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Rokkasho: active tests set to begin any day

Sampling of beach sand (see article on page 3)
(Photo by Shigeru Ogasawara)

Active tests at the Rokkasho reprocessing plant are expected to commence very soon. For the first time, plutonium will be separated from spent fuel at Rokkasho. Of course, Japan has been separating plutonium at the Tokai facility since 1981, but Rokkasho will be Japan's first industrial-scale reprocessing plant. Indeed it will be the first such plant outside the nuclear weapons states, as defined in the Non-Proliferation Treaty (NPT). India has reprocessing facilities, but it is outside the NPT. Of course, this does not excuse India, but the international legal implications are different for Japan.

History of reprocessing in Japan

Perhaps now is a good time to recap some of the history of reprocessing in Japan. Table 1 shows that reprocessing was part of Japan's nuclear energy policy from the beginning.

President Carter agreed to allow Japan to reprocess spent fuel, despite his concerns about proliferation risks and despite abandoning reprocessing in the US. He did so as a result of intense lobbying by the Japanese. A compromise

Table 1

1956	Atomic Energy Commission of Japan adopts a policy of reprocessing spent nuclear fuel and extracting plutonium.
1971	Construction commences at Tokai reprocessing facility.
1977	President Carter reverses his opposition to Japanese reprocessing.
1981	Tokai reprocessing facility commences operations.
1985	The Governor of Aomori and the Mayor of Rokkasho accept a request from the Federation of Electric Power Companies to establish a reprocessing plant at Rokkasho.
1993	Construction of the Rokkasho reprocessing plant commences.
2001	Construction of the Rokkasho reprocessing plant is completed.
2003 (December)	Chemical trials are completed (radioactive substances not used).
2004 (December)	Uranium tests begin (using depleted uranium).
2006 (January)	Uranium tests are completed.
2006 (soon)	Active tests are due to begin (using spent fuel).
2007 (August)	Rokkasho reprocessing plant is due to become fully operational.

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was reached whereby Japan agreed not to extract plutonium in pure form. Instead, plutonium would be mixed with uranium and extracted as a mixed oxide (MOX) powder. (Note that at this stage in the fuel cycle it has not been fabricated into MOX fuel.) This was said to be more proliferation-resistant than pure plutonium oxide. The reality is, however, that the chemical process of separating plutonium from the mixed oxide is not particularly difficult. The IAEA treats MOX powder as a "direct use" weapons-usable material, so clearly the compromise was a political compromise rather than a scientifically based compromise. This compromise was later accepted by the IAEA, which shows that regardless of the importance of IAEA safeguards on nuclear facilities, the IAEA's decisions are essentially political rather than scientific. This is an important point to remember in the context of the debate over Iranian uranium enrichment.

Waiting for Aomori government approval

As this article is being written, Aomori Prefecture is debating whether to approve the commencement of active tests. Central government approval has already been given, so it is expected that the tests will start soon after the Governor of Aomori gives his consent. He is expected to give his consent on the basis that the central government has assured him that the plant is safe. A safety agreement will then be signed between Aomori Prefecture, Rokkasho Village and Japan Nuclear Fuel Ltd. (JNFL), which owns the plant.

What is reprocessing?

The majority of spent nuclear fuel is uranium which has not undergone any nuclear reaction. About one percent is plutonium, which is formed when uranium-238 captures a neutron. Another approximately three percent of spent fuel is fission products. Besides plutonium, there are also other heavy elements (collectively called actinides) formed by additional neutron capture and beta release. Altogether, this represents a potent mix millions of times more radioactive than the original fuel. During reprocessing, the spent fuel is dissolved in nitric acid and separated out into three streams, uranium, plutonium and the rest. The latter category is by far the most radioactive and is classified as high-level waste.

What do active tests involve?

The objective of the active tests is to test those functions which couldn't be checked during previous tests, including the quantity of radioactivity released into the environment, separation of fission products, separation of plutonium from uranium and treatment of liquid and solid wastes. These functions can only be tested using spent fuel.

JNFL plans to reprocess 430 tons of spent fuel, including 210 tons of PWR fuel and 220 tons of BWR fuel. The tests will be broken up into two main stages. The first stage will confirm safety and performance of equipment and facilities. These will be tested to confirm that they perform in accordance with design and that they operate within design parameters. The second stage will test the whole plant by operating it in a manner similar to real operations. The purpose of this is to confirm that the plant will be able to operate safely at its full capacity of 800 tons of spent fuel per year. Low burn-up spent fuel which has been cooled for a long period of time will be reprocessed before higher burn-up spent fuel which has been cooled for a shorter period of time. This is because the former is less radioactive than the latter. Altogether, active tests are scheduled to continue for 17 months.

The highest burn-up that will be tested for spent PWR fuel is 47,000 MWd/tU (cooled for between 6 and 17 years) and for spent BWR fuel is 40,000 MWd/tU. (cooled for between 8 and 20 years). The highest burn-up currently permitted for fuel in Japanese reactors is 55,000 MWd/tU. However, no such fuel will be reprocessed during the tests. In order to assess how much radioactivity will be released into the environment when this high burn-up fuel is reprocessed, JNFL will extrapolate from results obtained for the lower burn-up fuels. For this, calculation codes including ORIGEN will be used. We are skeptical that these calculations will give a reliable indication of the amount of radioactivity that will be released when high burn-up fuel is reprocessed. The projected maximum annual releases of radioactivity are shown in Tables 2 and 3. JNFL will use these projections as the basis of its assurance that a yearly dose of 0.022 milli-Sieverts to members of the general public will

not be exceeded. We believe JNFL is drawing a long bow to connect these calculations to this maximum annual dose.

Table 2: Radioactivity in Aerial Releases

Isotope	Bench mark (from license application) (Bq/year)
Krypton-85	3.3×10^{17}
Tritium	1.9×10^{15}
Carbon-14	5.2×10^{13}
Iodine-129	1.1×10^{10}
Iodine-131	1.7×10^{10}
Other isotopes	
alpha emitters	3.3×10^{8}
non-alpha emitters	9.4×10^{10}

Table 3: Radioactivity in Liquid Releases

Isotope	Bench mark (from license application) (Bq/year)
Tritium	1.8×10^{16}
Iodine-129	4.3×10^{10}
Iodine-131	1.7×10^{11}
Other isotopes	
alpha emitters	3.8×10^{9}
non-alpha emitters	2.1×10^{11}

A tale of two presidents

There is a great irony in the fact that Rokkasho will begin separating plutonium so soon after President Bush announced that the U.S. plans to return to reprocessing itself. The US plans to use a different reprocessing method than that used at Rokkasho and other existing reprocessing plants. The reason for this is that the PUREX method used at Rokkasho and elsewhere is recognized to present proliferation risks. Setting aside for a moment the fact that scientists are skeptical of whether the process proposed by George Bush is much safer, to be consistent President Bush should now return to the position originally taken by President Carter and request Japan to refrain from operating the PUREX reprocessing plant at Rokkasho.

Philip White (NIT Editor)

Project to measure radioactivity released from Rokkasho

1. Objective

It is impossible to operate the Rokkasho reprocessing plant without discharging radioactivity with the liquid and gaseous wastes. It is, therefore, important for citizens to have information that they can trust about the pollution released into the surrounding environmental. There is a danger that agricultural produce will be radioactively contaminated in the course of the plant's normal operations, so it is essential to analyze the nature of the radioactive pollution and highlight it as a social issue. For this, it is necessary to obtain environmental data before the plant begins operations. We intend to measure radioactive isotopes which are emitted in the course of normal operations, in particular the beta emitters tritium and carbon-14.

2. Operation of Rokkasho and radioactive pollution

Active tests are scheduled to be carried out from March or April 2006 to July 2007. During the course of these tests, it is planned that 430 tons of spent nuclear fuel will be reprocessed. During the active test phase, the plant will at times operate much the same as it will after commercial operations officially commence. Once reprocessing begins, volatile isotopes such as tritium, carbon-14, krypton-85 and iodine-129 will be released into the atmosphere and all sorts of isotopes, including cesium-137, strontium-90 and plutonium, will be released from the liquid waste pipe.

There are benchmarks for the release of radioactivity, but it is not clear whether actual releases will be kept within these benchmarks. If data from the surrounding area is not collected before the tests begin, it will be very difficult to prove later that pollution was caused by the plant. The people living around the reprocessing plants in France and the UK didn't have data showing the situation before reprocessing started, so they were at a great disadvantage when attempting to respond to the numerous problems that arose as a result of pollution and radiation exposure. Learning from their experience, we have decided to collect such basic data. We believe that it will be useful in all sorts of ways when responding to problems associated with the plant.

The current data from the surrounding area was collected by JNFL, or the relevant prefectural

government office. Often this type of data and the method of collecting the data is not made available to the general public. Frequently assessments lack objectivity and are unreliable. Detection limitations are not always clear and there may be problems with the methodology. In this survey, citizens will take measurements and do the analysis themselves, so they will be able to clarify problems in the company's measurements.

3. Major radionuclides released

See Table 1 and comments for each radionuclide below.

Table 1: Releases per year of operation of 4 major radionuclides in tera-becquerels (1TBq = 10^{12} Bq)

Isotope	Half life (years)	Rokkasho (aerial)	Rokkasho (liquid)	La Hague (aerial)	La Hague (liquid)
Tritium (H3)	12.2	1,900	18,000	67	12,000
Carbon-14	5,730	52	-	17	8.7
Krypton-85	10.8	330,000	-	250,000	-
Iodine-129	15.7 million	0.011	0.043	0.0074	1.8

La Hague: actual releases (iodine-129 for 1999, others for 2003)
Rokkasho: benchmarks in license application

Comments for each radionuclide

1) Tritium (beta ray energy 18 keV) is currently contained in rainwater at a concentration of 0.001-0.002 Bq/cm^3. In reactors it is formed mainly through ternary fission. When spent fuel is reprocessed, tritium mainly exists in water, or as gaseous hydrogen. Hydrogen molecules disperse rapidly in the atmosphere, so the radiological effect is not thought to be great. In liquid form it is mainly released as wastewater. When considering its radiological effect, it is important to bear in mind that it can be exchanged with hydrogen atoms in living organisms. The Rokkasho benchmark is similar to the actual releases from La Hague, but there is concern that the high liquid releases may contaminate marine organisms.

2) Carbon-14 (beta ray energy 155 keV) is present in the atmosphere in CO_2 gas. The current level of radioactivity of 1 gram of carbon in atmospheric CO_2 is 0.25 Bq. When spent fuel is reprocessed it is released in gaseous and liquid form. The benchmark for Rokkasho is similar to the total actual releases from La Hague. According to JNFL the liquid discharges are very small and are lumped under "other isotopes: non-alpha emitters" (see Table 3, previous article). The concentration of carbon-14 recovered from grass, seaweed and shellfish near La Hague is 3 to 4 times higher than normal. Even if the effect is small, eating food containing such carbon-14 will certainly increase internal exposure.

3) Krypton-85 (beta ray energy 687 keV) is formed in the atmosphere by cosmic rays, but the concentration from this is low. When spent fuel is reprocessed all the krypton-85 is released. As a consequence, the concentration of krypton-85 in the atmosphere has risen to 1Bq/m^3. The Rokkasho benchmark works out at about 1 TBq per minute if the plant operates for 200 days a year. Krypton is not thought to have a great impact on human health, because it does not bio-accumulate, though it accounts for the largest portion of radioactivity released. Around La Hague concentrations over 10,000 Bq/m^3 have been recorded. The Meteorological Research Institute in Tsukuba City in Ibaraki Prefecture notes that concentrations are affected by the Tokai reprocessing facility 60 kilometers away. Radioactivity from Rokkasho would be expected to reach major cities in Aomori Prefecture, including Aomori, Hirosaki, and Hachinohe.

4) Iodine-129 (beta ray energy 150 keV) is formed in the atmosphere by cosmic rays, but the concentration is very low. It is also released in gaseous and liquid wastes from reprocessing plants. There is a considerable difference between the actual releases at La Hague and the benchmark for Rokkasho. This is because equipment to remove it has been installed at Rokkasho, but it is not known how effective this equipment will be.

4. Measurement of tritium and carbon-14

1) Tritium: There is too little tritium in rainwater to measure with usual measuring devices. However, it is easy to measure tritium at the legal limit for wastewater of (60 Bq/cm^3). Using a scintillation counter, this concentration can reliably be detected in 5 cm^3 of water in one minute. At the low concentration of 0.1 Bq/cm^3, a reliable measurement can be made in 30 minutes. We predict that a useful measurement can be made of radioactive contamination of seawater in the vicinity of Rokkasho and that it will be possible to follow the movement of contamination down the coast of Iwate Prefecture.

2) Carbon-14: For various *continued on page 6*

Damage and cracking in BWR control rods

Problem of damaged control rods spreads

Major damage to control rods, including cracks in over 40 places, was first identified in Toshiba control rods at the Fukushima I-6 reactor on January 1st during a periodic inspection. Since then damage has been found at other reactors as well. The affected control rods are hafnium blade type. Hafnium is used as a neutron absorber. The control rods are used to control power output and are partly inserted into the core.

As shown in the diagram, each thin hafnium blade is enclosed in a steel sheath. Four blades are joined with a tie rod to make a single control rod. The problems relate to the numerous cracks which have appeared in the sheaths and tie rods, and the damage to the sheath that seems to have developed from these cracks. Crack damage has been found in 9 of the 17 hafnium blade type control rods in use at the Fukushima I-6 reactor.

In all, 382 hafnium blade type control rods are in use in Japan's Boiling Water Reactors (BWR). A further 207 are in storage having completed their useful life. As of March 5th, inspections had been completed for 134 control rods still in use. Besides Fukushima I-6, damage and cracking was found in 5 of the same type of control rod at Fukushima I-3. In addition, 157 of those no longer in use had also been checked and 32 anomalies found: 8 at Fukushima I-5, 9 at Kashiwazaki-Kariwa-2, 2 at Kashiwazaki-Kariwa-6, 13 at Hamaoka-3.

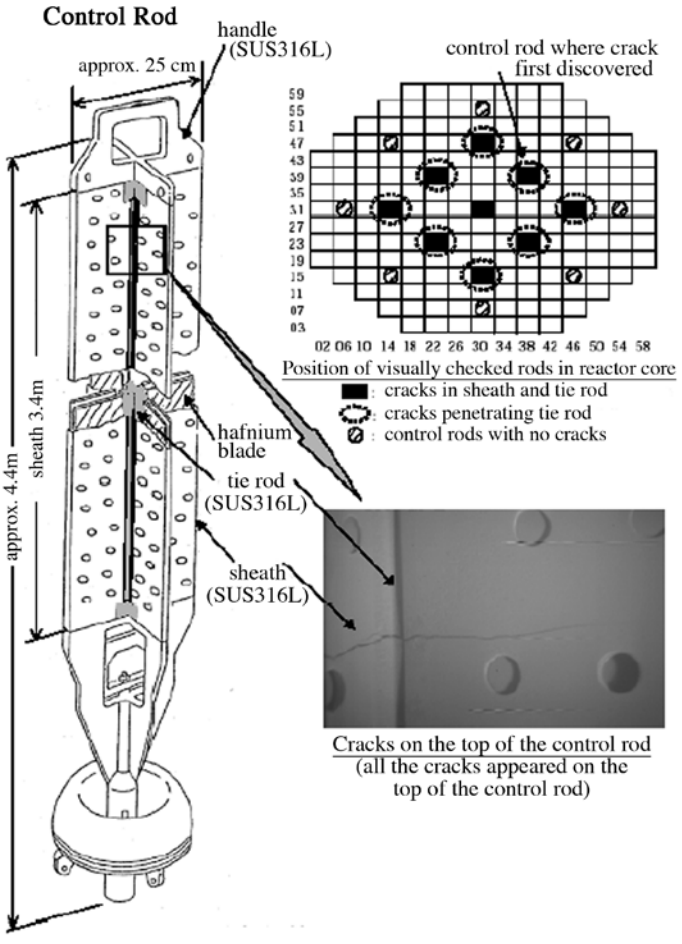
Driving with broken brakes

The Nuclear and Industrial Safety Agency (NISA) says that the damage is related to the degree of cumulative irradiation. On February 3rd it directed power companies operating BWRs to fully insert all hafnium blade type control rods for which the cumulative thermal neutron irradiation dose exceeds 4.0 x 10^{21} neutrons/cm^2, or is expected to exceed this level during the current operating period. The idea is to insert them into the core before they break. If that were to happen it would no longer be possible to insert them. Continuing to operate the reactors under these circumstances is highly irregular.

In the case of Hamaoka-4, for example, this means that 21 control rods have been fully inserted, reducing the power output by 400 MW to 700 MW (62%). Control rods are a nuclear reactor's brakes. There couldn't be anything more dangerous than operating a reactor with these not fully functional. Both the La Salle 2 power oscillation accident (1983) in the US and the Chernobyl disaster (1986) in the Ukraine occurred at reduced power output. In order to avoid a catastrophe, the power companies should immediately stop the reactors and carry out a thorough check.

Stress corrosion cracking caused by neutron irradiation

The sheaths and tie rods are made of SUS316L stainless steel. It was assumed that hafnium control rods would be employed as neutron absorbers for extended periods of time, so SUS316L was chosen to replace SUS304, because it was believed to be less prone to stress



corrosion cracking. However, it is known from irradiation experiments at US experimental reactors and BWRs that stress corrosion cracks appear in SUS316L under cumulative fast neutron irradiation doses of more than 1.0 x 10^{21} neutrons/cm^2. Therefore, it (SUS316L) cannot be said to be very effective. When high burn-up fuels and MOX fuel are used, the situation will become even more serious than when the object is to operate reactors for long periods of time.

NISA's directive relates to control rods where the cumulative thermal neutron irradiation dose exceeds 4.0 x 10^{21} neutrons/cm^2, but cumulative irradiation by fast neutrons generally exceeds this by quite some margin. Also, judging from past accidents, there is a high probability that stress corrosion cracks will appear or be latent at even lower irradiation levels, so the scope of the inspections should be expanded. The same can be said about other types of control rod. Judging just from recent examples, stress corrosion cracks have appeared in hafnium flat tube type, hafnium rod type and hafnium - boron carbide type control rods, so inspections should not be restricted to hafnium blade type rods only.

During the 2002 Tokyo Electric Power Company scandal, attention was focused on cracks in SUS316L. Then in 2003 cracks were found around welds on the handle of the hafnium blade type control rods. It is therefore hard to believe that power companies have not carried out checks for cracks in control rods before. Indeed, the discovery of cracks in used control rods suggests that previous discovery of cracks has been covered up.

Chihiro Kamisawa (CNIC)

Stop Press: The Kanazawa District Court has upheld the plaintiffs' suit for termination of operation of the Shika-2 reactor. The reasons for the verdict were that the design basis earthquake was too small, that the Ohchigata fault zone was not taken into account, that the method used to predict earthquakes was inappropriate, and that an earthquake could cause the plaintiffs to be exposed to radiation above the allowed dose. Shika-2 commenced operations on 15 March 2006. Assuming Hokuriku Electric appeals the verdict, Shika-2 can continue to operate until the final appeals court's decision.

continued from page 4 reasons, the concentration of carbon-14 in the environment varies, so it is desirable to obtain data from the local area. To measure carbon-14, accelerator mass spectrometry is used. Special equipment is required for this. We intend to commission a private organization to do this. Since only a limited number of samples can be measured, careful selection from a large number of plant and animal samples is necessary.

3) Others: We are interested in krypton-85 and iodine-129, but we are unable to measure these isotopes in this survey. We intend to assess the data released by JNFL, etc. Besides the abovementioned isotopes, we also plan to measure gamma emitters by collecting samples of sand from the beach and sediment from the seabed.

Professor Michiaki Furukawa
(Member of CNIC Board of Directors)

continued from page 10 preservation. He is engaged in the movement against nuclear energy, because he believes that society must rid itself of nuclear energy as soon as it possibly can.

1. The term 'pluthermal' refers to the use of plutonium in the form of 'mixed oxide' (MOX) fuel in light water reactors.

*Noritomo Nagase is a local councilor in Kariwa local council. He has worked with Kazuyuki Takemoto against the Kashiwazaki-Kariwa Nuclear Power Plant from the beginning.

Haiku for the season

On a steep slope
first flight of swallows
passed in an instant

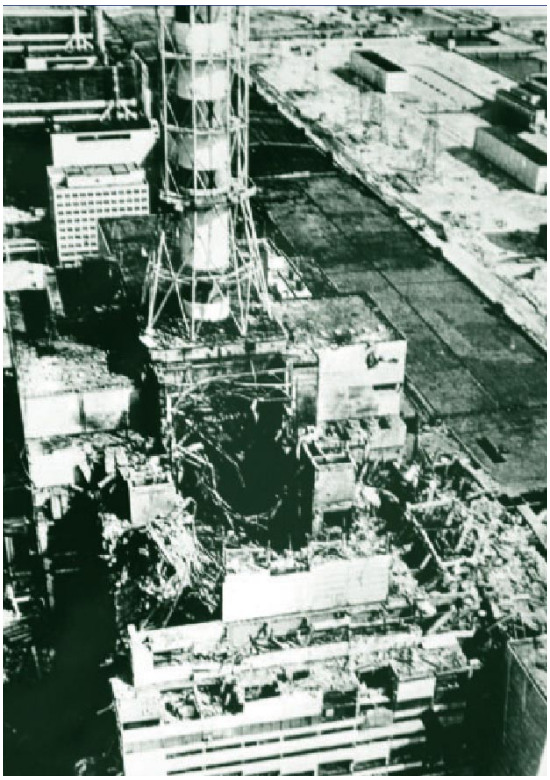
by Shoji Murata

Comment:
Haiku should capture a moment in time. Though the writer is not mentioned, she/he is present as the observer. Not all haiku adhere strictly to this formula, but Shoji Murata's contribution to this issue of NIT is an excellent example of one that does.

Chernobyl 20th Anniversary in Japan

In September 2005 in Vienna the Chernobyl Forum released a report which estimated that around 4,000 people could have died or could die in the future as a result of exposure to radiation from the Chernobyl accident. (The Chernobyl Forum is an initiative of the International Atomic Energy Agency (IAEA), in cooperation with seven other UN agencies and the governments of Belarus, the Russian Federation and the Ukraine.)

The report only considers 600,000 of the people exposed to radiation from Chernobyl. It takes no account of deaths and other health effects to a further 6.8 million people living in 200,000 square kilometers of Europe which does not fall within the definition of "more contaminated areas" (above 555 kBq/m^2 of Cs-137), but which is defined as "contaminated" (above 37 kBq/m^2 of Cs-137). Apparently the report adopted the position that there couldn't be health effects from exposure to such low-levels of radiation. This conclusion is the result of an arbitrary interpretation of the medical effects of exposure to radiation exposure. It represents an extraordinary refusal to look at the totality of this nuclear accident.



The burnt-out Chernobyl No. 4 reactor (photo from Chernobyl Forum Report)

In fact the report was an international publicity stunt by the proponents of nuclear energy. The purpose was to convey the message that, 20 years on, the health effects of the Chernobyl accident are not that great after all. This shows a callous disregard for the victims.

20th Anniversary Events

On March 4th CNIC held a public meeting entitled "20 years on, what we now know about the Chernobyl accident". The speakers were Tetsuji Imanaka and Katsumi Furitsu.

Tetsuji Imanaka is a researcher at the Kyoto University Research Reactor Institute. Along with researchers from the regions most affected by the Chernobyl accident, for many years he has been doing research into the nature of the accident and its effects on human beings. In October 2004 he started a project entitled, "Multi-faceted approach to elucidating the truth of the Chernobyl accident: 20th anniversary as an opportunity to collate the damages caused by the accident". The project investigates the Chernobyl accident from the perspective of victims, journalists, NGOs, scientists and social scientists. He reported that the conclusions of this project are completely different from those of IAEA et al mentioned above.

Katsumi Furitsu is a doctor who, as a member of an NGO named Chernobyl Hibakusha Relief Kansai, has been involved in providing relief to the victims of the Chernobyl accident. She gave a report on international conferences, including last September's Chernobyl Forum.

Around 80 people attended the meeting and there was a lively discussion after the speakers' presentations.

On April 16th a symposium will be held entitled "20 years after the Chernobyl Catastrophe - What happened and what continues now?" The keynote speaker will be Yuri Shcherbak, a doctor, author and former Ukrainian Ambassador to the US. Ukrainian singer and harp player, Oksana Stepanyuk, will give a musical performance. A panel discussion will include photojournalist Ryuichi Hirokawa, Katsumi Furitsu and Tetsuji Imanaka. There will also be a video and an exhibition of pictures by Chernobyl children and photographs. (For more details see CNIC's web site, or contact CNIC directly.)

Mikiko Watanabe (CNIC)

Toshiba gambles on Westinghouse

On February 6th Toshiba and BNFL agreed on the sale of Westinghouse to the former for $5.4 billion. Of this, Toshiba will pay 51-53%. Negotiations are proceeding to secure investment from other engineering firms, nuclear power plant makers and businesses to make up the difference. However, at this stage no other investors have been confirmed.

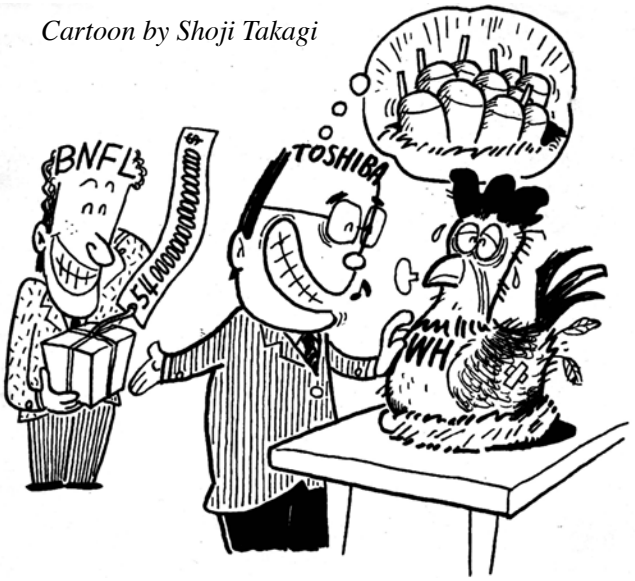
Toshiba will pay 4.5 times the $1.2 that BNFL paid for Westinghouse in 1999. It seems far too high a price. As a result of the purchase agreement, Toshiba's stock value has fallen. One after the other, ratings agencies have downgraded its credit rating. Other than the large purchase price, another reason for this is that the nuclear power business has become less predictable. It has suddenly undergone a 180 degree shift from being seen as a "stable business area" to being seen as a "growth area".

Nevertheless, at the press conference on February 8th Toshiba's leader was ebullient. President Atsutoshi Nishida said that combining Westinghouse's world sales network and PWR technology with Toshiba's turbine technology and total plant design along with their construction capabilities would generate beneficial synergies for the two companies. He emphasized that by 2015 sales equal to the purchase price plus 10% profits could be expected for the combined companies. He said they would become a new global leader in the nuclear industry.

The basis for this assessment, according to Executive Director Masao Niwano, was the expectation that they would win orders for around one third of the 10-15 reactors planned by China, as well as over half of the 15 envisaged for the US. There would also be increased opportunities for maintenance of both PWRs and BWRs. He anticipates an increase of $2.3 billion from the US market, $0.3 billion from the Asian market, including China, and $0.2 billion from Europe.

Counting on expanded sales to recover the investment would seem to be a big gamble, when there isn't even any guarantee that existing sales can be maintained. President Nishida predicts that the world nuclear energy industry will expand to 1.5 its current size by 2020, but this is quite unrealistic.

Cartoon by Shoji Takagi



Also, at the time of purchase Westinghouse has no plant construction capacity. Great expectations of US orders are not credible without AP1000, but is it really possible to advance an AP1000 project without the cooperation of Mitsubishi Heavy Industries (MHI)? MHI's President Takashi Nishioka said at a press conference on February 21st that it is difficult to understand why Toshiba would purchase Westinghouse. He criticized the price, saying that it couldn't be expected to pay off as a nuclear energy business. He rejected the possibility of teaming with Toshiba, saying that if MHI were to cooperate "we would collapse."

Hitherto all nuclear plant makers, including Toshiba, have been downsizing and cutting staff numbers, on the grounds that nuclear energy is a "stable business area". They haven't expected orders from within Japan and have regarded prime contracting for exports as impossible, because of the problems of nuclear fuel supply and nuclear proliferation. Talks had been proceeding about integrating the companies' nuclear divisions. It is said that Toshiba's outlandish behavior has confused the other companies.

Baku Nishio (CNIC Co-Director)

Exports by Japanese Nuclear Power Plant Makers

Region	Country	Item	Purchaser	Export Year
North America	USA	Reactor pressure vessel	PSEG / Hope Creek-1 (via GE)	1973
		Control rod drive mechanism	Dominion / North Anna-1&2	2004
		Replacement reactor vessel head	Dominion / Surry-1&2 OPPD / Fort Calhoun-1 NPP A NPP B-1 NPP B-2 NPP C-2	2003 (2006) 2004 2004 (2005) (2005)
		Replacement steam generator	OPPD / Fort Calhoun-1 (2) SCE / San Onofre-2 (4) SCE / San Onofre-3 (4)	(2006) (2008) (2009)
		Replacement pressurizer	OPPD / Fort Calhoun-1	(2006)
Central America	Mexico	Steam turbine	CFE / Laguna Verde-1 (1 HP, 2 LP) CFE / Laguna Verde-2 (1 HP, 2 LP)	1975 1976
Asia	China	Reactor internals	CNNC / Quinshan I	1985
		Reactor pressure vessel	CNNC / Quinshan I CNNC / Quinshan II-1	1986 1999
		Main feedwater pump	CNNC / Quinshan I (3)	1987
		Auxiliary feedwater pump	CNNC / Quinshan I (3)	1986
		Main coolant pump	CNNC / Quinshan II-1 (2) CNNC / Quinshan II- 2 (2)	1999 2001
		Charging pump	CNNC / Quinshan II-1 (3) CNNC / Quinshan II-2 (3)	1998 1999
		Turbine generator and plant auxiliaries	CNNC / Quinshan III-1&2 (via AECL)	2000
	Taiwan	Reactor containment vessel	TPC / NPP 1 (Chinshan) - 1&2	1973
		Reactor pressure vessel, reactor internals	TPC / NPP 4 (Lungmen) - 1&2	2004
		Radioactive waste treatment facility	TPC / NPP 4 (Lungmen) - 1&2	2003-2005
		Turbine generator	TPC / NPP 4 (Lungmen) - 1&2 (2 HP, 6 LP)	(2006)
	South Korea	KEDO project Various key equipment (reactor vessel head, etc.)	KEDO (via Doosan)	Suspended
	Pakistan	Turbine generator	PAEC / Karachi	1972
Europe	Finland	Reactor pressure vessel	TVO / Olkiluoto-3 (via Framatome)	(2006)
	Belgium	Replacement steam generator	Electrabel / Tihange-1 (3) Electrabel / Tihange-2 (3) Electrabel / Doel-2 (2)	1995 2001 2004
	Sweden	Replacement reactor vessel head	Vattenfall / Ringhals-2 Vattenfall / Ringhals -3 Vattenfall / Ringhals-4	1996 2005 2004
		Control rod drive mechanism	Vattenfall / Ringhals -2 Vattenfall / Ringhals -3 Vattenfall / Ringhals -4	(2005) (2005) (2005)
	Switzerland	Reactor internals	KKL / Leibstadt (via GE)	1978
	Spain	Turbine rotor	Endesa / Vandellos-2 (1HP, 3LP)	1999
	Slovenia	Turbine rotor	NEK / Krsko (2LP)	(2006)
	Russia	Plant simulator	Minatom / Novovoronezh Nuclear Power Plant Operation Training Center	1996

1. NPP A,B,C not identified. 2. (2), (3), (4) indicate the number of items. 3. (Year) indicates planned year of shipment.

Anti-Nuke Who's Who

Kazuyuki Takemoto: changing nuclear policy from the regions

by Noritomo Nagase*

The Kashiwazaki-Kariwa Nuclear Power Plant (NPP) is the largest NPP in the world, with 7 reactors and a total power output of 8,212 MWe. It was built by the largest electric power company in Japan, Tokyo Electric Power Company (TEPCO).

Kashiwazaki City and Kariwa Village are located 250 km north west of the capital, Tokyo. The area has a population of 100,000 people and is surrounded by mountains and sea. It is mainly a region of paddy fields, but there was oil drilling there 100 years ago and some related machinery industry remains. The plan for a nuclear power plant was announced in 1969, just when agriculture began to decline.

Kazuyuki Takemoto was born in 1950, the oldest son of a farmer whose farm was near the NPP site. A farmer himself and also a technologist involved in agricultural construction, Kazuyuki is engaged in survey, planning and design work related to water and soil. He is also involved in flood response and post-earthquake recovery planning. He has opposed the NPP plan ever since it was announced, taking the view that "nuclear energy is dangerous and will ruin the local community". He has been campaigning now for over 35 years. During that period he was a local councilor for 6 terms, for a total of 24 years.

Besides protesting the all too frequent nuclear accidents, in 1979 the movement against the Kashiwazaki-Kariwa NPP initiated a lawsuit for the annulment of the plant's license. This lawsuit is still continuing. It has been campaigning against the pluthermal[1] plan since 1997 and is also campaigning on the problem of electro-magnetic radiation associated with high voltage transmission cables.

More than 20 years have passed since the first reactor at Kashiwazaki commenced operations. Aging is a big issue and numerous cracks have appeared in the pipes and structural components of reactor cores. Kazuyuki is a key member of the movement, employing the wealth of knowledge he has picked up from experts to home in on TEPCO's weak points. Consequently, he is a very busy man.

Kariwa Village, where Kazuyuki lives, has a population of 5,000 people. One in every four families has a family member who makes his or her living at the NPP or at a related company. It is like a castle town, totally dependent on the castle, though in this case the castle is the NPP. But it was this same Kariwa Village which, in 2001, held a referendum and a majority voted against the pluthermal1 plan. This achievement was brought about by the joint efforts of many people within the movement.

Kazuyuki studied geology and seismology and in 1974 drew attention to the poor quality of the ground on which the NPP stands, pointing out that the NPP would not withstand a powerful earthquake. Ever since, he has been arguing with TEPCO, which built the plant, and the government, which approved the license, about the NPP's earthquake resistance. The Niigata Prefecture Chuetsu Earthquake occurred in October 2004. Now, the ability of the plant to withstand earthquakes has become the issue of greatest concern in the area. Recently, people working at the NPP have begun to give inside information to the anti-nuclear energy movement in Kashiwazaki and Kariwa. This is evidence that the movement, which has been campaigning for all these years, is trusted in the local area. The Kashiwazaki Kariwa anti-nuclear energy movement hopes to change nuclear policy from the regions. Kazuyuki Takemoto sees nuclear energy as war technology, which began with Hiroshima and Nagasaki. He believes that it is incompatible with human peace and environmental

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NEWS WATCH

Pluthermal developments

With regard to the pluthermal project for Kyushu Electric's Genkai-3 (PWR, 1,180 MW), Governor Yasushi Furukawa of Saga Prefecture announced his view on February 7th. At the time he said, "The safety of the project is assured." On February 17th Genkai Town held an extraordinary town assembly meeting and unanimously endorsed a statement requesting Town Mayor Tsukasa Terada to agree to the project. On February 20th the mayor visited Governor Furukawa and communicated his intention to do so. On March 22nd the Saga Prefectural Assembly endorsed the project, but Governor Furukawa is now seeking a meeting with the Minister for Economy Trade and Industry to obtain an assurance of the project's safety from the central government.

CNIC Co-Director, Hideyuki Ban, and nuclear safety research officer, Chihiro Kamisawa, visited Mayor Terada on January 19th and met with Governor Furukawa on January 20th. They asked them to listen to the voices of the residents, to discuss the issue thoroughly and to refrain from making a hasty decision." Unfortunately, it appears that their request was ignored.

With regard to the pluthermal project for Shikoku Electric's Ikata-3 (PWR, 890 MW), on March 16th the Nuclear Safety Commission concluded that there is no problem with the project in terms of disaster prevention. The government's official approval is expected any day. However, on February 17th, the Mayor of Ikata Town, Yoshihisa Hatanaka, was arrested on bribery charges related to bidding for construction work for the town. This will no doubt delay granting of prior understanding by the local government.

On March 3rd, Chubu Electric Power Co. applied to the government for permission for its pluthermal project at Hamaoka-4 (BWR, 1,137 MW). Then on March 13th it signed an agreement with Areva for the supply of MOX fuel.

Toshiba falsified testing data

It has been revealed that in 1993 Toshiba falsified testing data related to a feed water flow gauge for Fukushima 1-6 (BWR, 1,100 MW). Data from tests carried out when the equipment was delivered were falsified, because the measurement error was not within the range of accuracy specified in the specifications. Tokyo Electric Power Co. (TEPCO) found out about the falsification from a whistle blower in September 2005. TEPCO made an announcement about the incident on 31 January 2006, after investigations confirmed that data had been falsified.

Although TEPCO stated that "there was no falsification elsewhere," it was revealed on February 9th that data for a purchase for Kashiwazaki-Kariwa-7 (ABWR, 1,356 MW) had been saved on computer. There were signs that the program had been tampered with to allow the gauge to meet the accuracy specified in the specification.

Request for withdrawal of Kumihama Nuclear Power Plan

On 9 February the mayor of Kyotango City asked Kansai Electric Power Co. (KEPCO) to withdraw its request to the city for permission to carry out an environmental assessment for the construction of a nuclear power plant. KEPCO originally lodged its request in 1975. As a result of the merger of six towns in 2004, Kumihama Town is now Kyotango City.

The mayor stated that while there was a plan for a nuclear power plant, the town was unable to launch local promotion measures. However, the day after submitting his request to KEPCO,

he announced a local promotion plan combining tourism and fishery.

Japan-US-French cooperation on sodium-cooled fast breeder reactor

The policy group of the Generation IV International Forum (GIF), which is promoting research and development of generation IV nuclear power systems, met on February 15th - 16th in Fukui City. Current GIF membership is Japan, France, US, Canada, UK, Switzerland, South Korea, South Africa, Mexico, Argentina and the EU. At the meeting reports were made on the progress of six reactor models, one of which was the sodium-cooled fast breeder reactor. Japan, the US and France signed a system agreement for this reactor. The agreement stipulates concepts for intellectual property and basic management methods for R&D. The UK, South Korea and EU are also expected to sign the agreement.

Eighty-five percent of employees feel anxiety working at nuclear plants

KEPCO conducted a survey of subcontractors' employees in response to the August 2004 accident at the Mihama-3 reactor (PWR, 826 MW). As a result of the accident, five people were killed and six others were injured by high-temperature steam from a ruptured pipe in the secondary cooling system. On February 5th, the Asahi Shimbun carried a report on the results of the survey. The questionnaire was sent to roughly 3,600 employees of some 40 companies, among whom 2,650 responded. To a question related to working around piping in the secondary cooling system, 84.6% responded, "I always feel anxious," "I still feel strong anxiety", or "I feel slightly uneasy". With regard to the way KEPCO's employees treat subcontractors, 37.4% were "unsatisfied," while 32.8%. indicated that they were "satisfied".

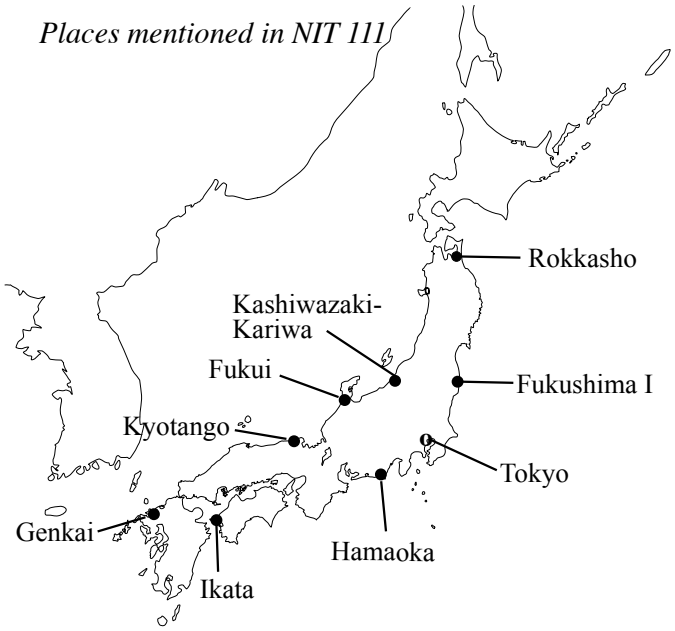
Material Unaccounted For

The Japanese government has released more information regarding its plutonium stockpile, including new information about Material Unaccounted For (MUF). The data was released in response to inquiries by CNIC and Diet Member Nobuto Hosaka.

In 2004 there was 1 kg of MUF at the Tokai reprocessing facility. Much larger quantities can be expected for the Rokkasho reprocessing plant, so we have requested that similar data be released each year in future.

See the following web page for a more detailed account:
http://cnic.jp/english/topics/plutonium/plutonium04.html

Places mentioned in NIT 111



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