

LETTER FROM JAPAN(8): THE NUCLEAR DILEMMA

Japanese plans to develop a complete nuclear fuel cycle are caught between rising energy demands and American nonproliferation efforts

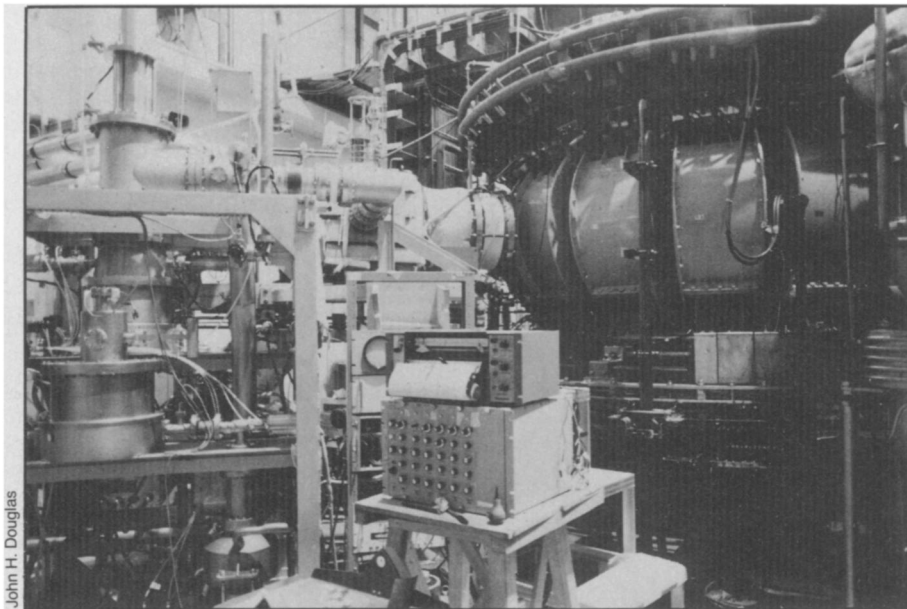
BY JOHN H. DOUGLAS

A highly placed government official connected with Japan's nuclear program takes out a handkerchief to wipe his palms again. He would very much have liked to refuse this interview, but after months of effort I finally obtained an introduction he could not ignore. No, I won't use his name, I assure him again. He crumples the handkerchief back into his pocket. Now, would he please tell me what he thinks about President Carter's recent nonproliferation initiatives? He fidgets and looks helplessly toward the grey desks where colleagues are studiously avoiding his glance. "It's quite irrational!" he finally blurts out.

Newspapers are calling it the "Carter shock" — a sudden reversal of nuclear export policy reached without consulting the trading partners whom it will affect the most. And of the advanced countries involved in the dispute, Japan is by far the most dependent on American nuclear technology and fuel supplies. What galls the Japanese most, however, is not so much the fact of dependence as the sense of betrayal — the knowledge that the United States first encouraged them to pursue an aggressive nuclear program but now threatens to cut off critical enriched uranium services unless the program is curtailed.

The current problem began to intensify during the last U.S. presidential elections, when the danger of nuclear terrorism and weapons proliferation became a hot campaign issue. Shortly after his election to the presidency, Jimmy Carter, a nuclear engineer by training, began to move against what the administration still believes to be the key technology involved in the spread of weapons — plutonium production. Later, Congress passed the Non-Proliferation Act of 1978, requiring renegotiation of all foreign nuclear trade agreements to slow the spread of plutonium technology.

When spent fuel from a nuclear reactor is "reprocessed" to remove wastes and salvage the fissionable material still remaining, one of the key products is a nitrate solution of plutonium. Such a liquid could hardly be considered raw material for an atomic bomb, but the next step of the fuel cycle, "conversion," produces



JFT-2 Tokamak: Significant contributions at the frontiers of research.

powdered plutonium oxide, which is then remixed with uranium to fabricate new fuel rods for reactors. This "reactor-grade" plutonium oxide could conceivably be used by terrorists to make a crude bomb, although they would more likely kill only themselves in the process of handling this particularly inconvenient form of a toxic, as well as radioactive, substance. A country intent on building an atomic arsenal would build an additional facility to convert the powder to "weapons-grade" metallic plutonium.

Present administration policy is to change the fuel cycle at the reprocessing stage, where plutonium is produced as a separate stream. They argue that since plutonium for fuel rods is eventually blended back with uranium anyway, why not keep the two substances together during the whole fuel cycle, making diversion of weapons material even more difficult? And, during the next stage of atomic energy development, why not abandon the current plans to build reactors that will "breed" even more plutonium, in favor of breeder reactors based on some other element, which could be used to fuel reactors but not to build bombs?

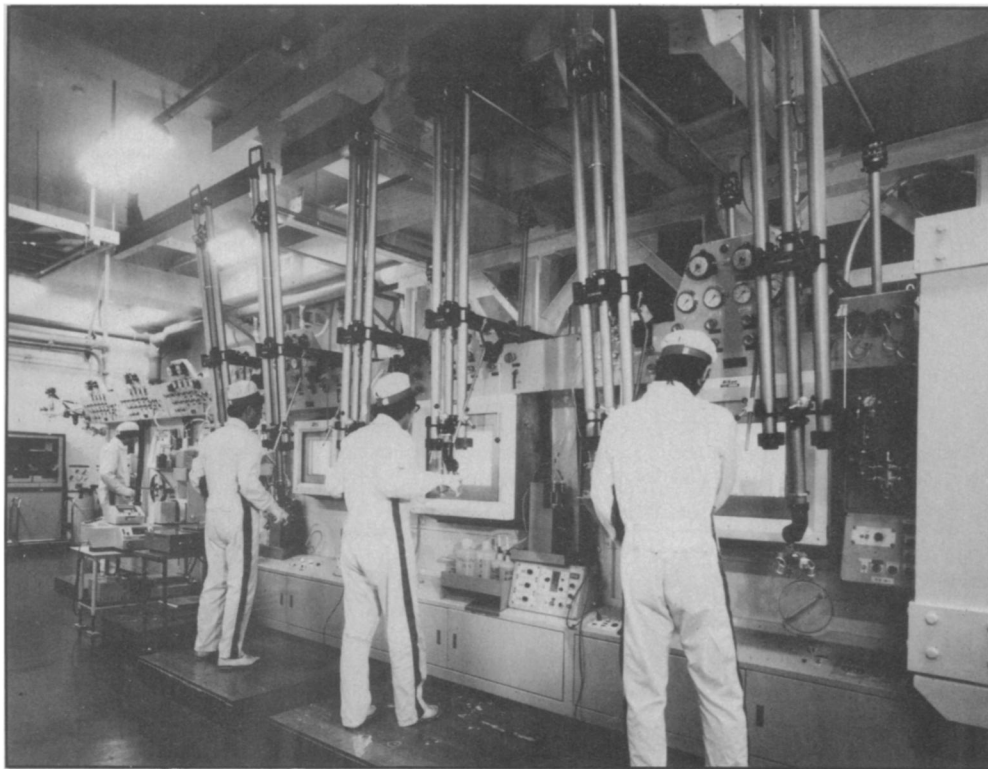
European energy planners answer these questions directly and vociferously: The necessary technology hasn't been developed; it will surely be more expensive; other safeguards are available; and any country intent on becoming a nuclear power could do so more easily by building an enrichment facility or a small, experimental reactor designed to produce copi-

ous amounts of plutonium than by trying to expropriate plutonium from the fuel rods of a commercial power reactor. Besides, they say, Americans are just crying "sour grapes" because Europe has had more luck in developing advanced plutonium technology. (They point out, for example, that the French *Phenix* breeder reactor was built in four years for less than \$125 million, while the American Clinch River breeder project was almost a decade behind schedule and pushing toward a \$2 billion price tag before the administration began efforts to cancel it entirely.)

By contrast, Japanese planners are neither direct nor defiant. While Europeans boldly challenge what they consider a hasty American decision, the Japanese nervously appeal for understanding. My cornered nuclear official wipes his palms again and says that if current plans to develop a domestic nuclear fuel cycle were curtailed, "Japan would be in a critical situation."

Japan's energy needs, already second in the free world, have been growing faster than in any other Western country. With virtually all of its present energy supplies imported and with little of the extreme energy waste that could be cut back in the United States, Japan sees a complete fuel cycle, including plutonium recycling, as the only hope for greater energy independence. "We cannot help but utilize plutonium," says the official gravely.

The plutonium issue in Japan came to a head recently over the opening of a reprocessing plant at Tokai Mura, a seaside



Technicians manipulate spent nuclear fuel at the Tokai Mura facility.

Foreign Press Center/Japan



John H. Douglas

Reactors by the sea: Japan is a rising force in nuclear technology.

research complex 85 miles northeast of Tokyo, in Ibaraki Prefecture. Although the United States had originally approved the French-built facility for use with American-supplied nuclear fuels, administration representatives approached the Japanese with a proposal to modify the already completed plant to "co-processing" —

keeping both the plutonium and uranium streams mixed throughout the complex series of steps involved.

Japanese negotiators complained that the additional costs would be intolerable and that the technology hadn't been sufficiently developed. A compromise was eventually reached allowing limited oper-

ations of the plant for two years while experiments are conducted to see whether coprocessing would be technically and economically feasible. At the same time, all the Western nuclear nations would participate in an American-initiated International Nuclear Fuel Cycle Evaluation (INFCE) program to work out mutually acceptable policies and safeguards for the broader issues of plutonium production and fuel recycling.

Although these compromises allowed everyone involved to "save face"—at least for a while—there now appear to be potentially dangerous gaps between what the various parties expect to happen at the end of the grace period of experimentation and negotiation. Informed observers tell *SCIENCE NEWS* that the costs to convert Tokai Mura to co-processing will almost certainly turn out to be so high as to be unacceptable to the Japanese, while INFCEP may not convince Europeans that their present policy toward plutonium and breeders isn't safe already.

If these predictions come true even in part, the United States will be faced with an extremely painful decision: either to retreat from its previous, strongly stated position and accept an even greater lag behind the Europeans and Japanese in plutonium fuel cycle development, or to isolate itself even further from its allies by forcing them to pursue an entirely independent course. Either way, Japan would be forced to turn increasingly to European countries for nuclear technology and fuel supplies—a prospect that European energy representatives in Tokyo openly relish.

Already the process of realignment appears to be beginning. Japan has agreed to provide \$285 million for construction of a huge reprocessing plant in Britain—about one-fourth the estimated cost of the project. In turn, the British have agreed to reprocess 1,620 metric tons of spent fuel for Japan during the period from 1982 to 1991. A similar contract has been negotiated with France. Meanwhile, Japan intends to build its own commercial-sized reprocessing plant, with a capacity of 1,500 tons per year, presumably with some European help. (The prototype Tokai plant has a capacity of only 210 tons per year, about enough to handle the needs of Japan's current 14 reactors.)

Despite its currently dependent role, Japan is likely to be a major force in the development of nuclear technology by the mid-1980s. Some 90 percent of new Japanese reactor equipment is now made domestically. A breeder reactor capable of producing 50 to 100 megawatts power began operation last year, having cost only \$120 million, and a site has been selected to build a breeder three times as large. To provide experience in using nuclear fuels with varying plutonium content, an advanced thermal reactor with 165 megawatts capacity began operation this year. And work is proceeding feverishly on a

uranium enrichment plant to qualify Japan for a "grandfather clause" exemption to any possible INFCEP decision to limit such technology to countries that already possess it.

Japan is also beginning to make creditable contributions to nuclear developments at the frontiers of research. A major national R&D project is bringing together developments from several disciplines to create within a decade a process to produce steel by direct ore reduction, using hot gases coming from a nuclear reactor. A second-generation Japanese tokamak is now being designed, which will be one of the world's largest fusion devices when completed — possibly providing the critical break-even conditions needed to boost fusion energy into contention as an alternative to breeder reactors. And recently Japanese Prime Minister Takeo Fukuda proposed that the United States and Japan set up a \$1 billion joint fund to pursue fusion research.

However, as one might expect in a country whose first experience with atomic energy was the bombing of Hiroshima and

Nagasaki, the development of nuclear power has not come without considerable opposition. Although public opinion polls show that a majority of the Japanese people support nuclear power in general, most don't want a nuclear reactor in *their* community. Organized opposition, then, focuses almost exclusively on local issues and tends to oppose any sort of disruptive new industrial facility, not just nuclear reactors. The government has started to counter this tactic by offering compensation to communities that accept nuclear reactors — giving them funds for such popular facilities as a new gymnasium or community health center.

Some opposition political parties have also tried to exploit the nuclear issue as a means of embarrassing the ruling Liberal Democrats, but the recent intervention by the United States has only tended to rally Japanese domestic support behind the government's position. This reaction has even led some observers to speculate that, should the United States press its demands too hard and lose "credibility" with the Japanese, the outcome could be a

determination by Japan to develop its own nuclear weapons — exactly the sort of proliferation the American administration is trying to avoid!

Japanese nuclear planners have also faced some purely technical problems. For reasons that remain unclear, Japan's nuclear reactors have very poor performance ratings; that is, they tend to be shut down relatively frequently and stay down longer for repairs or because of minor mishaps. Some Japanese scientists blame this failure on the borrowed American technology, others see it as the result of overly cautious government regulation. Indeed, quite bitter feelings have developed between scientists involved in importing nuclear technology and those working to create their own in Japan. This feud could be perhaps the most serious internal threat to Japan's whole nuclear program, for it hinders formation of the sort of consensus on future policy that is so necessary in the Japanese system.

Japan thus finds itself at the center of a growing international storm whose ultimate dimensions cannot now even be guessed. On the one side stands the United States, whose Export-Import Bank has helped finance 11 of Japan's reactors, whose leading nuclear companies have provided the technology for these reactors, whose facilities still provide most of Japan's enrichment services — but whose policy has suddenly shifted to oppose the very course of future development that Japan has chosen to follow.

On the other side stands a defiant Europe, refusing to renegotiate their present nuclear agreements under American pressure, while offering to help Japan become more independent of the Americans also. As one European nuclear expert in Tokyo puts it, "The United States led Japan out on a limb." He draws his conclusion almost gleefully: Europe not only has the will and the facilities to supply its own nuclear energy needs but "we would love to supply the United States too, if you keep going on like this!"

Many observers believe that the Americans and the Europeans will eventually reach a compromise that would also relieve current Japanese anxieties. Few would now be willing to wager on a full-scale confrontation between the United States and either Japan or Europe. But anyone who ever mistakes Japanese nervousness for weakness is treading on dangerous ground. My interview with the sweating official progressively degenerated in the way conversations about nuclear policy so often do here, but a more outspoken senior scientist in one of the country's leading nuclear facilities bluntly expressed the determination that I sense in all the Japanese I have asked about the issue. Japan is very eager to compromise with the United States, he says, but rather than abandon its plans for a complete nuclear fuel cycle, "Japan will go it alone." □

