



## **Making the Grade 2000: Second Annual Review of Fissile Material Control Efforts**

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A little over a year ago, ISIS initiated an annual review of fissile material controls covering a broad spectrum of initiatives. To do so, 19 separate initiatives were identified and assessed. Based on this assessment, grades were awarded on a scale of A, B, C, D, and F, where an "A" is excellent and an "F" is failing. Numerically, an "A" corresponds to a numerical grade of four, and an "F" to zero.

The results of the first review were disappointing. Only 12 of the 19 initiatives received a passing grade of "C" or higher. The average grade of the initiatives was a "C"-showing an unfortunate level of mediocrity across the fissile material control agenda.

In ISIS's 2000 review, we found that the outlook is worse today than it was a year ago. Rather than make progress during the past 12 months, the overall fissile material control agenda fared poorly. The average grade of the identified initiatives fell from a "C" to a "C-minus."

This overall finding is borne out if one looks at the individual grades assigned to each of the 19 identified initiatives. ISIS judged that five initiatives remained essentially static, nine received lower grades, and five initiatives received higher grades.

### **Major Findings**

A few initiatives moved forward in the last year. ISIS found that efforts to improve the protection of fissile materials in Russia and other former Soviet states made progress. The quantity of fissile materials that have been protected has increased somewhat over the past year to more than 50 tonnes. Site-wide upgrades have been completed at 27 sites, including 14 in Russia, where fissile materials are located. Security systems at another 37 buildings located at other, more sensitive sites, have been completed, and work has begun at more than 70 buildings containing an estimated 400 tonnes of fissile material.

Under a new initiative, Russia and the United States have begun to consolidate fissile materials-principally highly enriched uranium (HEU)-at a fewer number of sites, and HEU is being converted to non-weapons forms. Although only about 200 kilograms have been consolidated and converted so far, the United States and Russia plan to greatly expand this effort.

Nevertheless, progress here is tempered by difficulties in gaining access to more sensitive Russian facilities, a lack of adequate accountancy systems, and the realization that improvements are not yet sustainable in Russia without active U.S. partnership. Adequately protecting fissile materials in Russia will take many more years than the Department of Energy initially planned. The United States and Russia will need to devote considerable resources for the foreseeable future if Russia's protection and material accountancy systems are to be brought up to international standards.

Modest progress has also been made in the area of transparency of fissile material stocks. The U.S. Department of Energy (DOE) is soon to release a long overdue report on U.S. HEU production, acquisition, and use. Much credit for the report is due to a few Energy Department officials who have navigated treacherous bureaucratic waters and worked for years to assemble and present the data. The report accompanies a similar report that the DOE issued in the mid-1990s on U.S. plutonium inventories. Together, the reports set an important example for other states that possess military fissile material stocks. They show that basic information about these stocks-such as production history, quantities, forms, and locations-can be made public without compromising national security. More important, the process of compiling and analyzing the data needed to complete these reports holds important lessons for other countries seeking to make their own stocks more transparent.

Progress also has been made on the Trilateral Initiative, where the United States, Russia and the International Atomic Energy Agency (IAEA) are seeking to negotiate an agreement that would verify classified fissile materials in the United States in Russia, and permanently remove the materials subject to verification from military stocks. When completed, the Trilateral Initiative will create a new verification regime that can build international confidence that nuclear arms reductions are permanent and irreversible.

Bilateral transparency measures between the United States and Russia have had mixed success. Transparency measures under the U.S. - Russian HEU Purchase Agreement have been installed and expanded over the past year, building confidence that the uranium sold to the United States under the agreement is derived from HEU. At the same time, however, the United States and Russia have been unable to reach an agreement on how to verify that fissile materials entering a storage facility, now under construction at Mayak, originated from dismantled Russian nuclear weapons. According to U.S. officials, such an agreement is necessary if Russia expects the United States to help fund the facility's operations.

Moreover, much greater transparency is necessary to support very deep nuclear arms reductions, as envisioned under the START process. Promised information and data exchanges between the United States and Russia about their nuclear weapons and fissile material stocks have not materialized.

Achieving transparency measures related to the verifiable dismantlement of nuclear warheads is back on the agenda following the Russian Duma's ratification of the START II treaty in April. The ratification allows for the negotiations of a START III treaty, which, under a 1997 pledge, is to include such transparency measures. However, the number of warheads potentially subject to verifiable dismantlement is constrained by U.S. policy to retain several thousand warheads in reserve. The technical means to verify warhead dismantlement also remains problematic. Moreover, despite interest in the United States to finalize a treaty before the end of the Clinton administration, the START III negotiations are expected to be complicated. It is not clear that differences over these issues, which include differences over modifications to the Anti-Ballistic Missile (ABM) Treaty, the numbers of strategic weapons allowed under START III, and the permitted means to deploy these weapons, will be resolved anytime soon, despite public optimism.

There is also an increased awareness of the need to minimize stocks of weapons-usable, separated civil plutonium. In particular, there is growing interest in several countries in finding ways to reduce their stocks of separated civil plutonium in a meaningful timeframe.

Many initiatives, however, fared poorly.

Efforts to end the production of fissile materials for nuclear explosive purposes are hampered by political gridlock and inattention. In particular, the Conference on Disarmament (CD) failed to achieve the consensus needed to resume negotiations on a fissile material cutoff treaty (FMCT). The perceived bad faith on the part of the United States for failing to ratify the Comprehensive Test Ban Treaty, and attempts to link the negotiations with other disarmament initiatives by some CD members continue to plague efforts to start the FMCT talks. Given the expectations following the formation of an ad hoc committee to negotiate an FMCT in the fall of 1998, the lack of consensus and failure to reconvene this committee is especially disappointing.

Both India and Pakistan are increasing their production of fissile materials. Pakistan, which many believe observed a moratorium on HEU production for many years in the 1990s, has resumed HEU production and is now capable of producing separated weapon-grade plutonium. Efforts by the United States and others to persuade India and Pakistan to observe a bilateral moratorium on fissile material production have fallen on deaf ears.

Other countries may be seeking to produce fissile materials for weapons. In particular, suspicions have increased that Iraq is renewing efforts to create a fissile material production capability. The continuing lack of IAEA inspections in Iraq, as called for by the UN Security Council, make it extremely difficult to confidently detect or deter such activities.

In the nuclear weapon states, France, Russia, the United States, and the United Kingdom continue to observe unilateral moratoria on fissile material production for weapons. There are also no indications that China is producing additional military fissile material stocks. However, U.S.-Russian efforts to shut down or convert Russia's three remaining plutonium production reactors have completely failed to arrive at a mutually acceptable plan.

Programs to dispose of excess military HEU are behind schedule. While Russia has blended down 80 tonnes of HEU and sold the resulting LEU to the United States, schedules have continually slipped. The United States will need to maintain vigorous oversight to ensure the long-term success of the agreement, which is to dispose of 500 tonnes of Russian HEU. The United States has also extended the schedules for blending down portions of its own excess HEU.

Plutonium disposition plans also are very uncertain, despite reports that a U.S.-Russian bilateral agreement is close to signature. At present, Russia and the United States each plan to dispose of 34 tonnes of plutonium over a 20-year period beginning in about 2007. The vast majority of this plutonium is to be mixed with uranium and used as nuclear reactor fuel. However, both countries lack the infrastructure to process the plutonium into fuel suitable for reactors, and Russia lacks the resources to construct the necessary facilities. Under the draft U.S.-Russian agreement, Russia will be released from its obligations if it is unable to raise the capital needed to support the program. In turn, since the agreement envisions parallel disposition efforts, the U.S. program will not be implemented if the Russian program is unfunded. The U.S. program also received a set back in mid-April, when one of two utilities that was to use fuel containing ex-weapons plutonium decided not to participate in the program.

Efforts to combat nuclear proliferation have fared little better. India and Pakistan dramatically demonstrated throughout the year that they have little interest in giving up their nuclear weapons capabilities. Iraq has resisted allowing the resumption of IAEA Action Team inspections, and could quickly reconstitute its nuclear weapons program. Without inspections, there is little chance that such efforts would be detected. Should Iraq resume its pursuit of nuclear weapons, Iran may feel compelled to do the same.

Despite the promise offered by strengthened IAEA safeguards, states have been slow to adopt these measures. States need to approve a Model Protocol before many of the more powerful measures can be brought into force. However, only eight of 49 states that have submitted such a protocol to the IAEA Board have brought the measures into force. In the Middle East, where the risk of nuclear proliferation remains high, only Jordan has taken this step. Iran has resisted ratifying a protocol. Progress on creating nuclear-weapon-free-zones has not moved forward much in the past year, either.

The international community has also failed to adequately deal with violators of international nonproliferation norms. In particular, Iraq so far has rejected a December 1999 UN Security Council resolution that would reestablish inspections in Iraq, which undermines the Security Council's authority. If this situation continues indefinitely, the possibility of resorting to military solutions to address proliferation risks becomes more attractive in some quarters.

## The Report Card

The remainder of this paper comments on the status of all 19 fissile material control initiatives, focusing on changes that have occurred since ISIS concluded its first assessment at the end of 1998. The grades are summarized in the following table: **Scorecard Summary[1]**

Category	Grade	
	1999	2000
<b>(I) Ending the Production of Fissile Material for Nuclear Weapons</b>	<b>C</b>	<b>D</b>
(a) Unilateral initiatives to end the production of new materials for weapons in Britain, China, France, Russia and the United States	A-	B+
(b) Ending production in other states	D	F
(c) Obtaining a fissile material cutoff treaty	B-	D
<b>(II) Protecting and Reducing Military Stocks of Fissile Materials in the Nuclear Weapon States</b>	<b>C</b>	<b>C</b>
(a) Declaring military stocks to be excess	C-	C-
(b) Placing excess stocks under international safeguards or verification	B	B+
(c) Disposing of excess HEU	B-	C
Disposing of excess plutonium	D+	D
Establishing verifiable warhead dismantlement	C-	C
<b>(III) Protecting Fissile Materials From Theft</b>	<b>C+</b>	<b>C+</b>
(a) Improving protection and accountancy systems in the Former Soviet Union	D+	C-
(b) Improving physical protection worldwide	B+	B+
<b>(IV) Creating Inventory Transparency</b>	<b>C+</b>	<b>C+</b>
(a) Military stocks of plutonium and HEU	D+	C-
(b) Civil stocks	B+	D+
<b>(V) Ending the Proliferation of Nuclear Weapons</b>	<b>C+</b>	<b>C-</b>
(a) Strengthened IAEA safeguards	A-	B-
(b) Working towards NPT universality and nuclear-weapon-free zones	B-	C-
(c) Dealing with violators of international nonproliferation commitments or inspections	D	D-
(d) Improving export controls	C+	C-
<b>(VI) Reducing the Threat Posed by Civil Stocks of Fissile Material</b>	<b>C-</b>	<b>C-</b>
(a) Minimizing stocks of separated civil plutonium	D+	C-
(b) Eliminating civil HEU	C	C
<b>(VII) Establishing Acceptable Nuclear Waste Repositories</b>	<b>F</b>	<b>F</b>
<b>Overall Grade of all Categories</b>	<b>C</b>	<b>C-</b>

[1] Grades are awarded on a scale of A, B, C, D, and F, where an “A” is excellent and an “F” is failing. Numerically, an “A” corresponds to a numerical grade of four, and an “F” to zero.

## Category I. Ending the Production of Fissile Material for Nuclear Weapons

**Overall Grade: D+ (down from a C)**

a) Unilateral Initiatives to End the Production of New Materials for Weapons in Britain, China, France, Russia, and the United States-The political commitments made by four of the five nuclear-weapon states to refrain from producing additional fissile materials for nuclear weapons remain unchanged. However, the principle that countries should not be producing weapon-grade materials is undermined by the failure of the United States and Russia to close down or convert Russia's remaining plutonium production reactors. *Grade: B+ (down from an A-).*

b) Ending Production in Other States-India and Pakistan continue to produce fissile materials for nuclear weapons, likely at increased rates. There are indications that Pakistan has been reprocessing spent fuel from the Khushab reactor to obtain separated weapon-grade plutonium. There are also growing uncertainties as to whether or not Iraq is assembling a program to clandestinely produce fissile materials. Iran may be seeking its own unsafeguarded stock of fissile materials. The status of Israel's fissile material production programs remain unknown, although it is not believed to be accelerating its program. *Grade: F (down from a D).*

c) Obtaining a Fissile Material Cutoff Treaty-Following much anticipation that negotiations on a fissile material cutoff treaty would begin in 1999, the Conference on Disarmament failed to convene an ad hoc committee to begin the talks. The perceived bad faith on the part of the United States for failing to ratify the Comprehensive Test Ban Treaty, tensions between India and Pakistan, and attempts to link the negotiations with other disarmament initiatives by some CD members continue to plague efforts to resume the talks. *Grade: D (down from a B-).*

## Category II. Protecting and Reducing the Military Stocks of Fissile Materials in Nuclear Weapon States

**Overall Grade: C (unchanged)**

a) Declaring Military Stocks to be Excess-The United States, Russia, and the United Kingdom have declared portions of their military fissile material stocks to be excess to military needs. However, no additional stocks of excess military fissile materials have been declared-by any of the nuclear-weapon states-over the past year. *Grade: C- (unchanged).*

b) Placing Excess Materials under International Safeguards or Verification-Excess UK materials have been placed under Euratom verification and have been made eligible for IAEA safeguards under a voluntary offer agreement. Russia, the United States and the IAEA have made progress under the Trilateral Initiative to create a new verification regime for excess fissile materials. Transparency arrangements on the blending down of Russian excess HEU have improved. However, overall gains in are somewhat tempered by the U.S.-Russian failure to reach an agreement on the terms of verifying that fissile materials entering a storage facility, now under construction at Mayak, originated from dismantled nuclear weapons. *Grade: B+ (up from a B).*

c) Disposing of Excess HEU-Both U.S. and Russian schedules to blend down HEU have slipped, although the United States may increase the quantity of HEU to be blended down over the next few years. As of March 2000, Russia had blended down 80 tonnes of HEU, but LEU deliveries slipped by several months. The U.S.-Russian HEU Purchase Agreement also remains vulnerable to market changes; the deepening fiscal troubles of the United States Enrichment Corporation (USEC), which acts as the U.S. Executive Agent for the purchase agreement, cast a pessimistic shadow on the future of the agreement to function without continued government intervention and vigorous oversight. *Grade: C (down from a B-).*

d) Disposing of Excess Plutonium-A bilateral agreement between the United States and Russia governing the disposition of plutonium may be close to completion, but the draft agreement covers less material than originally planned. Moreover, the lack of international financing to pay for the Russian disposition program will scuttle the agreement entirely, if countries do not provide funds once the bilateral agreement is signed. The decision by a U.S. utility not to participate in the U.S. plutonium disposition program is also a political setback, although it may have little effect on actual disposition schedules. *Grade: D (down from a D+).*

e) Establishing Verifiable Warhead Dismantlement-Russia's ratification of START II will allow negotiations to begin on START III, which is to include transparency measures related to the verifiable dismantlement of nuclear warheads. The scope of such measures is constrained by U.S. plans to retain a large reserve of nuclear warheads. *Grade: C (up from a C-).*

### **Category III. Protecting Fissile Materials from Theft**

**Overall Grade: C+ (unchanged)**

a) Improving Protection and Accounting Systems in the Former Soviet Union-As of the end of 1999, Russia and the United States have brought 50 tonnes of fissile material under significantly better protection. Twenty-seven sites (including 14 in Russia) have been fully upgraded, and an additional 37 buildings located at sensitive Russian sites have been secured. Efforts to improve the protection of an additional 400 tonnes of fissile material are now being implemented. However, progress has been offset by difficult working conditions in Russia, Russia's continued unwillingness to grant access to sensitive sites that contain much of its weapons-usable materials, and questions about Russia's ability to maintain and systematize physical protection and accounting practices in the long run. *Grade: C- (Up from a D+).*

b) Improving Physical Protection Worldwide-The physical protection of weapons-usable nuclear materials remains relatively robust in many parts of the world, notwithstanding conditions in Russia and the Newly Independent States. Standards for physical protection were strengthened in 1999. However, the revised standards still fail to meet standards associated with the protection of stored nuclear weapons. Moreover, the revisions remain advisory in nature and are not subject to international reporting and verification. Proposals to broaden the Convention on Physical Protection to cover materials in domestic storage, use and transport, as well as to apply the strengthened standards, have failed to garner support. Consequently, different states continue to apply different physical protection standards. *Grade: B+ (unchanged).*

#### Category IV. Creating Inventory Transparency

**Overall Grade: C+ (unchanged)**

a) Military Stocks of Plutonium and HEU-Absent an agreement between the United States and Russia to exchange classified data on fissile material stockpiles and nuclear weapons inventories, progress in this area is relegated to national declarations of these inventories. A report, soon-to-be released by the Department of Energy, will provide details about U.S. HEU production and stockpiles. The report marks an important milestone for the other nuclear weapon states, which, outside the UK, have not declared their inventories. However, the report will not contain as much detail as originally expected. *Grade: C- (up from a D+).*

b) Civil Stocks-Under the plutonium management guidelines, nine states with large holdings of civilian plutonium are making annual declarations of their holdings. However, other key states have not signed onto these guidelines. Transparency of civil HEU stocks has not measurably improved. *Grade: B+ (unchanged).*

#### Category V. Ending the Proliferation of Nuclear Weapons

**Overall Grade: C- (down from a C+)**

a) Implementing Strengthened IAEA Safeguards-Almost three years after the IAEA Board of Governors approved a Model Protocol that codifies many of the more powerful measures to strengthen safeguards, 49 states have signed such a document. This is almost double the number that had signed the protocol as of the fall of 1998. However, only eight states have brought the protocol into force. Among Middle Eastern countries, where the risk of proliferation is high, only Jordan has brought the protocol into force. Iran has indicated little interest in signing a protocol, even as concerns increase that it may misuse civil nuclear facilities for military purposes, particularly given the impasse over resuming inspections in Iraq. *Grade: B- (down from a A-)*

b) Working Toward NPT Universality and Nuclear-Weapon-Free Zones-India, Israel, and Pakistan remain outside the NPT. India and Pakistan, in particular, are more determined than ever to increase their nuclear arsenals. There is also growing concern that the integrity of the NPT has been weakened, which may lead to some states to opt out of the treaty for national security concerns. The negotiation of a nuclear-weapon-free zone in Central Asia has proceeded slowly, and problems continue to plague the formalization of such a zone in South East Asia. A nuclear-weapons-free zone in the Middle East remains a distant goal. *Grade: C- (down from a B-).*

c) Dealing with Violators of International Nonproliferation Commitments or Inspections-International strategies to deal with violations of international nonproliferation commitments or inspections continue to be applied haphazardly. Principal violators continue to be North Korea and Iraq, where NPT commitments and IAEA safeguards were flaunted in the 1980s and 1990s. UN Security Council efforts to resume inspections in Iraq-after more than a year's hiatus-have been met by determined Iraqi resistance. In the case of North Korea, bargaining and negotiation may yet result in bringing that country back into compliance with its safeguards agreement, but success of this effort is far from certain. *Grade: D- (down from a D).*



d) Improving Export Controls-The concern here centers on export controls in former Soviet states, even though Western countries must continue to keep up their guard. Russia and other Newly Independent States continue to lack adequate means to enforce strict export controls on nuclear and nuclear-related dual-use items. Significant risk exists that Iraq or Iran may exploit these weaknesses to obtain needed items, despite the best efforts of the Russian government to prevent them from doing so. Given the increased demand for these technologies, inadequate export controls pose a more significant threat. *Grade: C- (down from a C+).*

#### **Category VI. Reducing the Threat Posed by Civil Stocks of Fissile Material**

**Overall Grade: C- (unchanged)**

a) Minimizing Stocks of Separated Civil Plutonium-Civil plutonium stocks continue to grow, particularly in Russia, where the risk that these materials might be stolen and sold on a black market remains high. Russia is considering a moratorium on the additional separation of civil plutonium, and the United States is offering to fund U.S.-Russian civil nuclear research projects to help cement this pledge. At the same time, however, some Russian policymakers and members of the Duma would like to allow Russia to import spent nuclear power reactor fuel, which would be reprocessed. Other countries with large civil plutonium stocks currently have few options available to reduce these stocks in a meaningful timeframe, although there is a growing recognition that more effort is needed. *Grade: C- (up from a D+)*

b) Eliminating Civil HEU-Several countries continue to rely on civil HEU for research reactor fuel. Stocks in South Africa also remain in place, despite discussions with the United States about removing or otherwise disposing of these stocks. *Grade: C (unchanged).*

#### **Category VII. Establishing Acceptable Nuclear Waste Repositories**

**Grade: F (unchanged)**

Whether or not a viable repository will ever be developed and opened is a question that cannot be answered at the present time. The lack of a repository in the United States and Russia will threaten the integrity of programs to dispose of excess military plutonium. For the non-weapon states, the lack of international or regional repositories creates its own hardships. *Grade: F (unchanged).*