IAEA Custody of Japanese Plutonium Stocks: Strengthening Confidence and Transparency

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Even before the 2011 Fukushima nuclear disaster shut down all 48 Japanese nuclear reactors, Japan’s plan to reprocess its spent nuclear fuel and use the recovered plutonium and uranium as mixed-oxide (MOX) fuel in its nuclear power plants suffered from significant delays.

The country now has a stockpile of some 44 metric tons of plutonium, with more than nine metric tons in Japan and about 35 metric tons in Europe that must eventually be returned to Japan.[1] With formidable challenges precluding any quick or easy route for using or disposing of this material, Japan has a major plutonium problem on its hands.

This problem not only has produced a national test for managing Japan’s plutonium, but also has intensified apprehensions by neighboring states about Japan’s nuclear weapons ambitions. Nonproliferation analysts have expressed concerns that such a stockpile sets a poor example for the global nonproliferation regime and increases the risks of nuclear theft. Reducing or eliminating this stockpile will be daunting and take many years to accomplish, but Japan could alleviate international apprehensions and strengthen the global nonproliferation regime by placing its excess plutonium under the custody of the International Atomic Energy Agency (IAEA).

Obstacles to the Abe Policy

On April 11, Japanese Prime Minister Shinzo Abe announced the latest Basic Energy Plan, which calls for the restart of nuclear power plants that satisfy rigorous post-Fukushima regulatory standards, the start-up of the Rokkasho reprocessing plant, and the use of MOX fuel in Japanese reactors. The plan stated that the Japanese government “remains committed to the policy of not possessing reserves of plutonium of which use is undetermined on the premise of peaceful use of plutonium. In order to achieve this policy effectively, the government will conduct an appropriate management and utilization of plutonium while paying due consideration to an appropriate balance between separation and utilization of plutonium.”[2] The Federation of Electric Power Companies of Japan (FEPC) announced that Japanese utilities would clarify a plutonium-utilization plan before plutonium would be recovered at the Rokkasho plant.[3] Yet, it will be challenging to run the plant and reduce or at least not increase Japan’s plutonium stockpiles.

The Nuclear Regulation Authority (NRA) has been reviewing 18 reactors to determine whether they meet the new post-Fukushima safety regulations. On July 15, the NRA declared that two reactors meet the new safety standards, and the local community has appeared to favor a restart. According to estimates in the Japanese media, the entire process should conclude around October.[4] Even if the NRA determines that reactors meet the new safety standards, however, the Japanese utility operators have agreed to consult with local jurisdictions before they make a final decision on resuming operation of any reactor. Nevertheless, the federal government has been clear that it alone has the final say on whether nuclear power plants operate.[5] Recent polls reveal that opponents of restarting the nuclear program outnumber supporters by about two to one.[6]

Some local governments support nuclear power because it brings jobs and government subsidies to...
their communities. Other localities are strongly opposed. [7] Thus, any plans to restart reactors could be undermined by local opposition. One city has sought a court injunction to prevent a nuclear plant from being built. [8] Adding to the uncertainty was a ruling in May by a Japanese court against restarting reactors 3 and 4 at the Ohi nuclear plant in Fukui prefecture. [9]

A Reuters analysis concluded that only one-third of the 48 idled reactors are likely to pass Japan’s new, more stringent safety standards and meet the seismological, economic, logistical, and political hurdles needed for restart. [10] In addition, the reactor restarts are facing significant implementation costs ranging from $700 million to $1 billion per unit. A March estimate put the cost at $12.3 billion. [11]

The Japanese plan to burn the plutonium as fuel is further complicated by the government’s decision to halt the Monju prototype fast-neutron breeder reactor project, which was to play a central role in utilizing Japanese plutonium. [12] Finally, Japan Nuclear Fuel Limited (JNFL)—a private company involved in producing nuclear fuel, reprocessing and storing spent fuel, and disposing of nuclear waste—plans to start up the Rokkasho plant this October. Further delay is still possible, however, because the NRA review of the plant’s compatibility with the new safety regulations has been delayed and it is still uncertain when the plant will be completed.

In light of all these uncertainties and obstacles, trying to balance plutonium supply and demand will be a very tricky and complicated task, particularly if the Rokkasho plant begins operations and if restarted reactors do not have sufficient capacity to consume existing plutonium stockpiles or prevent an increase in these stocks.

An International Problem

Japan’s plutonium stockpile is not merely a national political and program-management problem. Countries in East Asia have long expressed concerns that Japan’s reprocessing and recycle policy has made Japan a plutonium superpower and put Tokyo in a position to develop nuclear weapons very quickly, should it decide to do so.

In answering what was an obviously staged question last January about press reports that Japan would return several hundred kilograms of weapons-grade nuclear material to the United States, [13] a spokeswoman for the Chinese Foreign Ministry, Hua Chunying, made several sharply critical points about Japan’s plutonium policy.

Japan’s large stockpile of nuclear materials including weapons-grade materials on its territory is an issue concerning nuclear material security, proliferation risks and big supply-demand imbalance. Only when there is such a balance, there can be no hidden dangers that may risk peaceful use of nuclear energy. ...

We also urge Japan to take concrete steps to tell the international community how it is going to redress the big supply-demand imbalance of nuclear materials on its territory as required by the IAEA. [14]

Hua also said that the IAEA “requires all parties to maintain a best possible balance of supply and demand of nuclear materials as contained in the Guidelines for the Management of Plutonium.” Under those guidelines, states are to increase transparency of their plutonium stocks by publishing annual statements of their holdings of unirradiated plutonium and periodic statements explaining their national nuclear power strategies. [15] Japan and eight other states agreed to follow the guidelines, which are voluntary.

According to press reports, the Japanese government failed to include 640 kilograms of plutonium in its annual statement to the IAEA in 2012 and 2013. In response, Hua said, “It is Japan who should answer the question of whether it is an unintentional omission or a deliberate concealment. Japan is not only required but also obligated to report faithfully its storage and usage of nuclear materials to the IAEA.” She added,

The Japanese side has long been holding a large amount of sensitive nuclear materials that far
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exceeds its actual needs, which is a matter of grave concern for the international community. We hope that the Japanese side can give an earnest response to the concern of the international community, take concrete actions as soon as possible to address the supply-demand imbalance of sensitive nuclear materials at an early date and refrain from, in particular, actions that may aggregate the imbalance.[16]

Japan voluntarily agreed to manage its civilian plutonium responsibly, including taking into account “the importance of balancing supply and demand, including demand for reasonable working stocks for nuclear operations, as soon as practical.”[17] The Japanese explained that the failure to report the 640 kilograms was due to their erroneous belief the plutonium was exempt from reporting.[18] Nevertheless, it is subject to IAEA safeguards and therefore known to the agency.

Beijing’s criticisms appear to reflect growing tensions with Tokyo. Relations between the two countries have worsened since China’s declaration of an air defense identification zone over the East China Sea in 2013 and its related long-standing dispute with Japan over Beijing’s claims to islands in that sea.

The Chinese statement elicited responses from IAEA Director-General Yukiya Amano and Joseph Macmanus, the U.S. ambassador to the IAEA, expressing confidence in the peaceful nature of Japan’s nuclear program and its proper handling of its plutonium.[19] Nevertheless, when the previous Japanese government suggested in 2012 that it intended to phase out Japan’s nuclear power program but continue to reprocess spent fuel, U.S. officials reportedly raised strong objections. According to news accounts, the officials said such a policy would lead to an increase in stocks of Japanese plutonium and set a bad nonproliferation example. They called on Tokyo to keep the amount of its plutonium to a minimum, the reports said.[20]

The U.S. government has long opposed the accumulation of weapons-usable materials, a policy reiterated by President Barack Obama when he said in March 2012, “We simply can’t go on accumulating huge amounts of the very material, like separated plutonium, that we’re trying to keep away from terrorists.”[21] The communiqué of the March 2014 nuclear security summit in The Hague also encouraged countries to minimize their stocks of highly enriched uranium and “to keep their stockpile of separated plutonium to the minimum level, both as consistent with national requirements.”[22]

An Alternative Path

Opposition to the closed fuel cycle—which involves reprocessing of spent fuel and recycling of the plutonium into fresh fuel—has also been virtually universal in the nonproliferation and arms control community, which criticizes reprocessing as an uneconomical approach posing significant risks of proliferation and nuclear theft. In a recent article, two critics urged Japan to adopt an approach, known as the once-through fuel cycle, in which spent fuel is not reprocessed but stored and eventually disposed of. More specifically, the article included the following steps:

- negotiating with the prefectural and local governments that host nuclear power plants for on-site dry-cask storage of spent fuel;
- renegotiating the deal with Aomori prefecture and the village of Rokkasho concerning the construction and operation of the reprocessing plant and the MOX fuel fabrication facility;
- having the central government take responsibility for final disposal of spent fuel away from the nuclear utilities and the operator of the Rokkasho plant; and
- disposing directly of Japan’s 44 tons of already separated plutonium instead of using it in MOX fuel in Japan’s nuclear power plants.[23]

A once-though fuel-cycle strategy would avoid an increase in Japanese stockpiles. Yet, any attempt to adopt all or even some aspects of this strategy would be a bumpy, grueling, and protracted ride. It would require convincing local communities to keep spent fuel at reactor sites; renegotiating...
agreements with Aomori prefecture, which supports reprocessing and MOX fuel fabrication; changing the law governing the national Reprocessing Fund, which bars repayment of loans for the construction of the Rokkasho plant unless the JNFL, whose majority shareholder is the FEPC, commits to operating the reprocessing plant, taking responsibility for final disposal of spent fuel away from itself and the nuclear utilities; and directly disposing of plutonium. Because industry, politicians, and local communities would fiercely resist these steps, implementing them is not likely to be any easier or quicker than putting the Abe administration’s program into effect.

Thus, although Japan should make every effort to reduce its plutonium stockpile and will sooner or later find a path—or, more likely, paths—toward this objective, its plutonium stocks are unlikely to go away anytime soon, no matter what policy or combination of policies Tokyo pursues.

The Custodial Regime

In the meantime, how should Japan deal with concerns that it is accumulating its stockpile as part of a “bomb in the basement” strategy or as a warning to China and North Korea that it is capable of developing nuclear weapons?

The charges that Japan is seeking nuclear weapons are not credible. It has become a cliché that the Japanese, as the only victims of nuclear weapons use, have a widespread and deeply felt opposition to nuclear weapons. Japan’s Atomic Energy Basic Law of 1956 restricts research, development, and utilization of nuclear power to peaceful uses. Japan is a strong supporter of all elements of the global nonproliferation regime, is a party in compliance with the nuclear Nonproliferation Treaty (NPT), and has a comprehensive safeguards agreement with the IAEA. It is not plausible that Japan would seek nuclear weapons as long as Tokyo has confidence in the security guarantee that the United States provides in its 1960 treaty with Japan.

There is no sign U.S.-Japanese ties are going to weaken. They are likely to be cemented in the coming years as U.S. policy rebalances to Asia and as Chinese-Japanese relations become more contentious. Nevertheless, given the rising tensions in East Asia and the portrayal of Japan’s plutonium policy by some as a strategy to develop a nuclear weapons capability, Tokyo needs to take steps to reassure the region and the global community of its peaceful nuclear intentions.

One step that Japan could take to demonstrate its commitment to use its plutonium for exclusively civilian purposes would be to place its excess plutonium under the custody of the IAEA. Article XII of the agency’s 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 by-product over what is needed for [peaceful purposes]...in order to prevent stockpiling of these materials.” The statute also provides that, “[a]t 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.

Although this provision has been in the statute since the agency’s inception in 1957, it never has been implemented. An IAEA experts group on international plutonium storage held several meetings from 1978 until 1982, but failed to reach agreement on an IAEA storage regime.

It may be time for Japan to consider concluding an agreement with the IAEA for a custodial regime for its excess plutonium. The details of such an agreement would have to be negotiated between Japan and the IAEA, and the agreement would have to be approved by the agency’s Board of Governors. It should have the following broad characteristics:

- Japan would determine the amount of plutonium to be placed under IAEA custody, but there would be a presumption that material not being used or not designated for use within a specified period of time would be excess and be deposited with the agency.
- Japan and the IAEA would agree on the location of storage sites, presumably co-located with Japanese reprocessing and MOX fuel fabrication facilities.
The agency would retain custody of the excess plutonium until the Japanese government requests its release for a specified peaceful use, for example, in a MOX fuel fabrication plant, a nuclear power plant, a vitrification facility, or a direct disposal site.

Japan could not 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:

- an assurance that the material would be used for exclusively peaceful, nonexplosive purposes;
- an assurance that the plutonium would be subject to continuing IAEA safeguards in accordance with the provisions of the IAEA-Japanese safeguards agreement or, if the material were to be exported to another country, that it would be subject to the safeguards agreement between the IAEA and that country;
- an assurance that the material 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.

An IAEA-Japanese custodial agreement would need to provide that the release of the plutonium from agency custody would be only for a declared, specific, immediate, and peaceful use and that the timing of release and the quantity and form of the material would be consistent with the declared end use and thus not result in stockpiling. The decision to release plutonium from custody should not be subject to debate by the IAEA board, as release would be a routine matter based on the provision of a certificate of use.

IAEA custody of the plutonium would not change most of the basic physical arrangements; operational, safety, and physical protection responsibilities; or nonproliferation conditions under which Japanese plutonium is now stored. The plutonium would not be moved to a separate IAEA facility, but would remain in storage under IAEA custody at sites such as Rokkasho or other locations where plutonium is normally stored. The title to the plutonium would remain with Japan; ownership would not be transferred to the IAEA. Japanese companies owning plutonium-storage facilities would retain responsibility for their management and operation.

In addition, safety and physical protection would remain the responsibility of Japanese authorities. The IAEA would apply safeguards at sites where Japanese plutonium is under IAEA custody as part of the agency’s normal safeguards responsibilities. The plutonium would remain subject to all nonproliferation assurances and conditions required by the NPT or by the suppliers of the nuclear material or equipment from which the plutonium had been produced. If the IAEA custodial regime were extended to Japanese plutonium located in the United Kingdom or France, the same conditions would apply. In other words, the relevant French or UK entities or authorities would have responsibilities for management, operation, safety, and physical protection of Japanese plutonium under IAEA custody on their territories.

Benefits of IAEA Custody

The proposed IAEA custodial regime would offer several benefits over and above the agency’s traditional safeguards system and other elements of the global nonproliferation regime.

Elimination of national stockpiling. It would remove excess plutonium from the sole control of Japan by placing it under the legal custody of an international organization.

Strengthened barriers to diversion. The purpose of traditional IAEA safeguards is to detect the diversion of a significant quantity of nuclear material and to deter such diversion by the threat of early detection. The IAEA custodial regime would go beyond classical safeguards because it would
afford the agency the legal authority to bar Japan from removing the material from its custody unless it met certain conditions for release. Unauthorized removal of the plutonium would require seizing the material in defiance of the international custodial authorities.

The establishment of IAEA legal custody over the material pending specified peaceful use would thus erect a significant new legal barrier to diversion. There could also be a physical barrier to removal, such as a two-key system that would require action by an IAEA official and a Japanese official for release of material from IAEA custody. In such a case, the operator should have the right to remove material from IAEA custody in emergency circumstances such as a fire. Any emergency entry would have to involve an immediate notice to the IAEA.

Increased transparency. The IAEA would verify that the location, form, and composition of material that it allowed to be released would be consistent with the declared use. Provided it does not compromise security and proprietary requirements, the IAEA should publish information on the quantity, form, and locations of the plutonium under its custody and on any of the material released from its custody, including the specific peaceful uses or disposition of such material in Japanese facilities. (Plutonium holdings published under the IAEA plutonium management guidelines are self-reported and are given on a countrywide basis.) After release of the plutonium from IAEA custody, the agency would apply safeguards to verify the ongoing peaceful, nonexplosive use of the material and confirm that it is being used for the particular application specified by Japan.

Increased assurance of effective physical protection and safety. Japanese physical protection measures have come under considerable criticism. In reaction to the September 11 attacks in the United States, Japan has improved security at its facilities, but still has much more to do. Japan was one of 35 countries that signed the initiative on strengthening nuclear security implementation at the March nuclear security summit. The signers pledged to “meet the intent” of various IAEA recommendations on physical protection and nuclear security guidelines and “to embed the objectives of the nuclear security fundamentals and the IAEA recommendations in national rules and regulations and to host peer reviews to ensure effective implementation.”[25]

Japan has recently deposited its instrument of acceptance of the 2005 amendment to the Convention on the Physical Protection of Nuclear Material with the IAEA. An IAEA-Japanese custodial agreement should require that the physical protection and safety measures for plutonium meet international standards while under the agency’s custody and during transport and use. The IAEA should verify that these standards are being met.

Minimal cost. The proposed custodial regime should not be particularly burdensome or costly to Japan or the IAEA. Because Japan is already a party to the NPT, its plutonium is already under IAEA safeguards. The incremental costs of administering a custodial regime should be relatively small. Although they could be covered by the agency’s budget, it would be prudent for Japan to pay for the additional expenses.

Plutonium in Japan and Europe

Unirradiated plutonium in Japan should be the prime candidate for submission to IAEA custody. That should include plutonium that has been fabricated into MOX fuel elements or assemblies but has no scheduled, near-term use.

The IAEA custodial regime also could encompass Japanese plutonium stocks located in France and the UK. Expanding the undertaking in this way clearly would be desirable from a nonproliferation point of view. Japan should explore the willingness of the French and UK governments to negotiate appropriate custodial arrangements with the IAEA and Japan for Japanese plutonium on their territories.

Even if London or Paris proves unwilling to put Japanese plutonium on its territory under IAEA custody, Tokyo should move ahead with placing plutonium on Japanese territory under such a custodial regime.

A Model for Others
If the custodial regime works well in Japan, it might serve as a model for other states with large plutonium stocks to place their excess civilian plutonium under IAEA custody.

Like Japan, some NPT nuclear-weapon states have substantial stocks of unirradiated civilian plutonium with no short-term or easy path for its disposition. Although it would take a radical change in mind-set for the nuclear-weapon states to place their excess civilian plutonium under IAEA custody, it would be a meaningful step toward fulfilling their disarmament commitments under Article VI of the NPT.[26]

NPT nuclear-weapon states may withdraw material from their voluntary safeguards agreements for national security reasons. If their excess civilian plutonium were under an IAEA custodial regime, it could be released from its custody only for peaceful, nonexplosive purposes and could not be returned to military use. Such a step would help respond to the recommendations of the 2010 NPT Review Conference for increased transparency of nuclear materials in nuclear-weapon states.[27]

An IAEA custodial regime for Japanese plutonium stocks is admittedly a modest step. It would not help Japan shrink its plutonium stocks. Tokyo must move as expeditiously as possible to fulfill its promises to reduce its plutonium stocks, and an IAEA custody regime should not be used as a justification for continued stockpiling. Such a regime, however, might alleviate international concerns and regional tensions over this issue until an option or options for reducing and eliminating Japanese plutonium stocks can be implemented. In addition, it could establish a good nonproliferation model for others countries with excess civilian plutonium stocks.

Fred McGoldrick served for many years as a senior official with the U.S. Department of State and Department of Energy and with the U.S. mission to the International Atomic Energy Agency (IAEA) dealing with nonproliferation and civilian nuclear cooperation issues. He participated in the talks on an international plutonium-storage regime at the IAEA in the early 1980s and in the negotiations on the IAEA’s “Guidelines for the Management of Plutonium.” He is presently a consultant on nonproliferation and civilian nuclear cooperation issues.

ENDNOTES

1. In its latest declaration to the International Atomic Energy Agency (IAEA), the Japan Atomic Energy Commission reported that as of December 31, 2012, Japan held 44,241 kilograms of separated unirradiated plutonium, of which 9,295 kilograms was stored in Japan and 34,946 kilograms was stored in France and the United Kingdom. IAEA, “Communication Received From Japan Concerning Its Policies Regarding the Management of Plutonium,” INFCIRC/549/Add.1/15, October 3, 2012.


10. Saito, Sheldrick, and Hamada, “Japan May Only Be Able to Restart One-Third of Its Nuclear Reactors.”


12. The government plans to convert the facility into a center for research on reducing the volume of nuclear waste and improving technologies related to nonproliferation.

13. The agreement to transfer the material was announced in March at the nuclear security summit in The Hague.


17. INFCIRC/549.

18. The material was located at an idle reactor in the form of mixed-oxide (MOX) fuel. Nevertheless, the plutonium was unirradiated, and Japan should have reported it to the IAEA as it agreed to do under the plutonium guidelines. “Japan Fails to Include 640 kg of Unused Plutonium in Report to IAEA,” Kyodo News, June 7, 2014.


24. The IAEA considers eight kilograms of plutonium to be a significant quantity. For highly enriched uranium, the amount is 25 kilograms.

25. In addition, Japanese Prime Minister Shinzo Abe pledged at the March nuclear security summit to strengthen security measures for Japanese nuclear materials and facilities and indicated that Japan
would invite a visit by the IAEA International Physical Protection Advisory Service by the spring of 2015.

26. Article VI of the nuclear Nonproliferation Treaty (NPT) states, “Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a Treaty on general and complete disarmament under strict and effective international control.”

27. The final document from the 2010 NPT Review Conference contains an action plan that includes the following items:

Action 16: The nuclear-weapon States are encouraged to commit to declare, as appropriate, to the International Atomic Energy Agency (IAEA) all fissile material designated by each of them as no longer required for military purposes and to place such material as soon as practicable under IAEA or other relevant international verification and arrangements for the disposition of such material for peaceful purposes, to ensure that such material remains permanently outside military programmes.

Action 17: In the context of action 16, all States are encouraged to support the development of appropriate legally binding verification arrangements, within the context of IAEA, to ensure the irreversible removal of fissile material designated by each nuclear-weapon State as no longer required for military purposes.
