

# **COMPREHENSIVE DISCLOSURE OF FISSIONABLE MATERIALS**

**A SUGGESTED INITIATIVE**

**JUNE 1995**

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**CARNEGIE COMMISSION ON**  
**PREVENTING DEADLY CONFLICT**

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Printed in the United States of America

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# FOREWORD

NEARLY ALL NATIONS agree that we must seek to eliminate the global threat posed by weapons of mass destruction. Sharp differences persist, however, over when and how to do so. With the end of the Cold War, the risk of nuclear confrontation between the United States and Russia has fallen dramatically, as has the threat to global peace from the seemingly inexorable spiral of the East–West arms race. Sadly, and dangerously, there has been no corresponding breakthrough to halt and reduce horizontal proliferation — nuclear weapons technology and materials remain available in increasing amounts and to more and more actors in this volatile post–Cold War world. It is not beyond the imagination that terrorism will become nuclear one day. We must take steps to prevent such a nightmare.

As this is written, representatives from more than 170 nations have just succeeded in extending indefinitely and unconditionally the 25-year-old Non-Proliferation Treaty (NPT). That historic achievement provides the basis and the mandate for further strengthening of proliferation controls.

The next important step in that regard is the full disclosure of fissionable materials. The goal would be better control of these potentially dangerous materials, including the vast and mobile supplies of weapons-grade materials that have been and are being released through the destruction of U.S. and Russian nuclear weapons.

To understand better the imperatives and possibilities of establishing exacting standards of accounting for fissionable materials, the Commission on Preventing Deadly Conflict asked one of its members, John Steinbruner of the Brookings Institution, to prepare a discussion paper that would stimulate thought and promote wide-ranging debate on these critical issues. He was assisted in his effort by David Owen, Roald Sagdeev, and the undersigned.

DAVID HAMBURG  
*Co-chair*

CYRUS VANCE  
*Co-chair*

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# COMPREHENSIVE DISCLOSURE OF FISSIONABLE MATERIALS: A SUGGESTED INITIATIVE\*

DURING THE COURSE of the Cold War hundreds of metric tons of plutonium and highly enriched uranium were fabricated into nearly a hundred thousand nuclear weapons. Tens of thousands of these weapons were dispersed to active forces. Provisions were made for the accounting, physical security, and safe operational handling of the weapons and materials, but these provisions were subordinated to the central objectives of deterrence and containment.

While the Cold War lasted, deterrence and containment provided the organizing focus of policy. So far, the new era has produced no such widely accepted objectives. It seems apparent, however, that any new formu-

\* This paper has been prepared for the Carnegie Commission on Preventing Deadly Conflict by John Steinbruner, David Owen, Roald Sagdeev, David Hamburg, and Cyrus Vance and does not necessarily reflect the position of individual members of the Commission or their respective countries.

lation will necessarily involve more prominent and more exacting standards for the accounting, physical security, and operational handling of nuclear weapons and fissionable material. More exacting standards of safety can be expected to become a compelling priority as the international community confronts the unavoidable problem of disposing of fissionable material released from weapons inventories and begins to comprehend the broader dimensions of that problem.

Regulating the dispersion of weapons and of weapons-related material and technology is necessarily a major part of the larger effort to prevent deadly conflict, and clearly, existing regulations will have to be strengthened considerably as access to potentially dangerous technology spreads inexorably throughout the world. More effective controls will ultimately be needed for weapons of all types, but the need for better controls is particularly urgent for nuclear weapons.

Therefore, an initiative should now be undertaken to establish a comprehensive arrangement for the disclosure of all fissionable material. This would make a useful contribution to international efforts to promote nuclear disarmament and nonproliferation. Such efforts comprise two fundamental aspects:

- First, it is necessary to reverse what occurred as a result of vertical proliferation. This requires implementation of existing disarmament agreements and negotiation of further such agreements that include nuclear weapons states not covered by existing agreements; an end to all nuclear testing; and cutoff—that is, no further production of weapons-grade fissionable material. Progress is being made in each of these fields. Declaration of all stocks of fissionable material would be a further useful demonstration of the commitment of nuclear weapons states to nuclear disarmament objectives.

- Second, since the beginning of international concern about the prevention of the spread of nuclear weapons over 40 years ago, it has been recognized that a fundamental means of preventing horizontal proliferation is to follow the disposition and flow of nuclear materials. For this reason, for example, the statute of the International Atomic Energy Agency (IAEA) envisaged stockpiles of such materials being put under the agency's direct control. The subsequent development of the agency's safeguards system rests elementally on following the flow of nuclear materials and detecting any diversion from peaceful to military purposes. The comprehensive disclosure arrangement proposed here would enhance the IAEA's ability to track the flow of materials and would thus help to restrain horizontal proliferation.

Establishing standards of accounting and physical security for fissionable materials is clearly fundamental to the achievement of nuclear disarmament and nonproliferation. Prevailing standards are not adequate, and this inadequacy is a major danger to international security.

### THE PROBLEM OF ULTIMATE DISPOSITION

The stark fact is that no provision was made during the course of the Cold War for using or managing the stocks of fissionable materials produced for weapons application if they were not incorporated in weapons or held in reserve for that purpose. The critical isotopes will be suitable for weapons application for spans of time ranging from tens of thousands of years to hundreds of millions of years, and their radioactive decay products will be a severe health hazard for as long.

Ultimately, some acceptable method of disposition will have to be devised.\* This material cannot be deployed in weapons or stored in its current sites for as long as it will remain dangerous.

The issue of ultimate disposition is being posed now as weapons-grade material is released from active inventories in the course of implementing the arms control agreements that have recently been concluded by the United States and Russia. The two countries will release approximately 100 metric tons of plutonium along with more than 600 metric tons of highly enriched uranium as they carry out the provisions of the START I and START II agreements. Uranium can be readily diluted to lower enrichment levels and stored indefinitely without radiological hazard. If it is eventually burned in commercial reactors, it will contribute to the further accumulation of plutonium—and in the United States, at least, there is no agreed method for disposing of this plutonium other than holding it in guarded storage. It currently appears likely that the effort to begin the process of disposition will take a decade or more, and completion of the process is likely to require several decades after it has been initiated.

In the course of attempting to solve that immediate problem, it can be expected that a broader issue will be recognized. More than a thousand metric tons of plutonium have been produced throughout the world as a by-product of nuclear power generation, with approximately a hundred

\* A review of the problem and an assessment of disposition options was recently conducted by the U.S. National Academy of Sciences. Its report, *Management and Disposition of Excess Weapons Plutonium* (National Academy Press, Washington, D.C., 1994), provides the technical basis for the suggested disclosure initiative.

tons of it held in separated form in several locations. Though this material differs in isotopic composition from the plutonium produced for weapons application, it can be fabricated into nuclear explosives and is thus nearly as dangerous from that point of view. It is even more dangerous as a radiological hazard. Dangerous as it is, however, plutonium generated in commercial reactors is not subjected to the same managerial standards as weapons-grade material, particularly with regard to physical security.

In general, the relatively high prevailing standards for the accounting and physical security of fissionable material that is incorporated in fabricated weapons are not maintained for material that is held for other purposes and in other forms. Accounting and physical security practices vary considerably across functional purposes and across national jurisdictions. This situation cannot continue indefinitely without producing a catastrophic accident or breach of control. Establishing comprehensive international standards for the accounting, physical security and ultimate disposition of fissionable materials will almost certainly emerge as a major security imperative of the new era, if not by virtue of preventive foresight then in reaction to some catastrophe.

### THE ROLE OF DISCLOSURE

In supporting efforts to extend the Non-Proliferation Treaty (NPT), the principal nuclear weapons states have conducted active discussions of a comprehensive test ban and a cutoff of fissionable material production for weapons purposes. Completed agreements in these two areas would prevent further additions to the already large weapons inventories but would not deal directly with the problem of setting standards for the existing inventories. The obvious first step in addressing that problem is to establish what in fact the inventories are.

At the moment there is no comprehensive listing. The accounting base established by the safeguard provisions of the NPT contains information on the fissionable materials stocks of all the signatory non-nuclear weapons states; these states are required by the treaty to report their fissionable materials holdings to the International Atomic Energy Agency. Nuclear weapons materials are exempted from this requirement, and that has been one of the aggravating inequities of the NPT.

The United States and Russia, by far the largest producers of fissionable materials and of weapons, agreed in principle at their September 1994 summit meeting to provide each other with a full listing of their fabricated weapons and fissionable materials inventories. Japan subsequently pub-

lished the amount—nearly 11 tons—of separated plutonium that it holds in connection with its power generation program. The German foreign ministry has suggested a general disclosure arrangement, and a group of states using plutonium in their civil fuel cycles have made voluntary disclosures of their civil plutonium holdings to the IAEA. These disclosures are in addition to the safeguards reports, which are not published and, at least officially, are not released to other participating governments.

These various initiatives begin to address the underlying problem but do not yet provide for a comprehensive arrangement. Moreover, the most important of them—the disclosure agreement between the United States and Russia—has recently encountered the hazards of bilateral politics. The actual exchange of information on weapons and material holdings, agreed to by Presidents Clinton and Yeltsin, cannot be legally accomplished until a formal agreement of cooperation is signed, and that in turn has become entangled in a dispute over Russia's prospective sale of reactor technology to Iran. With national sensitivities running high in both the United States and Russia, the bilateral understanding may have to be embedded in a broader initiative in order to succeed. At any rate, a broader arrangement would eventually be necessary to establish full accounting of all stocks.

The moment has come for a comprehensive initiative. All states should be asked to provide the IAEA with a complete listing of their fissionable materials inventories designated by isotopic composition. Further, the nuclear weapons states should supplement this basic listing by providing a complete account of their nuclear weapons inventories as well. If shared among the nuclear weapons states, such information could also provide a useful accounting basis for future multilateral disarmament negotiations among the five existing nuclear weapons states. This could be done independently of, or preferably in conjunction with, a commitment to placing fissionable materials from dismantled weapons under IAEA safeguards. For their part, the non-nuclear weapons states could commit themselves to increasing transparency in their management and utilization of fissionable materials by publishing details of their holdings of such materials, information that is generally kept confidential between the state and the IAEA. As a next step, such a commitment could be supplemented by the non-nuclear weapons states' agreeing to publish the IAEA's conclusions with regard to their safeguards, or they could authorize the IAEA to do so.

Disclosure of fissionable materials in this way would establish an important principle—namely, that the international community, in order to promote general safety, has a strong interest in establishing exact accounting for all fissionable materials. That is also a precondition for setting standards for both the physical security of these materials and for opera-

tional safety in any handling of them. Strict international standards for accounting, security, and operational safety would probably have to be in place before nuclear weapons deployments could realistically be reduced to very low levels or ultimately eliminated.

Disclosure to the IAEA of fissionable materials held by all states would also provide information on the dimensions of existing stocks of fissionable materials, and this reporting could thus provide a basis for planning for future demands on the IAEA's safeguards program. It could also improve the IAEA's ability to assist in checking allegations of nuclear smuggling.

The disclosure of fissionable materials in terms of isotopic composition would also help to resolve one of the major difficulties of the NPT—the fact that it has no means of accommodating the intermediate nuclear weapons status of India, Israel, and Pakistan. None of these states is a signatory of the treaty, and their potential accession is seriously encumbered in political terms by the history of their activities. All three are generally believed to have a substantial number of nuclear weapons in complete or nearly complete stages of fabrication, but they have not made formal declarations of that fact, nor have they observably associated the weapons with delivery systems. Moreover, until the 1994 Geneva agreement is fully implemented, North Korea too will have a form of intermediate status, albeit somewhat more limited.

It is not desirable to induce these states to make formal declarations or undertake observable deployments, but a comprehensive accounting of fissionable materials would have to include their stocks. A report categorized by isotopic composition would reveal their weapons potential to a close approximation without requiring a direct declaration of nuclear weapons capability. Disclosure could thus be a much-needed step toward nuclear transparency and confidence building between India and Pakistan and, in the Middle East, toward a regional nuclear-weapons-free zone, if Israel were to agree.

There are even broader and equally compelling reasons for undertaking such an initiative. Systematic disclosure arrangements are the only serious hope for controlling biological agents, for example, and ultimately they will almost certainly have to be developed for monitoring materials of all kinds that have high environmental sensitivity. The technology and the legal rules for systematic monitoring are very likely to be of truly vital importance as the politically fragmented international community attempts to manage a rapidly expanding globalizing economy that no national government or coalition of governments can expect to regulate by traditional means. For the moment, however, the problems posed by fissionable materials provide a strong enough incentive to move even the most reluctant and beleaguered of political leaders.

### AN ILLUSTRATIVE REPORTING ARRANGEMENT

The details of a comprehensive arrangement for registering all fissionable materials would have to be negotiated with all the countries directly affected, and clearly that would involve an extended deliberation. The basic idea can certainly be advanced, however, with some illustrative specificity.

The suggested arrangement would involve annual reports from all countries to the IAEA listing their fissionable materials holdings in each of the following categories:

- A. Amounts of plutonium with the isotope  $^{240}\text{Pu}$  comprising:
  - 1. 10 percent or less
  - 2. greater than 10 percent
- B. Amounts of uranium with the isotope  $^{235}\text{U}$  comprising:
  - 1. greater than 85 percent
  - 2. 65-85 percent
  - 3. 40-65 percent
  - 4. 20-40 percent
  - 5. less than 20 percent
- C. Amounts of uranium with the isotope  $^{233}\text{U}$  comprising:
  - 1. greater than 80 percent
  - 2. 12-80 percent
- D. All separated amounts of neptunium  $^{237}\text{Np}$

Categories A<sub>1</sub> and B<sub>1</sub> have historically been the primary weapons materials, but all the other categories except B<sub>5</sub> have potential weapons application as well. The other categories reflect the fuels and by-products of varying types of reactor design.

As a matter of practical politics, it is probably necessary to begin the reporting arrangement on a voluntary and unverified basis with a provision that the reports would not be published until compliance of all the nuclear weapons states and the intermediate states had been achieved. In the meantime, access to the information would be restricted to those states that had complied. If all the currently acknowledged and widely suspected nuclear weapons states were eventually induced to comply, presumably very few others would attempt to resist their example, and a nearly comprehensive voluntary arrangement would be established. A major political effort should be made to accomplish that result. Such a result is the natural first step toward the mandatory, verified arrangement that ultimately is likely to be necessary. Leadership by the five nuclear powers, particularly the

United States and Russia, will be vital. Agreements for mutual verification among the five, and their concerted efforts to gain adherence by threshold states, would lay the essential political foundation for full international verification at a later stage in the disarmament process.

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