to be excess; and the Russian Federation has declared, in principle, that 500 tonnes of HEU and 50 tonnes of plutonium are excess.

Greater quantities of such fissile materials could be declared excess by these states. Both the United States and the Russian Federation retain far more fissile materials in their programmes than needed to support future nuclear weapons arsenals, given reasonable assumptions about the future size of these arsenals. It is estimated that approximately 75 percent of Russian and U.S. inventories are currently contained outside active nuclear weapons. The United States, the UK and the Russian Federation also retain a far larger quantity of HEU than needed to support their naval nuclear propulsion programmes over the long term.

China and France have not declared any of their stocks to be excess.

Recommendation:

(2) All five nuclear-weapon states should assess their nuclear weapons requirements and declare appropriate amounts of fissile materials to be excess. They should declare the quantity of fissile materials needed to sustain current and projected nuclear forces and naval programmes. Public commitments that additional materials will be declared excess, based on projections of future need and contingent on arms reductions, also should be made.

C. Placing Excess Fissile Material under Verification

Verification that excess fissile materials are not returned to nuclear weapons is essential to confidently reducing the size of fissile material stocks. International verification agreements would make legally binding the political commitments by states not to reuse excess materials for weapons.

The United States has placed 12 tonnes of fissile material (10 tonnes of HEU and 2 tonnes of plutonium) under voluntary International Atomic Energy Agency (IAEA) safeguards, and a few tonnes of U.S. HEU have been diluted to low-enriched uranium (LEU) under IAEA monitoring. The UK is placing its excess plutonium under Euratom safeguards and has agreed not to remove these materials from safeguards for weapons purposes. The Russian Federation has not placed any of its excess material under safeguards, although approximately 50 tonnes of Russian HEU has been diluted to LEU under U.S. monitoring. China and France have not placed any of their stocks under international controls.

The United States, the Russian Federation and the IAEA are currently engaged in a "Trilateral Initiative" to develop the technical, legal, and financial mechanisms to place excess, weapons-programme origin fissile materials under IAEA verification. Special systems are required to verify, with a high degree of confidence, that the materials subject to IAEA verification indeed originated from weapons programmes, and that they are not returned to weapons, without revealing classified information about these materials in the process. The three parties are also drafting a model agreement that would commit a nuclear-weapon state not to use excess materials placed under IAEA verification in nuclear weapons. The three parties are expected to complete their work in 2000.

Recommendations:

(3) The five nuclear-weapon states should place as much excess fissile material as possible irreversibly under international verification as soon as practicable.

(4) To ensure the broad participation by all of the nuclear-weapon states in the Trilateral Initiative's outcome, UK, China and France should be invited to take part in the initiative. At a minimum, these three nuclear-weapon states should be regularly informed about the Trilateral Initiative's progress, and be allowed to comment on its efforts. In particular, these states should have an opportunity to comment on the draft model verification agreement.

(5) Implementing IAEA verification of excess stocks will place new financial strains on the Agency's safeguards budget. To address this concern, methods to create new funding mechanisms, such as proposed by the IAEA Director General, should be evaluated.

D. Disposition of Excess Fissile Material

Converting excess HEU and plutonium into forms that are unusable or unattractive for use in nuclear weapons is necessary to ensure that these materials are permanently removed from stocks.

Efforts to dispose of HEU and plutonium are now underway:

HEU Disposition. In 1993, the Russian Federation agreed to dilute 500 tonnes of weapon-grade HEU to LEU and to sell the resulting product to the United States over a 20-year period. While the agreement has periodically been beset by economic and financing concerns, so far it has proceeded relatively smoothly. Through the end of 1998, 50 tonnes of Russian HEU have been blended down and sold to the United States.

The United States has also begun to blend down excess HEU. Thirteen tonnes of HEU were blended down by the United States in 1997-1998. Additional HEU stocks-up to 88 tonnes -- are to be transferred to commercial processors in the United States and blended down for use in reactors by early in the next decade. When completed, the United States will have disposed of more than half of the currently declared excess HEU.

Plutonium Disposition. The United States and the Russian Federation are now engaged in negotiations on an agreement to cooperate on the disposition of plutonium. The preferred method of the Russian Federation is to convert excess plutonium to oxide form, mix it with uranium oxide, and fabricate mixed-oxide (MOX) fuel for use in nuclear reactors. The United States is also considering the "MOX option" for much of its excess plutonium, and would vitrify the rest in high-level waste ("immobilization").

These negotiations, begun in late 1998 are expected to be completed soon. However, whatever the outcome of these negotiations, it is uncertain if there will be sufficient financing to pay for plutonium disposition, particularly in the Russian Federation. Although the United States recently agreed to spend up to $200 million to support Russian plutonium disposition, other countries will be invited to contribute financially to the effort. Even if sufficient financing becomes available, it will take years to construct the necessary facilities in both countries for large-scale plutonium disposition. Disposition activities themselves will take decades.

Recommendations:

(6) Each nuclear-weapon state should commit to the disposition of its excess plutonium and HEU.

(7) Each nuclear-weapon state should commit to the safe storage of excess plutonium and HEU, preferably in forms less usable in nuclear weapons than metal nuclear weapons components.

(8) HEU disposition programmes should be accelerated to blend down excess HEU by the earliest possible date.