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Japan's perilous plutonium flights

A new agreement with the United States gives Japan carte blanche to fly plutonium from reprocessing plants in Britain and France. The U.S. Senate has failed to stop the plan, which this author finds dangerous and provocative.

"In order for atomic energy to fulfill its intrinsic mission," declared a spokesperson for the Japanese nuclear industry last fall, "it is necessary to complete the nuclear fuel cycle and promote the commercial use of plutonium." He added: "It is important to establish the fast breeder reactor system which will be capable of increasing the use of uranium resources as much as 50 times. There may be no immediate need to use plutonium, but it takes time to prepare the system for the safe use of plutonium, and steady efforts must begin now."

The speaker was H. Murata, vice-chairman of the Japan Atomic Industrial Forum. Murata also told the Uranium Institute symposium last September: "Effective means of preventing proliferation in these circumstances must be formulated. Nuclear nonproliferation remains the firm rule that we have to abide by."

The statement was a familiar refrain, one that has been sounded for three decades in the nuclear industry: the nuclear fuel cycle must be "completed" by retrieving (reprocessing) and using the plutonium in spent nuclear fuel. Uranium, which begins the cycle by fueling reactors, is a scarce natural resource; therefore, the breeder reactor, which theoretically will use plutonium to create an endless supply of energy, is the energy source of the future.

In light of recent developments, however, such a statement raises more questions than it answers. The assumptions on which the "plutonium imperative" is based have been severely undermined in recent years: breeder technology has been pushed farther and farther into the future, and plutonium-based reactor fuel, of whatever kind, is uneconomic and becoming more so. The only other use for plutonium is nuclear weapons, which Japan has pledged never to acquire.

Nevertheless, a recently negotiated agreement between Japan and the United States indicates that Japan intends to move full speed ahead with plans to stockpile large quantities of plutonium by the end of the century. Bald reiterations of familiar and outmoded themes simply do not suffice to explain these plans.

From the early 1990s onward, if all goes as planned, three times a month a cargo 747 will take off from an airport in Britain or France, bound for Japan, carrying 150 kilograms (330 pounds) of highly toxic, fissile plutonium oxide. By the end of the decade these air shipments will have transferred from Europe to Japan some 45 tons of plutonium, retrieved from the 500-600 tons of U.S.-origin uranium fuel burned annually in Japan's 35 nuclear power reactors.

The plutonium air-transport exercise can hardly be designated a "plan." On the contrary: as is so often the case in civil nuclear power policy, the nuclear Micawbers are making it up as they go along, waiting for something to turn up. In this instance they have already been doing so for nearly two decades, ever since Britain and France decided to become reprocessors to the world, with Japan soon becoming one of their biggest and most patient customers.

Britain's first foray into oxide-fuel reprocessing came to an abrupt and embarrassing halt in September 1973 when a radioactive blowback wrote off the B204 Head End Plant at the Windscale site of British Nuclear Fuels Ltd. Radioactive granules had settled out in a process vessel; when a fresh batch of liquid hit the hot spot, the resulting steam explosion blew radioactivity through the seals and into the working area of the plant, necessitating immediate evacuation of the building. The plant never reopened.

Since that time British Nuclear Fuels has had no operating facility able to reprocess the ceramic oxide fuel used in modern nuclear power plants. But that has not prevented the company from chasing reprocessing contracts at home and abroad. Even as the radioactive dust was settling at Windscale a much larger successor plant was being planned at the site, to reprocess both domestic and foreign oxide fuel. After the plan went through assorted convolutions, the new facility eventually emerged as the Thermal Oxide Reprocessing Plant, known as THORP.

In 1977 the THORP proposal was the subject of a major public hearing. One persistent question, however, went unanswered: how would plutonium separated at the facility be returned to foreign clients? International commerce in separated plutonium by the ton raised profound problems of safety and security, to say nothing of diplomacy. British Nuclear Fuels waved such concerns aside; they would be dealt with in due course, when the time came.

More than a decade later, the time has still not come. The company got the government go-ahead for THORP in May 1978 but did not even apply for detailed planning permission for nearly five years thereafter. Construction began in 1984 but the schedule has continued to slip, and the plant is now not expected on line until 1992 at the earliest. Meanwhile, for nearly a decade Japan has been sending spent fuel to the facility for storage and eventual reprocessing.

British Nuclear Fuels is as evasive as ever about the issue of international plutonium commerce. Plans for the plutonium flights, which supposedly will begin when the facility starts operating, were formulated entirely in secret, with no reference to Parliament. In late November 1987 the *Guardian* revealed the air-transport plans in Britain for the first time, even though they had been an open secret in Washington for months. British Nuclear Fuels authorities admitted to the *Guardian* reporter that the company had begun tests on plutonium air-transport casks at a military base in Wales the preceding month. They expressed confidence that a suitable design, able to meet any required safety standards, would be available in good time.

At first neither British Nuclear Fuels nor the government would say from which airport the flights would leave, but in March of this year, in response to a question in Parliament, the government announced that Prestwick, in Scotland, had been chosen. Officials said nothing about the security arrangements that would be required if 150 kilograms of plutonium were to be transported every 10 days from Windscale - now known as Sellafield - at least a hundred miles to an airport made impregnable to terrorist attack. A single cask would contain about enough plutonium for a bomb, a payload enough for 20. Still, British officials dismissed the suggestion that the security arrangements would turn a civil airport into an armed camp.

In France, too, the plutonium transport plans have been arranged behind closed doors. Fuel from Japan is now being reprocessed at the UP-2 plant of the French nuclear fuel company Cogema, at Cap la Hague on the Channel coast, producing perhaps five tons of Japanese plutonium a year. An earlier experiment with sea transport of plutonium from this plant was apparently what prompted the British and French reprocessors and their Japanese clients to examine other options.

On October 5, 1984, the Japanese freighter *Seishin Maru* put out from Cherbourg, bound for Japan. Its sole cargo was a shipment of some 250 kilograms of plutonium, separated from Japanese fuel.

During the five-week voyage the ship was escorted by warships of the French, British, American, and Japanese navies, with air cover and satellite surveillance. No information has ever been published on the cost of this massive military shadow over an ostensibly commercial shipment, nor on who paid for it.

In March 1987 the Nuclear Control Institute, an independent nonprofit group in Washington, D.C., campaigning against the spread of nuclear weapons, published an analysis of the air-transport option. Its conclusions were dismaying. Existing contracts signed in the mid-1970s between the Japanese utilities and the British and French reprocessors called for the separation of 45 tons of plutonium from Japanese fuel by the end of the century. Most of this fuel originated in the United States and therefore was subject to U.S. controls stipulated in the 1978 Non-Proliferation Act: it was not to be reprocessed or shipped except by permission of the U.S. government. Moreover, the obvious route would carry this material over northern Canada, with planes landing to refuel at Anchorage, Alaska, before completing the flight to Japan. Thus both legal and safety concerns generated controversy in Washington.

The overriding question remains: why does Japan want so much plutonium so soon? Japan already has a substantial inventory of separated plutonium for experimental purposes - about five tons, mainly from its small reprocessing plant at Tokai-mura which has been operating since the late 1970s. A second reprocessing plant, at Rokkasho-mura, is scheduled to come on stream in 1995, producing eight tons of plutonium per year.

Japan's one prototype fast breeder, Monju, has been dogged by financial disputes throughout its gestation and is not expected to start up before 1993. The Japanese electrical utilities do not expect to have a fast breeder ready for commercial use before 2030. When it comes on line it will only need several tons of plutonium for its first core and will use perhaps a ton annually thereafter. (The breeder will produce more plutonium than it uses, but that material would also have to be reprocessed before being used again in the reactor.)

Another possible use for plutonium is in plutonium-uranium mixed-oxide fuel (MOX) for thermal reactors. Japan recently commissioned a plant to manufacture MOX and has ambitious plans to use MOX in 12 reactors beginning in 1997. But plutonium is both fissile and toxic; MOX fuel is accordingly much more difficult and expensive to fabricate than conventional low-enriched uranium fuel. It also makes a reactor harder to control. Moreover, the cutbacks in nuclear programs around the world mean that uranium suppliers and enrichers are underbidding each other in pursuit of orders. There is little likelihood of significant uranium price rises until well after the year 2000. In such a context, MOX fuel makes no economic sense.

Even if it did, Japan would have more plutonium on hand than it could possibly use in MOX fuel. The 12 reactors would need perhaps 15 tons of plutonium for the initial cores and perhaps five tons a year thereafter - about half the amount that Japan would then have stockpiled. Why, then, fly tons of acutely sensitive material from the other side of the world, only to store it? Japan could simply leave it in storage in Britain and France, alongside the spent nuclear fuel that the Japanese utilities have been so eager to get out of their own storage ponds for the past decade. If Sellafield can store spent fuel for Japan, it could also store plutonium.

In Murata's words, "Effective means of preventing proliferation in these circumstances must be formulated." We could start by avoiding pointless and precarious international traffic in plutonium.

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