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Need for Enhanced Nuclear Safeguards

At the moment, the danger of a Russian-American suicidal conflict has diminished, but the global amounts of potential nuclear weapons materials continue to grow. Some of the weapons in Russian and American arsenals are being dismantled, but the hazard of nuclear terrorism is rising. During the past year, several extensive reports have been issued concerning weapons inventories, the most recent by the National Academy of Sciences (NAS).^{*} Aspects of weapons disposal were treated at the recent American Association for the Advancement of Science annual meeting in San Francisco. What follows draws on the two sources.

The situation is complex, and some secrecy remains. However, the Russians have been unusually forthcoming. They provided a substantial body of information to the NAS committee during 5 days of sessions in Moscow. An important positive development has been the removal of short-range tactical weapons from forward positions in Europe. Russia has completed withdrawal of these weapons from Warsaw Pact countries and from Ukraine, Belarus, and Kazakhstan. The United States has returned most tactical weapons from Europe. Both the United States and Russia are dismantling many of these weapons. Progress with respect to long-range strategic weapons is slower. At present, each side has 10,000 or more. These numbers will supposedly decrease to 3500 on each side by the year 2003.

But what will happen to the nuclear warheads (pits) of the various dismantled weapons? Thus far they are being removed from the devices but stored intact. Each pit consists either of about 5 kilograms of plutonium or of about 15 kilograms of highly enriched uranium (HEU)—95% ²³⁵U. In principle, disposal of the HEU is simple. It can be diluted with slightly enriched or ordinary uranium to provide fuel for power reactors. The Russians have contracted to gradually sell the United States 500 metric tons (MT) of HEU to be diluted by them to 4.4% ²³⁵U. The agreed price is \$11.9 billion. The Russians have said they plan to retain their store of weapons plutonium for use in power or breeder reactors.

Altogether the Russians must safeguard as many as 40,000 pits. Will they avoid theft of some of the weapons materials? Concern about possible thievery has been raised by the NAS committee and by Russians. One of them, Oleg Bukharin, participated in the AAAS symposium. Bukharin has pointed out that an economic crisis, widespread corruption, and the increasing transparency of its borders have opened Russia to a black market for nuclear materials. Furthermore, in the processing of weapons uranium to reactor fuel, many workers will have direct access to HEU while under limited surveillance.

The NAS report mainly discusses means of minimizing hazards arising from plutonium. The problem is magnified by continuing production of the substance in 400 nuclear power reactors located in many countries. Fuel assemblies are routinely held in reactors for 3 years. During that time, part of the uranium is converted to plutonium and highly radioactive fission products. After the fuel is withdrawn from the reactor its intense radioactivity discourages thievery. In the United States, the proposed ultimate fate of the spent reactor fuel is burial in a repository. However, in some of the countries the spent fuel is reprocessed to remove fission products and to recover fissionable materials, including plutonium. As of the end of 1992 there existed 87 MT of separated reactor plutonium—16 MT in France, 25 MT in Russia, and 36 MT in the United Kingdom. In addition, Japan has received reactor plutonium and is starting its own reprocessing industry. Annually, in the world's civilian power plants about 75 MT of plutonium are being created. Already a total of almost 1000 MT has been generated. This exceeds the amount to be removed from weapons by of the order of a factor of 10. While spent fuel remains unprocessed, problems of security are minimal. Therefore, one of the recommendations of the NAS report is that weapons plutonium be incorporated in fuel elements for burn-up in power reactors.

The NAS report points out that with only a tiny fraction of the world's weapons or reactor plutonium or HEU, a simple device could be fabricated having a yield of the equivalent of 1000 to 2000 tons of chemical explosives. Improving world standards for safeguards against diversion of civilian and military fissile materials should have a high priority.

Philip H. Abelson

^{*} The report, "Management and Disposition of Excess Weapons of Plutonium," is available from the National Academy Press, Washington, DC, 1-800-624-6242, for \$39.

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