

The Case for a Japanese Nuclear Fuel Cycle

Japan holds a prominent position as a nuclear power producer, but as a resource-poor nation badly needs to establish her own nuclear fuel cycle. The reasons are explained in a cross-table discussion between Kazuhiko Otsuka, director of the Agency of Natural Resources and Energy, and Tadao Ogaki, vice chairman of the Federation of Electric Power Companies.

OTSUKA: Japan today ranks fourth in the world in the utilization of nuclear power. I am afraid, however, that it lags seriously behind in the development of the nuclear fuel cycle, the stages that come before and after nuclear power generation.

Interested industries have been engaged for some time in study and research concerning the nuclear fuel cycle and the Federation of Electric Power Companies has been playing an important role in this field. The Ministry of International Trade and Industry (MITI) has also been studying ways to establish the cycle on a commercial basis. On July 2 this year, the Nuclear Sub-Committee of the Advisory Committee for Energy, an advisory body to the Minister of International Trade and Industry, presented a report which should serve as a guideline for developing this area. Around the same time, the Federation of Electric Power Companies established a headquarters to promote the nuclear fuel cycle on a commercial basis. The Federation's Vice President Ogaki is director of the new office.

Mr. Ogaki, would you please explain from the Federation's side the circumstances leading to moves to establish Japan's own nuclear fuel cycle system.

OGAKI: Electric power is positioned as the second most important source of energy in Japan's future energy supply structure. The electric power industry has taken the stand that the efforts for resource-poor Japan to reduce dependence on petroleum should focus on expanding nuclear power generation.

Japan started nuclear power generation with technology imported from the United States, specifically General Electric and Westinghouse. Japan has subsequently developed her own technology in this area. In fact, Japan has reached a point where she leads other industrially advanced countries in the operation and management of light water reactors.

Now that Japan is able to develop her own nuclear power plants, the next step is to conduct, on her own, uranium enrichment, reprocessing of spent fuels, and disposal of low-level radioactive wastes. I think Japan has now reached a stage where she can tackle the task of developing her own system for the nuclear fuel cycle—a task which we have always wanted to undertake, and one which must be undertaken.

I am afraid people in other countries do not fully understand that Japan, unlike other nuclear advanced countries, has almost no domestic energy resources, and must develop her own full-scale nuclear fuel cycle.

OTSUKA: Other countries do seem to have difficulty understanding your last point—the fact that nuclear power development is, for our country, almost the

only way to overcome the problem of resource scarcity. China, for instance, is enthusiastic about nuclear power generation. The Chinese have abundant energy resources such as hydropower and coal, but these are not evenly distributed, and it is hard to utilize them on a nationwide basis. So the Chinese are now trying to develop nuclear power generation as an alternative source of energy.

In Japan's case, though, there are almost no other options as regards energy sources. Japan has consequently drawn up plans to build up nuclear power generation as the country's largest power source by around the year 2000. However, Japan has no uranium of her own. In order to realize this plan, we have no choice but to set up our own nuclear fuel cycle on an adequate scale. I even consider it Japan's obligation to have her own nuclear fuel cycle.

OGAKI: In that connection, I hope people in other countries will keep in mind that, as I said earlier, Japan may have built up her economy but she has almost no resources of her own. In the case of thermal power generation, Japan must import a quantity of coal weighing some 80,000 times more than the nuclear fuel

Construction Plan of Three Nuclear Fuel Cycle Facilities

	Reprocessing facilities	Uranium enrichment facilities	Low-level radioactive waste disposal and storage facilities
Operating company	Japan Nuclear Fuel Service Ltd.	New company to be established in cooperation with electric utilities. (Scheduled to be set up within FY1984)	Same as left (Same as left)
Scale of facilities	Reprocessing capacity 800 tU/year Spent fuel storage facility 3,000 tU	To start operation at 150 tSWU/year, expanding ultimately to 1,500 tSWU/year	About 200,000 cubic meters (equivalent to one million 200 liter drum cans) initially but to be expanded ultimately to about 600,000 cubic meters (equivalent to 3 million 200 liter drum cans).
Site	3.5 million square meters (including wooded areas and roads)	3 million square meters (including wooded areas and roads)	
Construction period	Start of preparatory work..... around 1986 Start of operation of storage facilities..... around 1991 Start of operation of reprocessing plant..... around 1995	Start of preparatory work..... around 1987 Start of operation..... around 1991	Start of preparatory work.... around 1986 Start of operation of storage facilities... around 1991
Construction cost	Approx. ¥700 billion	Approx. ¥160 billion	Approx. ¥100 billion
Personnel	Peak construction period: 2,000 When operational: 1,000	Peak construction period: 800 When operational: 200	Peak construction period: 700 When operational: 200

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Tadao Ogaki is the vice chairman of the Federation of Electric Power Companies and is an expert in electric power generation. He joined the Tokyo Electric Power Co. in 1941 and became a director in 1975. He resigned from the company in 1980 to assume his present post.

needed to generate an equivalent amount of electricity. From the standpoint of economic management, this tremendous difference in the transportation load alone would seem to dictate the need for Japan to develop her own nuclear fuel cycle. I think that nuclear power generation is essential to Japan's national security.

I hope that people abroad will understand the circumstances which make it imperative for Japan not merely to push nuclear power generation but also to establish her own nuclear fuel cycle. If other countries would appreciate the basic fact that Japan wants to make peaceful use of atomic energy because her energy structure, the very foundation of economic growth, is so very fragile, I think they would support such efforts.

OTSUKA: I fully agree. There are many complicated problems with nuclear energy, the biggest of which is the problem of nuclear proliferation. It seems that the United States in particular is most concerned about nuclear proliferation. I can say with utmost confidence that Japan is one of the world's most conscientious countries when it comes to preventing nuclear proliferation.

Until last year I was assigned to the Japanese Embassy in Washington, and was able to observe American attitudes at firsthand. I received the impression that the U.S. is overly standardized in her approach to non-proliferation. I strongly



Kazuhiko Otsuka

hope America will understand Japan's earnest efforts to utilize atomic energy for peaceful purposes.

Take, for instance, uranium enrichment, for which Japan at present depends about 90% on America. I think that today the United States fully understands Japan's position. But on one occasion in the past, the U.S. imposed quite severe restrictions on Japan's nuclear power development program. I hope the American authorities will try to understand our thinking better in the future.

OGAKI: Whenever I have occasion to

meet Secretary Donald P. Hodel and other ranking U.S. Department of Energy officials, I stress this point. I take pride in the fact that Japan abides most faithfully by international agreements concerning the peaceful utilization of atomic energy.

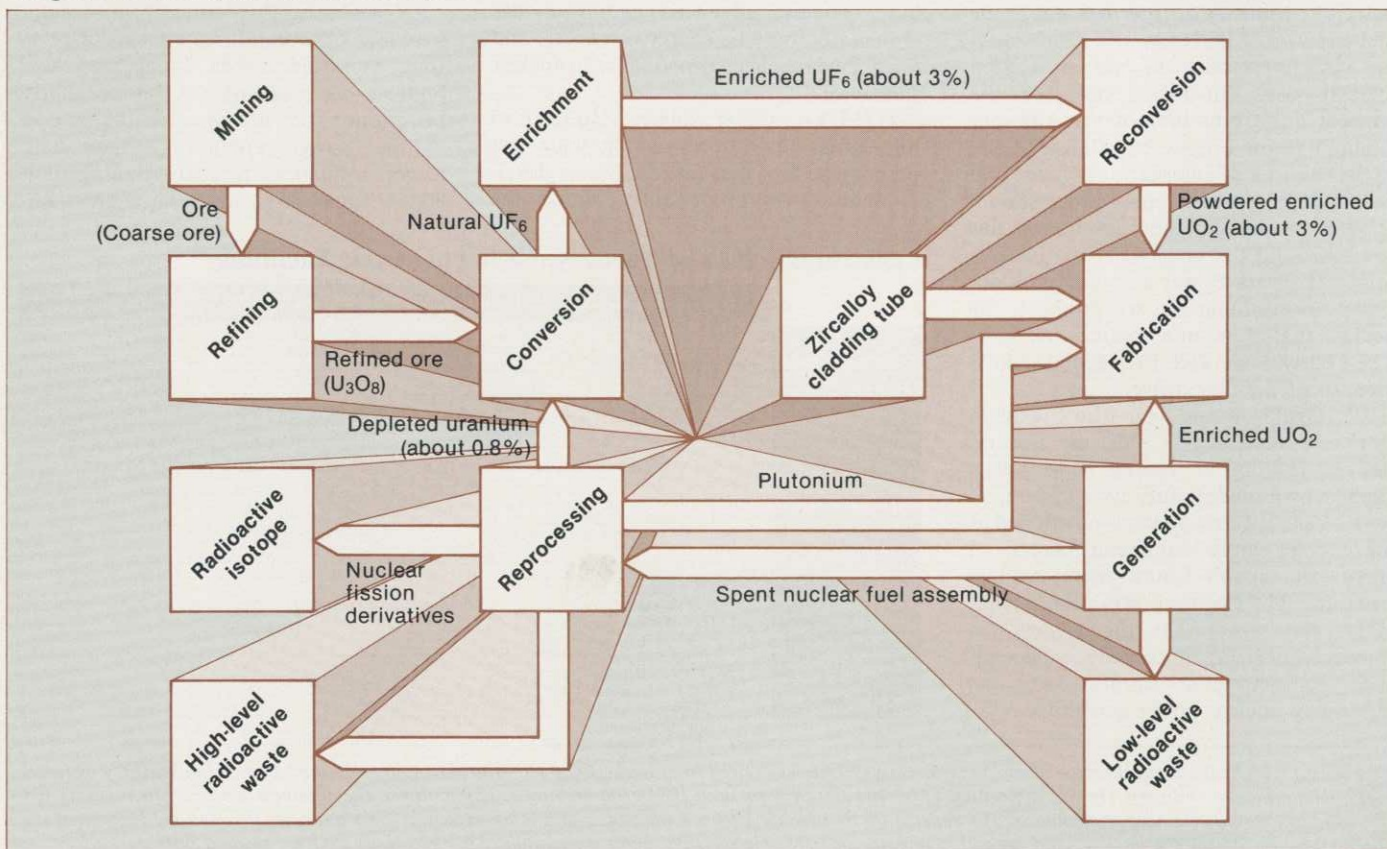
OTSUKA: We wish that other countries, particularly America, would understand this point.

OGAKI: America is eager to sell enriched uranium to Japan. But it would be better for Japan to enrich her own uranium. At present Japan plans to produce domestically about 30% of her enriched uranium needs by the year 2000. I feel strongly that we should not be satisfied with 30%, but should increase the proportion much further in the future.

OTSUKA: I think so, too. Domestic reprocessing of spent fuel would naturally produce plutonium. Japan is now studying ways to recycle plutonium in light water reactors or to use it in the advanced thermal reactor.

Moreover, we are vigorously pushing development of a fast breeder reactor. In short, Japan is systematically planning to use the plutonium for peaceful purposes instead of letting it accumulate. We hope other countries, especially the U.S., will recognize Japan's prudence and almost neurotic concern about using atomic energy only for peaceful purposes. I wish they would be fully sympathetic toward our plans for the nuclear fuel cycle.

Diagram Showing Nuclear Fuel Cycle



OGAKI: It does seem that other nations do not yet fully appreciate Japan's approach to atomic energy. The government and private industry must both step up their efforts to obtain the understanding of other countries.

OTSUKA: I would like to ask about the efforts being made by the electric power industry, with government support, regarding uranium enrichment, reprocessing of spent fuels, and disposal of low-level radioactive waste—the three nuclear fuel cycle processes. Under the present plan, facilities related to the first two are scheduled to become operational in 1991, while the reprocessing plant will follow around 1995. Would you please explain the points the electric power industry is taking into consideration in promoting these three projects.

OGAKI: As with nuclear power plants, the electric power industry believes that the major prerequisite for all these projects is to convince not only the local residents but the entire nation that nuclear plants are safe and do not pose any danger to the public.

The second point is cost. It is essential to supply enriched uranium to electric power companies at an internationally competitive price, even if this involves great difficulties. We must give up the easy-going idea that cost does not matter when national security is involved.

OTSUKA: Safety is an absolute condition on which there should be no compromise. Energy is apt to be linked directly to the problem of national security, and certainly energy procurement is very important from that standpoint. But at the same time, energy is at the base of all manufactured products and is essential to people's daily lives. Unless energy is made available at a low price, the people's standard of living will be undermined. Quite naturally, there is a growing consensus that nuclear power generation should be promoted with adequate consideration for cost.



Tadao Ogaki

On the technical side, domestically developed technologies such as centrifugal enrichment and radioactive waste disposal technology can be employed to economize on cost. Foreign technology may be necessary to some extent for reprocessing. But even then, we must make it clear in advance that we want adequate consideration given to the cost factor.

OGAKI: We cannot say for sure at this stage, but I think we should eventually be able to reprocess spent nuclear fuel domestically at a cost equal to or even lower than what we now pay to British and French reprocessing plants. I also think Japan will be able to enrich uranium at a price competitive with that charged by the U.S. Department of Energy. We are not saying that national security considerations call for all processes to be undertaken domestically at any price. The cost must be taken into consideration.

OTSUKA: I think Japan should also consider undertaking on a commercial basis the conversion of yellow cake (U_3O_8) into UF_6 . This is necessary to avoid troubles that might arise during transportation—troubles such as the case

of the Mont Louis which sank off Belgium with a nuclear cargo a few weeks ago.

OGAKI: At this moment, the electric power industry has not yet decided on a fundamental policy as regards the conversion of yellow cake. But I personally think Japan should do it domestically. As far as transportation is concerned, there should be no trouble as long as uranium is shipped in the form of yellow cake, or refined uranium ore. The present method of transporting uranium from mine to conversion plant and then to enrichment plant, all in different parts of the world, results in tremendous waste. It would be much cheaper and more reasonable to build a conversion plant close to an enrichment plant in Japan.

OTSUKA: At present, the Japanese atomic industry consists only of nuclear power plants and fuel rod processing plants. If the nuclear fuel cycle and other related projects could be put on a sound commercial footing, Japan's atomic industry would grow into a full-fledged integrated industry. It may take a long time, but once that state is achieved, nuclear power generation will become established as Japan's most stable source of energy.

OGAKI: In order to operate smoothly the nuclear power plants which are at the apex of Japan's atomic industry, it is necessary to have a broad base. We are now starting to build that base, including the nuclear fuel cycle.

The project to build a nuclear fuel cycle is often criticized. In particular, doubts have been expressed about Japan's technological capability to reprocess spent fuel. But our experience in nuclear power generation shows that we do have the capability to establish our own cycle. We are committed to doing so.

OTSUKA: In promoting Japan's own nuclear fuel cycle, it is necessary to adopt an internationally open policy, as we do in the case of nuclear power generation, to exchange technology with other countries, to learn from their experiences, and to share Japan's own experience with them. In this way, and by taking the utmost care together with other countries to prevent nuclear proliferation, Japan should be able to build a good nuclear fuel cycle.

OGAKI: I think Japan should become a model for all the countries of the world in the peaceful utilization of atomic energy, inclusive of the nuclear fuel cycle, that pays due consideration to the prevention of nuclear proliferation. This model student has the responsibility to share its experience with all other nations, advanced as well as developing, to tell them about its efforts, and to contribute to solving future energy problems of concern to the whole world. We should make this our mission and have pride in our achievement.



Control center at the No.2 plant of the Second Fukushima Station