International custody of excess plutonium

By Harold D. Bengelsdorf & Fred McGoldrick

SEVERAL COUNTRIES POSSESS LARGE AND GROWING STOCKPILES OF SEPARATED PLUTONIUM. DESPITE plans to ultimately dispose of or use this material, in the short term these stockpiles—of both civil and military plutonium—will continue to grow. In a few cases, the national stockpiling of separated plutonium has become the source of some international concern. Placing stockpiles of excess separated plutonium under the temporary custody of the International Atomic Energy Agency (IAEA) would be an important measure in assuring the international community that these materials will be kept safe and secure until their subsequent civil use or disposition.

By 1999 (the latest year for which official numbers are available) nearly 250 tons of separated plutonium had accumulated in several countries. France and Britain have about 40 tons and 60 tons of separated civil plutonium respectively, and Japan has some 30 tons, most of which is located in Western Europe. Russia has amassed more than 30 tons of separated plutonium from its peaceful nuclear program. While countries such as France, Japan, and Russia plan to burn their separated plutonium in civil nuclear reactors, the supply will outstrip demand for some time.

In addition, more separated plutonium is emerging as surplus from nuclear weapons programs. The United States and Russia have each declared approximately 50 tons of plutonium as excess to their military needs, and further anticipated reductions in their nuclear arsenals should lead to declarations of more excess separated plutonium.

In 1999, the American and Russian governments concluded an agreement to dispose of some 34 tons of their excess weapons plutonium by burning some as mixed oxide (MOX) fuel in peaceful nuclear reactors and by immobilizing and disposing of the rest as waste.

The implementation of this agreement now faces significant hurdles. Russia needs billions of dollars in aid from the international community to build MOX production facilities and to modify or complete new reactors to allow the use of MOX fuel. So far that aid has not been forthcoming. However, even if the two governments were able to meet their mutually agreed disposition targets, the conversion of this excess plutonium to more "proliferation-resistant" forms will take many years.

The international debate on plutonium

The last 25 years have witnessed an international debate on the merits of treating plutonium as a potential energy source or simply declaring it as a waste. This debate is unlikely to be resolved any time soon.

Some countries have adopted the so-called "closed fuel cycle" involving the reprocessing of spent nuclear fuel and the recovery and reuse of plutonium in peaceful nuclear power programs. Countries such as France, Japan, Russia, and others strongly believe that this is the preferred way to conserve energy resources, assure long-term sustainability of nuclear power, decrease reliance on foreign energy supplies, and improve the management and disposal of their nuclear wastes. They believe the current cost penalties associated with recycling plutonium are tolerable. Some proponents of the closed fuel cycle have been advocating the development of "proliferation-resistant" fuel cycles that would recycle fuel without separating the plutonium from the intensely radioactive nuclear wastes.

Others believe that the closed fuel cycle approach is imprudent and uneconomic and that the risks of proliferation associated with reprocessing spent fuel and recycling the recovered separated plutonium are unacceptable even if the facilities involved are subject to international safeguards. They argue that all reprocessing and recycling

should be terminated or phased out as soon as possible. They favor the "once-through fuel cycle," which entails the direct disposal of spent fuel without recovery of the plutonium. Still others believe that separated plutonium as well as spent fuel should simply be stored on a retrievable basis until societies can make prudent and well-considered decisions about what is best to do with it.

International concerns

The national stockpiling of separated plutonium has raised anxiety levels in recent years. The poor quality of the physical protection applied to separated plutonium in Russia has, of course, caused great international concern. Plutonium stocks in other locations also have been challenged. Some in East Asia have expressed concerns about Japan's reprocessing and plutonium recycling policies as well as fears that Japan's stocks of separated plutonium could threaten Asian stability, even though most of these stocks are located in Western Europe. Some have expressed these fears notwithstanding the deep-seated Japanese antipathy toward nuclear weapons, Japan's commitments under the Nuclear Non-Proliferation Treaty (NPT) not to acquire or manufacture nuclear explosives, and Japan's submission of all its nuclear activities to the safeguards of the International Atomic Energy Agency. (Japan has also adopted a unique and important declaratory policy of not holding on its own territory any surplus plutonium—that is, plutonium for no specific purpose.)

These concerns raise the question of whether any additional measures could be taken to provide greater assurance to the international community that excess stocks will not be diverted to military or explosive use pending their ultimate peaceful application or disposition. While some will argue that the solution is to turn off all reprocessing and all production of separated plutonium, states like France, Japan, and Russia, which are committed to the closed fuel cycle, are unlikely to agree to such an approach. Moreover, a proposal to terminate all reprocessing fails to address the issue of how to promote international confidence in the status of the large stocks of separated plutonium that already exist as well as those that are likely to emerge as a result of new arms control and disarmament measures.

Earlier efforts

The early pioneers in the atomic age foresaw potential concerns with national stockpiling of special fissionable materials and established a potential mechanism for their mitigation. In negotiating the Statute of the International Atomic Energy Agency, they proposed that the international community take over temporary custody of stocks of separated plutonium that were in excess of national needs.

Article XII A.5 of the statute provides that the IAEA has the right "to require deposit with the Agency of any excess of any fissionable materials recovered or produced as a byproduct over what is needed . . . in order to prevent stockpiling of these materials."

The statute also provides for the later return of the plutonium: "At the request of the member or members concerned special fissionable materials so deposited with the Agency shall be returned promptly to the member or members concerned," provided that the material is used for peaceful purposes under continuing IAEA safeguards.

This provision has never been implemented. The United States raised the issue of implementing it in the negotiations to establish the Nuclear Supplier Group Guidelines in the mid-1970s, but that group failed to adopt a recommendation on the issue.

To reduce concerns about national stockpiling, excess separated plutonium should be put under the temporary custody of the International Atomic Energy Agency.

In 1980 the U.S.-initiated International Nuclear Fuel Cycle Evaluation, in which more than 60 countries and international organizations participated, concluded that an international plutonium storage regime could have important nonproliferation and "assurance of supply" advantages. Earlier, in 1978, at the request of several member states, the IAEA Secretariat had prepared and circulated a preliminary study, "International Management and Storage of Plutonium and Spent Fuel," and subsequently invited member states to participate in separate experts groups on international plutonium storage and international spent fuel storage. The IAEA Experts Group on International Plutonium Storage met from 1978 until 1982, when it forwarded its report to the director general.

The group made considerable progress in identifying issues that would have to be resolved in establishing an international plutonium system and in defining in elaborate detail the possible elements of such a regime. Most par-

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Harold D. Bengelsdorf and Fred McGoldrick each served as senior officials with the State and Energy Departments and with the U.S. Mission to the IAEA. They are now partners in Bengelsdorf, McGoldrick and Associates, an international consulting firm.

ticipants, including several with advanced nuclear programs, seemed to believe that there could be merit in developing some form of IAEA plutonium storage regime for excess plutonium stocks. However, major disagreements over such issues as the definition of "excess" and the criteria for releasing plutonium from an international store effectively ended efforts to establish an international plutonium storage regime. Attempts by the IAEA's director general in the early 1990s to revive interest in an IAEA role in supervising excess plutonium foundered.

Then in the mid-1990s several countries with reprocessing programs or stocks of plutonium took a more modest approach by adopting a set of guidelines for managing plutonium (IAEA document INFCIRC/549). These were statements of national policy that registered the intentions of the participating states to publish information on plutonium stocks, to maintain national policies on safety and physical protection in accordance with international standards, and to exercise common controls on plutonium exports. Under these guidelines, however, excess separated plutonium remains under the complete legal control of the individual states.

Time to revisit international custody

With several large and growing stockpiles of excess separated plutonium, it is time to revisit the concept of an international plutonium scheme.

We propose a voluntary international custodial regime in which a participating state would declare specific quantities of separated plutonium in various forms as temporarily excess to its needs and agree to place these materials under the custody of the IAEA for an interim period until they can be utilized in a defined civil nuclear activity or otherwise disposed of in a peaceful manner, which could include immobilization and geologic disposal.

A participating non-nuclear weapon state would include quantities of separated plutonium that it judged to be in excess of its civil nuclear requirements. A nuclear weapon state that joined such a regime could include in its offer stocks of separated plutonium declared surplus to its defense needs as well as excess civil separated plutonium. For example, if the United States and Russia move forward with their plutonium disposition agreement, they could place their excess weapons plutonium stocks under temporary IAEA custody during the lengthy period of time when the excess material remains in storage until actual conversion and fabrication into MOX for irradiation or until immobilization and disposal.

In the case of excess weapons plutonium, the modalities of the IAEA custodial regime would have to ensure the protection of classified information. But this should not be an insuperable obstacle—the United States, Russia, and the IAEA have reportedly worked out mutually agreeable procedures for protecting classified information in the model verification agreement they are presently negotiating under the trilateral U.S.-Russia-IAEA initiative for verifying the plutonium the two states have declared excess to their military needs.

Under our proposed voluntary scheme, the IAEA Board of Governors would adopt a model agreement that would define the basic provisions of an international custody regime. Each state desiring to participate in that regime would then conclude a separate bilateral custodial agreement with the IAEA, which would have to be approved by the Board of Governors. The regime would have the following specific features:

• The amount of plutonium to be declared excess would be determined solely by the participating state. The material would be presumed to be excess if it were not to be put to a peaceful nuclear use or otherwise disposed of within an agreed period of time.

• The title to excess materials would remain with the state.

• The materials would not be moved out of the state to some "international site" but would remain in storage under IAEA custody in the state at sites such as reprocessing facilities or other locations where plutonium is normally stored.

• The IAEA would retain custody of the excess plutonium until such time as the state on its own behalf or on behalf of private entities under its jurisdiction requested its release for a specified peaceful use.

• IAEA officials would provide a continuous presence at these storage sites as part of the agency's normal safeguards or verification responsibilities and would have legal custody of the excess plutonium while the materials remain at the site.

While under the legal custody of the IAEA, the excess materials would be subject to IAEA verification arrangements or safeguards. However, the actual physical protection of the materials would remain the responsibility of the state in whose jurisdiction the plutonium is located.

No state could remove the materials from IAEA custody until it submitted to the IAEA a request for release of a specified quantity accompanied by an end-use certificate. The certificate of use would contain the following assurances and information:

that the material would continue to be used exclusively for peaceful purposes and would not be put to any use that would result in any nuclear explosive;

that the plutonium would be subject to continuing IAEA safeguards or verification procedures in accordance with the provisions of a safeguards or verification agreement between the state and the IAEA (or if the material were being exported to another country, a safeguards or verification agreement between the IAEA and that country would have to be in force);

that the materials would remain under effective physical protection in accordance with accepted international standards;

a description of the quantity and composition of the material to be released from custody;

the approximate date of delivery;

the timetable foreseen for utilization; and

the destination and end-use—fabrication into MOX fuel assemblies and prompt irradiation in a designated reactor, use in some research application, or immobilization and disposal.

The release of the plutonium to the owner would be a routine matter, based on the submission of a certificate of use to the IAEA. In the unlikely event that the IAEA were to have serious questions about the completeness or accuracy of the certificate of use, the IAEA Secretariat would consult with the state submitting the certificate of use, and only if the two sides failed to reach a common understanding would the issue be referred to the Board of Governors for resolution. The board's decision would be based solely on the completeness and accuracy of the certificate of use.

In the interest of transparency, states could agree to allow the IAEA to publish information concerning stocks of plutonium under the agency's custody and the subsequent peaceful uses of plutonium released from custody.

Benefits and costs

IAEA safeguards play an indispensable role in assuring the international community that nuclear materials subject to safeguards agreements remain in peaceful, nonexplosive use. In 1997 the IAEA Board of Governors significantly strengthened IAEA safeguards by adopting "the Additional Protocol," which gives the agency new rights and access to information that will allow it to detect undeclared nuclear activities.

An international custodial regime for separated plutonium would be an extension of and would complement IAEA safeguards. An IAEA custodial scheme would go beyond material accountancy, containment, and surveillance, and beyond the new access rights and information provided by the Additional Protocol, to remove separated plutonium from the sole control of national governments and place it under the legal custody of an international organization. This would constitute an important new legal and political barrier to diversion of this material to non-peaceful uses, since unauthorized removal of the plutonium would require seizing the material in defiance of the international custodial officials at the site. The custodial authority of the IAEA would exceed the inspection rights of classical IAEA safeguards.

An international custodial regime would have several benefits:

It would help to minimize the purely national stockpiling of separated plutonium, which should help to alleviate international concerns about the diversion of such material for nuclear explosive or other military purposes.

It would strengthen the international nonproliferation regime by requiring an authorization of the release of the plutonium from international custody. By affording the IAEA legal custody over the material pending a specified peaceful use, the regime would establish new and significant legal and political barriers to diversion that go beyond traditional safeguards or other international nonproliferation instruments.

It would increase transparency by requiring that all such materials be under international safeguards or verification. Even after release from IAEA custody, IAEA safeguards or verification measures would verify the ongoing peaceful use of the plutonium.

It would be designed as a complement to, not a replacement for, other plutonium schemes that participating states would be involved in, such as the U.S.-Russian plutonium disposition agreement or the trilateral U.S.-Russia-IAEA verification initiative.

Overall it would provide a meaningful new confidence-building measure that would help states manage their plutonium.

A suitable way would have to be found to finance the regime. Placing excess separated plutonium in a custodial regime by non-nuclear weapon states that are parties to the NPT would not entail much expense; all of this material is already under IAEA safeguards and the additional costs of administering a custodial regime would be relatively small. On the other hand, most of the excess separated plutonium in the United States and Russia is not under any IAEA safeguards or verification agreements. The costs of the custodial regime in the United States and Russia could be substantial, since any material under IAEA custody would have to be submitted to IAEA safeguards or verification arrangements.

If the United States and Russia were to begin their participation in a custodial regime by submitting their excess plutonium that is already under safeguards or verification agreements with the IAEA, the added costs of a custodial regime could be small. As more U.S. and Russian excess material was brought under safeguards, it too could be submitted to IAEA custody.

Most of the excess separated plutonium in France and Britain is under Euratom safeguards, not IAEA safeguards. If the costs of submitting that material to IAEA safeguards are seen as prohibitive, then excess British and French material could be placed under a Euratom custodial regime, since Article 80 of the Euratom Treaty contains a provision similar to that found in the IAEA statute.

Selling points

We can envision a far more rigorous regime. But no proposal is worth pursuing unless the governments with excess plutonium stocks are likely to find it acceptable. Sev-

eral features of this scheme might make it attractive to states with excess plutonium:

It would offer nonproliferation and national security benefits, but in an incremental way.

It would require neither radical changes in operations nor major political or financial costs. (The responsibility for managing the storage facilities would remain with the operator of the facility, not the IAEA, and the plutonium would remain in country, not removed to an international site.)

The state would retain responsibility for physical protection and safety, but IAEA involvement would ensure that physical protection and safety measures meet international standards.

The decision to release plutonium from custody would rarely be subject to debate by the IAEA Board of Governors, as release would be a routine matter based on the provision of a certificate of use.

The assurances and information in the end-use certificate are essentially the same as those contained in the International Plutonium Guidelines. All of the states with plutonium stocks have already adopted these guidelines for their exports, which have now become an international norm for the export of plutonium. They would now agree to them for domestic use.

Getting started

Belgium, France, Germany, Japan, Russia, Switzerland, Britain, and the United States could form the core of an international custodial regime, although other states could join as they accumulate stocks of separated plutonium.

No custodial regime is likely to emerge until at least one country possessing significant plutonium stocks expresses a willingness to place its excess separated plutonium under such a system. Moreover, history suggests that little in the international nonproliferation and arms control area is likely to happen unless the United States gets squarely behind a proposal and makes a major effort to advance it.

The United States could advance this potentially important proposal by offering to place its stocks of excess separated plutonium under temporary IAEA custody, urge other countries with large stocks of excess civil or military separated plutonium to do the same, and propose exploratory talks with these states with a view toward negotiating the establishment of an international custodial regime. ⚛