



JCO Criticality Accident: Superficial Changes and Forgotten Damages



Citizens monitoring the nuclear disaster drill in front of the Japan Nuclear Cycle Development Institute, where a criticality accident at its Tokai Reprocessing Plant was assumed. The sign in the middle reads "the balloons show the flow of radioactivity." A fixed North wind was assumed for the drill, when in fact it blew in the direction of the northeast and east. (Tokai Village, 29/9/01. Photo by Satoshi Fujino)

Two years have passed since the JCO criticality accident, which claimed two lives, forced residents within a 350 m radius of the plant to evacuate, and exposed at least 667 people to radiation (see Table 1). A number of amendments were made to nuclear-related laws following the accident, and a new Nuclear Disaster Law was enacted in June 2000. Nevertheless, residents are still suffering from various damages incurred by the accident. "Nothing has been solved" — this was the title of the meeting held on the second anniversary of the accident, 30 Sep. 2001, which was held in Mito City, Ibaraki Prefecture, and

attended by approximately 800 people.

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1. Nuclear Disaster Prevention and Response

On 29 Sep. 2001, a nuclear disaster drill sponsored by Ibaraki Prefecture and Tokai Village was held at the Village. This drill was based on the prefecture's nuclear disaster manual which was revised to adopt regulations specified in the new Nuclear Disaster Law. Under this law, a nuclear business operator is mandated to report when radiation level over 5 microSv/h is measured at the boundary of nuclear facilities (see fig. 1). When radiation over 500 microSv/h is detected, the Prime Minister will automatically declare a state of emergency. The Prime Minister will also be the one to issue evacuation orders. Officials from central and local governments, as well as nuclear experts, are to be dispatched to a designated local Off-Site Center (OSC), where all information and data will be gathered. Recommendations for response activities are to be discussed there. The members gathered at the OSC are to communicate by telecommunication with the Prime Minister and head of local governments, who will remain in their own offices. The government claims that gathering information at one site will ensure a speedy and coordinated response. However, concerns remain as to how much can be done by a group that will convene after the accident occurs — especially when the standard for reporting radiation levels is set at a



Elementary school students running towards the bus to be taken to the designated evacuation site during the Sep. 29th drill. It was assumed that school was in session when the hypothetical accident occurred. (Photo by Satoshi Fujino)

figure about 100 times the natural radiation.

Across the country, many nuclear disaster drills have been held since the accident, but these drills tend to lack realistic assumptions. One of the problems with these drills is that a particular wind direction is assumed in the drill manual, while the actual wind direction on the day is ignored. Wind direction is extremely important to keep radiation exposure as low as possible because radioactive fallout is carried by wind, and thus the downwind must be avoided when evacuating. On the 29th, citizens protested against this drill, which assumed a fixed North wind, by releasing balloons three times during the day to indicate the direction that leaked radioactivity would really have taken.

In our view, the main problems with the new Nuclear Disaster Law are as follows.

- 1) The minimum radiation level stipulated as requiring notification (5 microSv/h) and a declaration of a state of emergency (500 microSv/h) is too high. If realistic attempts are going to be made to prevent the exposure of local residents, the standards should be set stricter.
 - 2) The law only allows for the evacuation of an area within 8~10 km radius of the nuclear facility. Off-Site Centers (OSC) are located within 10~20 km radius, and in many cases have no specified back-up center.
 - 3) The law requires that the Self-Defense Force assist with evacuation. However, in order to be picked up by SDF trucks, people must walk to a certain collection point while, in all likelihood, being exposed to leaked radioactive materials. In some cases, citizens must even walk towards accident sites before reaching the pick-up point.
- Considering these limitations, and arguing that the best thing to do is to get as far away from the site as possible, some citizens recommend that people should evacuate with their own vehicles. Routes can be designated beforehand by local groups to prevent traffic jams. For example, six routes can be mapped out by citizens' groups and such maps can be distributed to each household. (Residents of A and B Town would use route 1, C Town residents use route 2 etc.)

2. Local Damage

2.1 Economic damage

Though contamination by radioactivity was relatively limited and confined to within about 3 km radius of the JCO plant, Tokai Village and Ibaraki Prefecture at large suffered from serious perceived damage. Over 8,000 claims were made to JCO for damage compensation. About 1,000 claims were withdrawn, and the company reached agreements with 90% of the rest of the 7,000 or so claims. However, a few companies unhappy with these negotiations have taken JCO to court. JCO is now faced with three civil law suits, in addition to the criminal law suit.

According to a survey carried out by Ibaraki University in December 2000 on 162 households practicing agriculture (17 from Tokai Village, 94 within a 10 km radius, and 51 within a 60 km radius), 34% of those from Tokai Village reported that the sales of fiscal year 1999 (April '99~March '00) had dropped to less than half. Altogether, 83% of respondents reported that sales decreased after the accident. Even among those within a 10 km radius, 13% reported that sales had decreased



As part of the disaster drill, residents transported by the SDF truck get off at the community center designated as the evacuation site. (Sep. 29th, 2001 Photo by Satoshi Fujino)

to less than half, and a combined 66% reported that sales had decreased since the accident. For those within a 60 km radius, 13% reported that sales had decreased since the accident.

As for the sales of FY 2000 (April '00~March '01), 28% of those from Tokai Village estimated that sales would be less than half compared

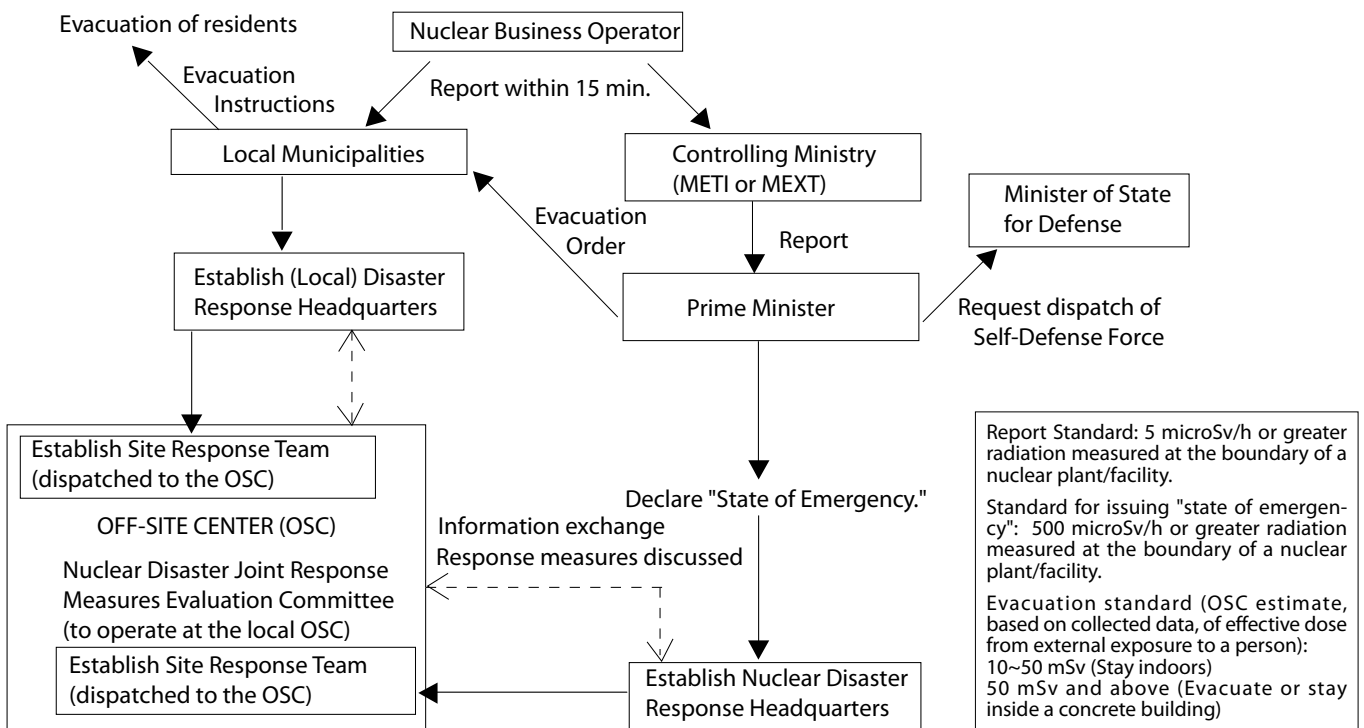


Fig.1 Procedures of the Nuclear Disaster Response System under the New Nuclear Disaster Law

to pre-accident times, and a combined 79% expected lower sales. Furthermore, 39% of those within a 10 km radius and 15% of those within 60 km estimated that sales would be lower. Price falls and termination of trade by customers were the two problems cited by respondents. There were many respondents from Tokai Village and within the 10 km radius who reported that prices and trade had not recovered yet. The report concludes that actual damage to farmers goes far beyond the numbers of claims and the amount agreed upon in the negotiations for damage compensation between farmers and JCO.

2.2 Physical and mental damage

According to the government's estimate, the highest exposure dose among local residents was 21 mSv. Mainly on the basis of data collected from A-bomb victims, the government claims that there will be no deleterious health effects from exposure under 50 mSv. Yet a research report released in Sep. 2001 by a group from the Hannan Central Hospital shows a much higher exposure dose. This group conducted personal health surveys, used the available data with the highest figures, and also adopted the 1990 ICRP (International Committee on Radiation Protection) recommended qualification factor for the effects of neutrons on human bodies. Japan legally adopted the ICRP '90 recommendation this April, increasing the quality factor twofold. Though the government was aware that the new figure would soon be adopted, it calculated the exposure dose in 1999 using the then legal quality factor which set the effects of neutrons as ten times that of the effects from gamma radiation, whereas the current factor sets the effects from neutrons at 20 times.

The government has advised Ibaraki Prefecture to hold free annual health check-ups for local residents. The second such health

check-up was held in mid-April 2001 and 268 people participated. However, many citizens are unhappy with the doctors selected by the prefecture, who persist in claiming that any symptoms experienced by residents are not the result of the accident. The JCO Victims' Group, formed shortly after the accident by local residents, has been negotiating with the government for the issue of radiation victim ID cards similar to those provided for the exposure victims of Hiroshima and Nagasaki. However, the government refuses to issue such cards. Residents are still complaining of various physical and mental symptoms which were triggered by the accident. Parents are going through a difficult time due to anxiety, not only about their own health but over the health and future of their children. There are also serious concerns over discrimination. According to a survey conducted by the University of Tokyo's Institute of Socio-Information and Communication Studies in Jan.~Feb. 2000 on residents in a 10 km radius of the JCO plant, there were incidents in which respondents from Tokai Village were refused accommodation at hotels, and entry to hot springs. Also, there are rampant rumors that people from Tokai Village and its vicinity will have difficulties finding marriage partners.

Table 1 Exposure Dose According to STA's Report Released on 13 October, 2000

Description of the exposed people	number	Dose	
Nuclear-related employees	172		
JCO employees directly involved in the process leading to the accident (measured)	3	16-20 GyEq ¹⁾ 6.0-10 GyEq ²⁾ 1-4.5 GyEq ³⁾	
Employees involved in containing criticality (extraction of coolant etc.) (measured)	18	3.8-48 mSv	
Employees involved in containing criticality (those who poured borate solution) (measured)	6	0.7-3.5 mSv	
Others at the site at the time of the accident	(measured)	49	0.6-48 mSv
	(estimated)	96	0.06-17 mSv
Accident response task-force members	260		
Employees of government-associated Japan Atomic Energy Research Institute and Japan Nuclear Cycle Development Institute (measured)	56	0.1-9.2 mSv	
Fire fighters involved in rescuing the three JCO employees (measured)	3	4.6-9.4 mSv	
Officials of local governments (estimated)	167	0.0002-7.2 mSv	
Officials of the central government (estimated)	8	0.49-2.1 mSv	
Media (estimated)	26	0.014-2.6 mSv	
Citizens in the locality at the time of the accident	235		
Local residents (measured)	7	6.7-16 mSv	
Residents and area employees (estimated)	200	0.01-21 mSv	
Transients (estimated)	28	0.01-3.8 mSv	
TOTAL	667		

1) Mr. Ouchi, died on 21 Dec. 1999 2) Mr. Shinohara, died on 27 April, 2000
3) Mr. Yokokawa, left hospital on 20 Dec. 1999

On the other hand, many respondents pointed out that sensationalized media reports contributed to such discrimination, worsening the perceived damage suffered by residents.

3. The Court Case

On 1 Nov. 2000, the Mito District Prosecutor's Office indicted six JCO employees as well as JCO itself. The defendants have pleaded guilty to all charges (see NIT 84 for details). However, it is believed that they are bargaining for a lesser penalty by pleading guilty. In the course of the open sessions, JCO has shown some eagerness to disclose the responsibilities of the government and the government-associated corporation, the Japan Nuclear Cycle Development Institute (JNC), which placed the order for the uranium solution that became the source of the accident. For example, at the third open hearing held on 4 June 2001, one of the defendants testified that when JCO applied to the former Science and Technology Agency (STA) for the approval of amendments to processing methods to make possible the manufacturing of high-enriched uranium in 1984, Mamoru Yoshida, a temporarily transferred JNC employee working as an agent of the STA, altered JCO's application without the company's knowledge. According to the defendant, JCO had applied for permission to treat consecutive batches of uranium solution during a single process, but the approved procedure required that only one batch could be treated at a time.

It has been pointed out that the difficult specifications made by JNC, for example regarding the homogeneity of the uranium solution, are also among the factors that led to the JCO accident. It is hard to believe that the STA could have done a proper independent safety review of JCO's processing methods, when an employee of the main customer for the product to be manufactured by that particular process was trusted to conduct the review in 1984. Indeed, at the eighth court session held on 15 Oct. 2001, though not directly related to the alteration that was made to JCO's application, Yoshida admitted that he was rash to conclude in 1984 that double safety measures

were in place to prevent criticality because limits were set on the mass and concentration of uranium solution to be treated. As seen in these two testimonies, it is likely that more information will be disclosed as the case progresses.

4. The Future of JCO

JCO's business license was revoked on 28 March 2000 by the then STA. Since then, the company has mainly been dealing with compensation claims and other administrative work. However, there are facts which hint at the intentions of the company to re-open its plant.

The company, known as Japan Nuclear Fuel Conversion Co, Ltd. until changing its name to JCO Co. in 1998, converted enriched uranium hexafluoride (UF_6) into uranium oxide to be used to manufacture commercial nuclear fuel. Until the accident, JCO was the sole provider of uranium oxide for fuel for BWRs manufactured at Japan Nuclear Fuel — now Global Nuclear Fuel Japan (GNF-J) — a company jointly owned by General Electric (GE), Hitachi, and Toshiba, and the Tokai Plant of Nuclear Fuel Industries (NFI, Sumitomo/Furukawa Group). It also provided uranium oxide for NFI Kumatori Plant, which manufactured PWR fuel assemblies. Aside from its main business, JCO also converted UF_6 into high-enriched uranium for mixed plutonium-uranium oxide (MOX) fuel to be used at the Joyo Experimental Fast Breeder Reactor. Mitsubishi Nuclear Fuel (MNF), which converts uranium on its own and manufactures PWR fuel, refused to cover for JCO after the company lost its license. Fuel manufacturers then turned to cheap uranium oxide from the U.S. and other overseas suppliers. According to an article in the Tokyo Newspaper dated 23 April 2001, while NFI would rather have a domestic supplier and seems to be keen on JCO re-starting its business, GNF-J appears to be content with importing uranium from multiple companies, as it had relied solely on JCO for uranium oxide until the accident.

Meanwhile, JCO transferred 24 of about 100 of its employees to Rokkasho Village, Aomori Prefecture, to assist in the construction of the

Rokkasho Reprocessing Plant. In addition, on 16 April '01, JCO opened up its low-level radioactive waste storage facility to the public for tours in an attempt to "regain trust" in the company. JCO has even built a mock precipitation tank, the equipment that was being used when the accident occurred, for the public to view. JCO will be able to apply for a new license starting March '02.

5 Japan's Nuclear Policy

5.1 Effects of the accident

Except for the fact that promoters can no longer avail themselves of the myth that there can be no nuclear accidents in Japan, the JCO incident did not bring about any fundamental changes to the country's nuclear policy. However, the JCO accident and the '99 BNFL MOX fuel data falsification scandal have been repeatedly referred to by local politicians and activists alike when commenting on the state of public opinion. For example, the Fukushima Governor who postponed the loading of MOX fuel at the prefecture's Fukushima I-3 this Feb. cited the two incidents as the reasons for his decision. Subsequently, in May, he set up a committee to undertake a comprehensive review of the Prefecture's energy policy. In areas with nuclear plants, residents' concerns over the possibility of a large-scale accident suddenly became more immediate following the accident. Such heightened anxiety was among the concerns which led to the majority of the Kariwa Villagers voting against the use of MOX fuel in

the referendum held in late May '01.

5.2 Japan's plutonium program

What is often missing from the discussion of the JCO accident is acknowledgement of the fact that the company was preparing uranium to be used to manufacture MOX fuel for the Joyo Experimental FBR. Most of the company's business dealt with low-enriched uranium (about 3~4%) for fuel for commercial reactors, but Joyo required high-enriched uranium (about 18%). Countries world-wide have given up on the development of fast breeder reactors due to technical and economical difficulties. The JCO accident was in a sense caused by Japan's anachronistic and inflexible plutonium program. By the mid 1990's, it was clear that the dream of the '50s and '60s — to develop a nuclear reactor that would produce more fuel than it consumed, breeding plutonium while generating electricity — was nothing but an illusion.

Though Japan is burdened with a worrying surplus of plutonium, instead of learning from the nation's worst nuclear accident, the government persists in promoting the reprocessing of spent fuel to extract plutonium. The build-up of plutonium, mounting radioactive waste, poor economic performance, the inherent risk of nuclear accidents, the danger of nuclear-proliferation, workers' exposure — what further evidence must be produced to outweigh the "greater benefit" of nuclear power as a source of electricity?

By CNIC

(A chronology of the JCO accident up to Sep. 2001 is available at

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Japanese Optical Glass Giant Involved in U.S. Nuclear Weapons Development

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A US subsidiary of the Hoya Corporation, a Japanese optical glass giant, is supplying a US hydrogen bomb research facility called the National Ignition Facility (NIF) with laser glass slabs, key components of the facility. Immediately after Hoya's involvement in NIF was reported in early Feb. this year in Japan, Hoya announced that it would withhold delivery to NIF for the time being due to strong opposition. But on 22 March the company declared that it would resume delivery as of 26 March. Many people believe that the struggle is over, because the announcement of the resumption was not reported widely. But the struggle continues.

NIF is under construction at Lawrence Livermore National Laboratory (LLNL), one of the two US nuclear-weapon design laboratories, located near San Francisco. The aim of NIF is to achieve the fusion explosion phenomenon of hydrogen bombs in a laboratory environment by using laser energy.

Hoya's glass slabs (79 x 44 x 4.5 cm), mixed with a slight amount of neodymium to amplify the laser, are essential for NIF. Hoya plans to supply half of the approximately 3,500 slabs needed for NIF, with the other half being supplied by Schott Glass Technologies, a US subsidiary of the Schott Group headquartered in Germany. They are the only companies that have the mass production technology for this special glass, and are also producing glass for Laser Megajoule, a similar weapons research facility being constructed by France. According to LLNL, by January this year, Hoya had produced 600 slabs for NIF and 125 for LMJ.

In a letter to the Japan Congress Against A- and H-Bombs dated 20 Feb. 2001, Hoya tried to justify its relation with NIF by saying that it understands that "the main focus of the NIF project is not the maintenance and expansion of the defense technology." Yet a US General Accounting Office report dated Aug. 2000 says about 85% of the facility's

experiments will be for nuclear weapons physics.

Hoya also maintains that "one of the NIF's missions is to avoid the danger of leaving nuclear weapons unattended." But the US is not going to leave nuclear weapons unattended, with or without NIF. And NIF is not helpful in preventing accidental nuclear explosions which might occur due to defects in the "primary" of the weapon, involving chemical explosives and plutonium. NIF's research concerns the "secondary," involving hydrogen isotopes that are designed to undergo fusion using the energy coming from the "primary." The "secondary" is not going to detonate on its own.

Frank von Hippel, a former scientific advisor to the Clinton administration, explains: "Since 1994, the leaders of the US nuclear-weapons design program have insisted that, in the absence of nuclear testing, NIF will be essential to their ability to maintain and enhance the laboratories' understanding of nuclear weapons physics. This is the principal mission of NIF." He also points out that NIF is an important part of "the US 'Stockpile Stewardship Program,' the program by which the US hopes to evaluate modifications in its nuclear weapons and train a new generation of US weapon scientists without conducting test nuclear explosions."*

In September 2001, the assemblies of two Japanese municipalities, Chofu City in the suburbs of Tokyo and Fuchu Town located within the city of Hiroshima, passed a resolution demanding the cancellation of Hoya's delivery to NIF. This makes the total of the municipalities now officially opposed to Hoya's involvement in NIF four, since the mayors of Hiroshima and Nagasaki have also sent protest letters to the company. The number may increase significantly in the December session of the local assemblies. A signature-collecting campaign against Hoya is also under way.

* The Mission of the U.S. National Ignition Facility (April 16, 2001) Japanese translation published in Kagaku Aug. 2001 Vol.71 No.8. For the English original, see <http://www.gensuikin.org/>

Nuclear Subsidies in Japan in Light of Kariwa Village's Rapika Incident

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INTRODUCTION

In Japan, the local municipalities in which nuclear power plants are located enjoy various forms of tax income. This article introduces a case of corruption involving such subsidies. There are three tax sources for the funding of these subsidies: the Electric Source Development Promotion tax which is included in the electricity fee; the nuclear fuel tax which is paid to the prefectures by the electric power companies when fuel is loaded into the reactors; and fixed property tax on nuclear plants.

There are three laws which regulate the collection and distribution of the Electric Source Development Promotion tax. These laws, commonly called the "Three Electric Power Laws (3EPL)," consist of the Electric Power Development Promotion Law, the Law on Special Accounts for Electric Power Development Acceleration Measures, and the Law on the Development of Areas Adjacent to Electric Power Generating Facilities.

According to these laws, subsidies are distributed to fund public projects, like the construction of

are located. Local municipalities prepare the application for receiving funds for a particular public project. The application is submitted to either the Ministry of Economy, Trade and Industry (METI), which controls commercial nuclear plants, or the Ministry of Education, Culture, Sports, Science and Technology (MEXT), which controls facilities for nuclear research and development. Then the controlling agency will review and discuss the project with the Ministry of Finance, and make the final decision based on the outcome of these discussions.

The government explains that the 3EPL is for implementing measures which assist "smooth" promotion of the development of electricity sources. Some say these subsidies find their way back to the central administration. Others say the system is an addictive drug: once nuclear facilities are built, local public projects become dependent on subsidies from the central government. In Niigata Prefecture, where Kariwa Village, featured in this story, is located, shopping centers, a medical facility, and greenhouses have

Situated at the border of Kashiwazaki City and Kariwa Village in Niigata Prefecture, Tokyo Electric's Kashiwazaki-Kariwa plant is the largest nuclear energy site in the world. Using a fund set up under the Three Electrical Power Laws (3EPL), Kariwa Village built the 'Rapika' adult education facility and a sports complex. The name 'Rapika' comes from the first letters of the English words for the village's main products, rice and peaches, and from the village's name. The adult education facility cost 6.5 billion yen, of which 5.6 billion yen came from the 3EPL fund, while the sports complex cost 2.1 billion yen, of which 1.5 billion yen was from 3EPL. The design was prepared in FY 1995 and the facilities were built from FY 1996~8. Rapika consists of a main building with a wooden tea ceremony room and pottery studio, a gymnasium, a heated pool, a library, a garden and a car park. The sports complex includes a baseball ground, tennis courts, and a public square.

In 1992, the Village commissioned a corporate foundation named the Center for Development of Power supply regions (CDP) to draw up the basic idea and plan of the facility. Then the village's general plan was finalized, and a specialist from CDP was delegated to Kariwa Village to participate in the planning, design and administration of the Rapika and sports complex projects. CDP is made up of people on lease from the METI and electricity companies. After a design competition, Ishihara/Yamaguchi Planning Research Institute won the design contract. The institute was also hired by the Village to supervise the construction. The construction was carried out by a conglomerate including Taisei Corporation, a powerful general contractor with a nation-wide business network.

The first revelation concerned the tatami mats (rush floor mats) for Rapika's tea ceremony room. The cost of the tea room was 710,000 yen/m². In the application, the tatami mats were reported to

cost 128,000 yen each. In fact, styrofoam mats were purchased for just under 10,000 yen each. In addition, the design included cypress pillars at 730,000 yen/m³, but composite materials were used instead. An ordinary house costs about 180,000 yen/m². So suspicions arose about this wooden building constructed at four times the standard price.

At first a special committee of the local council considered the matter. The village maintained that the project had been through inspections and investigations by Niigata Prefecture and the predecessor of METI, the Ministry of International Trade and Industry (MITI), so there was no problem. The excuse of the institute in charge of the design was that it was natural that good taste and elegance should be expensive. The majority faction in the local government set about covering up the matter, supposedly for the "greater benefit" of the many citizens who use the facilities.

On 11 May 2000, citizens submitted a petition to the village demanding an audit. The demand was rejected, the reason given being that over one year had elapsed since payment was made (30 April 1999). The tea room design specification and invoices (shipment certificates) were then obtained under freedom of information regulations. With proof that there had been falsifications regarding the cost of the tatami mats, the request for an audit was resubmitted on 1 June. This request was also rejected, so the citizens took the matter to court.

With the tatami mat falsification having been exposed, the village assembly adopted the right to conduct an investigation under article 100 of the Local Governing Law and began to receive evidence and to cross-examine witnesses in an attempt to clarify the issue. The investigation achieved a great deal and produced a report in March 2001, but the village, the METI, and the contractor all maintained that "overall, the construction exceeds the design specifications."

The Rapika problem was frequently raised in the Diet as an example of improper use of the 3EPL fund. Then in June this year, via a Diet member involved in checking public works projects, we obtained the application for funding and the specifications as at the time of approval. We

analyzed these documents and discovered that the Rapika specifications contained no precise estimate of costs or quantities of materials. The price record was mostly estimated unit prices and there were numerous examples of fixed rates and grossly over-estimated unit prices. We are in the process of pointing these out to the METI and to the Board of Audit.

Allocations from the 3EPL fund are decided on the basis of the amount of electricity generated, and for this reason Kariwa has received a concentrated amount of subsidies despite its population of only 5,000 people. Throughout the country, pro-nuclear groups assert that nuclear energy brings wealth to the region. However, it seems that there exists a system in which money from the 3EPL flows back to the center instead of truly being used for the benefit of local communities.

I suspect that the Rapika scandal was devised with an understanding between officials and the industry that "for the purpose of accomplishing a national policy, 3EPL fund projects can be treated leniently," and that is why the cover-up continued even after the initial revelation. Improper allocation of public funds authorized by METI and a construction project that does not comply with the design specifications is, in my opinion, a criminal offense. I intend to continue working on the Rapika scandal until the public funds are returned.* People say that the region became wealthy because of nuclear energy, but it seems to me that the sense of regional independence which underpins the desire to improve one's own region has been weakened. I hope that the Rapika scandal will spread awareness among Japanese citizens living in areas where there are plans for the penetration of nuclear facilities that regional plans which depend on outside funds are bound to fail.

* Editor's note: Subsequently, on 1 Oct., METI ordered the village to reconstruct the tea room, in addition to returning 140 mil. yen of the 5.7 bil. yen that was provided by the 3EPL fund. By the end of Nov., this incident will be documented in the Board of Audit's annual report. The amount to be returned to METI will depend on the figure to appear in this report. The village will most likely have to pay the required amount from its own budget. However, debates from now on will focus on clarifying the responsibilities of the village mayor, the govern-

ESCO and Energy Conservation in Japan

ment, and the construction company. Residents are demanding the Board of Audit make an accurate calculation of the amount that was falsified. After that, locals will calculate the village's loss, and then campaign to have that loss covered by those involved in the incident.

1. Japanese ESCOs Experiencing Expanding Business Opportunities

Simply said, ESCOs (Energy Service Companies) are companies whose business is to provide energy conservation services. Unlike energy conservation consultant companies or companies which develop and sell, or design and construct, energy conservation equipment, ESCOs provide a comprehensive service including consultation and equipment supply with a view to improving energy efficiency.

Fig.1 shows the mechanism of ESCO projects. During the contract period, the investment, interest payments, and expenses are all paid with the money saved by energy conserved (in most cases, customers can expect to earn some profit as well, even during this period). After the contract period finishes, savings resulting from the reduction in energy expenses become the client's profit.

The market for ESCOs in Japan has been expanding in recent years. Japan is still suffering under a recession, but this is working in favor of ESCOs. The limited growth in the economy is stimulating the desire in businesses to reduce expenditure on energy. The total of orders for ESCO projects jumped to 8.3 billion yen in FY 2000, compared to orders totaling 2.8 billion yen in FY 1998. It is expected that the figure will further rise to 45 billion yen for FY 2003. It is also estimated that there is a potential market as large as 2.5 trillion yen. The crude oil equivalent of this potential is about 4 Giga-liter.

Originally, private ESCO businesses were started up in the U.S. in the late '70s following the 1973 oil shock. However, ESCO business in Japan began with the leadership of the government in 1996. What caused this 20-year delay in the initiation of Japanese ESCOs? In Japan, each company manufactures and sells its own high-performing energy conservation equip-

ment, but there was never a business that provided a combination of the best selection of equipment manufactured by various makers

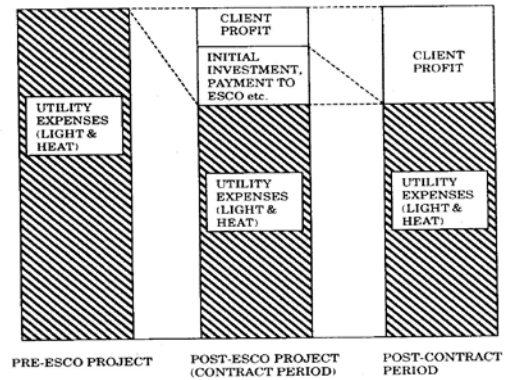


Fig. 1 ESCO Project System

for a comprehensive energy conservation system service. Moreover, the biggest obstacle for initiating ESCO business in Japan is the country's idiosyncratic financing system. In order to start up an ESCO company, the profitability of the business becomes the object of financing. In the past, however, Japanese banks have provided loans on the security of assets, and are unwilling to provide any loans for "project finance," which is not based on assets.

Starting this year, the Ministry of Economy, Trade and Industry (METI) has finally set out to assist ESCOs. Part of the background of this decision is the fact that it has become clear that it will be difficult to achieve a dramatic increase in nuclear energy capacity, as originally planned, to contribute to the reduction of CO₂ emissions, and that in order to reach the 6% reduction target set at COP3 in Kyoto, energy efficiency must be improved. The long-term energy supply and demand outlook released by METI's Comprehensive Energy Review Committee in July '01 estimates that in FY 2010, energy conservation by ESCO projects will reach about 1Giga-liter in the crude oil equivalent. The committee is also working on reviewing the problem with "project finance," and is expected to release a report this year.

2. True energy conservation

Things are not all rosy with the current Japa-

nese ESCO business either. As shown above, energy conservation is evaluated by the rate of money saved on energy expenses. However, it must be noted that by consuming more energy than necessary, not only does the utility bill rise, but equipment wears out, and product quality and the safety of workers also become undermined.

Focusing on the above-mentioned problems, the Micro ESCO Loss Elimination Business Union, directed by Yasuo Otani, looks at energy conservation from the opposite angle to standard ESCOs, which simply focus on reducing energy cost. "Micro" in the company's name refers to the fact that the staff consists of a small number of retired technicians. Their activities could be regarded as inefficient and time-consuming according to the standards of business-oriented ESCOs. The inspections for energy conservation diagnosis of standard ESCOs are conducted under a fixed routine. However, Otani's union makes detailed observation of each individual piece of equipment, visits the clients' factories and offices many times to conduct detailed inspections and surveys, and investigates and analyzes even the actions of workers and the waste that is produced.

Following are a couple of examples of energy conservation diagnosis provided by Otani's union. At an ice cream factory which produces a Japanese-style ice cream cookie sandwich, the plant was being operated seven days a week in order to keep up with the orders. Under severe pressure, workers were operating the machines faster than the speed they were designed for, and thus, the ice cream cookies were disfigured and wrappings were crooked — resulting in a massive number of products which did not meet standards.

Most likely, a standard ESCO would go only as far as recommending that the company buy equipment that performed better. However, Otani's union knows better than that. They pointed out that the improper use of equipment was burdening the workers, and that this was leading to the deterioration of product quality and the safety margin. Then they demonstrated that the

company could save more money just by using the machine at the speed it is designed for, rather than investing in new equipment. They also pointed out that if they did not reduce the current level of waste they would require a new incinerator and more time to treat waste, and that they'd be burdened by exhaust gas produced in the course of such treatment.

At a rubber factory that makes vibration-proof rubber for vehicles, processing and end-product manufacturing were all done in a large plant. It was extremely hot inside the plant, and the ten or so air conditioners were not helping at all. Otani's union pointed out that the air conditioners were simply circulating hot air that was being generated by the processing of rubber. The union advised that measures be taken to mitigate such heat instead of increasing the numbers of air conditioners. As a side note, there was an additional factor that contributed to this situation. Because this plant is situated in the vicinity of a nuclear power plant, about a month's worth of electricity per year is free. This was one of the reasons why the plant operators overlooked the increase in electricity cost resulting from the excessive use of air conditioners.

What can be said from these examples is that attempts which only focus on immediate benefits do not resolve the problems in the long run, and that wasteful energy use resulting from such attempts can actually work against what was supposed to be achieved. Maximum results cannot be obtained by simply increasing the amount of energy use, — in the ice cream factory case, the improper and excessive use of equipment was a problem, and in the rubber factory case, the improper and excessive use of air conditioners was adding to difficulties. Rather, there is an optimal figure for energy consumption that brings out the best result. As the name of Otani's union, Micro ESCO Loss Elimination, suggests, energy conservation is literally eliminating loss. There is a great potential in improving efficiency and the quality of life by implementing energy conservation measures which eliminate loss.

By Tadahiro Katsuta

Data: Japan's Separated Plutonium Inventory

FACILITY		Amount of Plutonium, as of the end of the year (kg, total plutonium)							
		1993	1994	1995	1996	1997	1998	1999	2000
Tokai Reprocessing Plant	Pu nitrate	238	710	597	384	385	384	375	365
	Pu oxide	38	125	155	217	153	154	154	217
	Total	326	836	753	602	538	537	528	582
Domestic MOX Fuel Fabrication Plant	Pu oxide	2,339	2,032	1,980	2,345	2,553	2,737	2,652	2,515
	Being processed	790	948	985	785	725	473	481	439
	Completed fuel	140	38	181	411	370	385	358	350
	Total	3,269	3,018	3,146	3,543	3,649	3,596	3,491	3,413
Reactor Sites (Stored as fresh fuel)	Joyo FBR	15	5	31	48	23	2	38	18
	Monju FBR	637	15	357	357	357	357	357	357
	Fugen ATR	12	53	0	43	0	34	0	0
	Commercial LWRs	0	0	0	0	0	0	465	465
	Critical assemblies	425	425	425	429	429	429	428	440
	Total	1,089	498	823	887	819	832	1,298	1,290
	DOMESTIC TOTAL	4,684	4,352	4,722	5,032	5,006	4,965	5,318	5,285
Reprocessing Plants	(BNFL, U.K.)	1,285	1,412	1,418	2,437	3,549	5,109	5,957	10,118
	(COGEMA, France)	4,911	7,308	9,960	12,653	15,534	18,290	20,639	21,953
	OVERSEAS TOTAL	6,197	8,720	11,378	15,090	19,083	24,398	27,596	32,070
TOTAL		10,881	13,072	16,100	20,122	24,089	29,363	32,913	37,355

Japan's total plutonium stockpile has increased 4.4 tHM since last year, and now exceeds 37 tHM. The domestic plutonium surplus has reached about 4 tHM, excluding the amount which is stored within reactor buildings. On 20 Nov. 2000, Tokai Reprocessing Plant, which had been shut down since the fire and explosion in March 1997, re-started its operation. The plant had reprocessed 8.5 tHM of spent fuel by the end of 2000, and the total amount of plutonium (Pu-tot) extracted there was 63 KgHM. But no domestic demand for this plutonium is expected in the near future. Currently the reactor core of Joyo Experimental Fast Breeder Reactor (FBR) is being reconstructed, and the plant will be shut down until 2003. Fugen Prototype Advanced Thermal Reactor (ATR) will be shut down in 2003. Each of these reactors consumes around 100 KgHM per year. It has been publicly announced that the Monju Prototype FBR will be re-started by 2005 at the earliest. Thus even when assuming that Monju will operate smoothly, 4 tHM of plutonium will suffice for the domestic

Compiled by CNIC

Data source: Atomic Energy Commission (AEC)

demand for at least 10 years. In the absence of plans for the use of domestic plutonium in light water reactors, the domestic plutonium stockpile is nothing but excess.

Japan has so far signed reprocessing contracts with France and England. All of the reprocessing contracts with the French company COGEMA and Japanese Electric Power Companies, for 2,944 tHM of spent Japanese nuclear fuel, were completed last year. About 24 tHM of plutonium, including amounts that were shipped to Japan, have been extracted in France. Currently, the MELOX plant in France is the only overseas plant fabricating MOX fuel for Japan. The extent of any further increase in Japan's plutonium stockpile depends upon the operating performance of British Nuclear Fuel plc (BNFL)'s THORP (Thermal Oxide Reprocessing Plant). However, BNFL is on the brink of bankruptcy, and there is a possibility that reprocessing at the plant will stop altogether.

By Hideyuki Ban

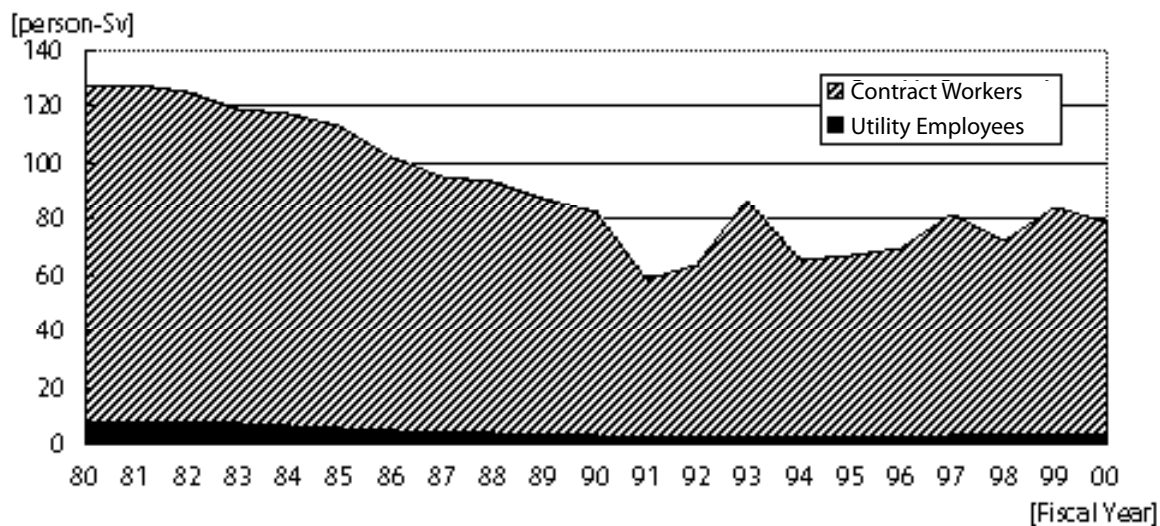
Data: Workers' Exposure at Nuclear Plants

Workers' Radiation Exposure at Nuclear Plants, 1980~2000
Annual Collective Dose of Nuclear Plant Workers (person-Sv)

Fiscal Year	Utility Employees	Contract Workers	Total
1980	7.96	119.52	127.47
1981	7.84	119.33	127.18
1982	7.33	117.67	125.00
1983	6.60	112.06	118.67
1984	5.97	111.25	117.23
1985	5.36	107.25	112.59
1986	4.31	97.68	101.98
1987	3.88	90.93	94.82
1988	3.76	89.00	92.76
1989	3.12	84.28	87.39
1990	2.96	79.01	81.94
1991	2.69	55.16	57.86
1992	2.66	60.89	63.54
1993	2.78	83.86	86.65
1994	2.45	62.48	64.89
1995	2.85	63.50	66.32
1996	2.92	66.10	68.99
1997	2.98	77.77	80.77
1998	3.07	68.78	71.85
1999	3.06	80.69	83.78
2000	3.13	75.72	78.83

*Fugen Prototype Advanced Thermal Reactor excluded
Source: Agency of Nuclear and Industrial Safety

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Anti-Nuke Who's Who

Kenji Higuchi

The Most Intriguing Photographer You'll Ever Meet

Kenji Higuchi is a great friend of CNIC. He has contributed hundreds of wonderful pictures to our publications. Indeed, his pictures have received high ratings from around the world, and this year he received the Nuclear-free Future Award.*

Higuchi was born in 1937, a son of a farmer in Nagano Prefecture. Without any definite plans, he left Nagano for Tokyo in the late '50s when he realized that Japanese agriculture, which was about to undergo a transition from manual labor to mechanized labor, had no future. But then his life was changed forever when he stumbled on Robert Capa's picture exhibition, which stirred up a great desire in Higuchi to document the suffering of those at the bottom in Japan. He had no prior knowledge of photography, so he went to a photography school for two years and then worked as an assistant teacher for two and a half years.

Then came the second turning point. A man had committed suicide in protest against the pollution being caused by petro-chemical plants in Yokkaichi City, Mie Prefecture. Higuchi was extremely alarmed, and rushed to the city. At first, things did not go smoothly, as people were very skeptical about journalists. But when the victims took the matter to court, they were advised by their defense council to enlist the aid of journalists. From then on, people, who in all likelihood were also convinced by Higuchi's earnest intentions, began to let him interview them. His involvement with Yokkaichi reached its final stage in 1972 with the court ruling in favor of the victims, and the subsequent publication of his first photograph collection.

Higuchi's third turning point came when, in early '70s, he learned about the fierce struggle against the plan to build a nuclear plant at Kashiwazaki-Kariwa. He rushed to the area to document the local residents' struggle, and got involved with their campaign himself. Then he learned of Mr. Iwasa — the first man to take the issue of workers' radiation exposure to court. Again with little prior knowledge, Higuchi studied



energy and radiation in order to clearly understand and document what Mr. Iwasa was talking about. Higuchi recalls saying to Mr. Iwasa that workers' exposure would not become a social issue while they were alive, but that by making a record of Mr. Iwasa's own suffering as well as the court case, they would leave material for those of the future generation that will sympathize with and carry on their work.

Ten, twenty, and thirty years have passed since then. Mr. Iwasa did not see workers' exposure become a social issue within his lifetime, but Higuchi succeeded in significantly raising awareness of the issue with his evocative and spirited pictures. There is now a committee that organizes exhibitions of his pictures across the country. He has also been invited to many places to give lectures.

Higuchi is all too aware that it takes a long time, some times too long, for social struggles to even receive attention — let alone to reach some kind of resolution. Now that he has received the Award, he says he is compelled to continue his work, though it is somewhat tempting to think about retiring and working on themes from his younger days. The piercing eyes of the farmer's son, a photographer with no tolerance of injustice, will continue to shed light on the dark side of the "prosperity" based on mass-use of energy and mass-consumption — a condition only made possible by the suffering of those at the bottom. (By Gaia Hoerner, based on an interview with Higuchi on 25 Sep. 2001)

nuclear* This award is given by an anti-nuclear association, World Uranium Hearing, which was established in 1992 and is based in München, Germany. The group has been making the award since 1998. The award has four categories: resistance activities, education, problem solving, and lifetime achievements. Higuchi was the fourth person to receive the award in the education section, and was the first Japanese to receive this award.

NEWS WATCH

Decommission Plans for Tokai Magnox Plant Submitted

On 4 Oct. '00, the Japan Atomic Power Company (JAPC) submitted to the Ministry of Economy, Trade, and Industry (METI) a request for the approval of its plans for the decommissioning of Japan's one and only gas-cooled (Magnox) reactor, the Tokai Plant. The company plans to begin preparatory work from 4 Dec.'01. The reactor core area is to be left alone during fiscal year 2001~10 while preparatory work progresses. Then it will be dismantled and the buildings will be removed during FY2011~17. The entire de-commissioning is planned to take 17 years and the company estimates about 93 bil. yen for the project. The company expects about 18,100 tons of low-level waste to result from the decommissioning process. Moreover, it expects to see about 45,400 tons of "waste which does not have to be treated as rad-waste" according to the "clearance level" set by the government. Such rad-waste under certain levels will be allowed to be disposed of with general waste, in addition to about 113,900 tons of "non-radioactive waste" estimated to emerge from the process. Low-level waste with higher radiation levels will either be taken to the Low-level Waste Disposal Center at Rokkasho, Aomori Prefecture, or to a new facility that is to be built to dispose of waste from decommissioning that has high levels of beta and gamma radiation.

ANIS Instructs Companies to Inspect BWR Shrouds

On 6 Sep. '01, METI's Agency of Nuclear and Industrial Safety (ANIS) instructed the five utilities which own BWRs to inspect shrouds (cylindrical supportive structures which surround the reactor cores) to see whether or not there are

stress corrosion cracks, and to report the findings.

This was in response to the discovery, during a regular annual inspection at the Tokyo Electric Power Company (TEPCO)'s Fukushima II-3 (BWR, 1,100 MW) on 6 July 2001, of a series of cracks along the circumference near the welds of the ring in the lower part of the shroud. Although the material used for the shroud was stainless steel with a lower carbon content specifically developed to prevent stress corrosion cracks, the major cause for the cracks is considered to be the negligence of measures reducing the effect of residual stress created at the time of welding. Thus the ANIS instructed power companies to identify reactors which have shrouds that have been manufactured with similar methods and have not been treated for residual stress, and to conduct visual checks. ANIS has also instructed TEPCO, which is planning to repair Fukushima II-3's shroud using a tie-rod method, to assess the structural health of the tie-rods and their accessories, as well as the impact of tie-rods on the existing equipment and facilities.

In Jan. 1989, at Fukushima II-3, an underwater-bearing ring of a recirculation pump fell off and the pump was severely damaged. As a result, a total of 30 kg of metal fragments flowed into the reactor.

Approval of Plebiscite Ordinance for Inviting Nuclear Plant

On 21 Sep.'01, the Miyama Town Council in Mie Prefecture passed an ordinance, with a majority vote, to hold a referendum asking whether to invite a plan to construct a nuclear plant. The bill was tabled by the town executive officials, and the plebiscite will take place on 18 Nov. '01.

This referendum has two major features. Firstly, the utility does not even have a plan yet to build a nuclear power plant in this town. Secondly, the bill was proposed by nuclear promoters (it is said that the Town Mayor, who is a civil engineering and building contractor, was the one pulling the strings).

Miyama Town is located 15 km southwest in a straight line from the former planned site for the Chubu Electric Power Co.'s Ashihama nuclear plant. The company had given up on this project in Feb. 2000, after the governor of Mie Prefecture announced that plans for Ashihama should be cancelled (see NIT 76, p.3). As an alternative to the plan for Ashihama nuclear plant, local building contractors (who are also town councilors) waged a campaign to have the plant built in Miyama Town. Since they collected petitions in favor of the project from more than 63% of the constituents, they proposed the plebiscite with confidence.

However, many people who signed the petition did so reluctantly under pressure in relation to their work, or because they were asked by relatives, and in reality not all of the 63% of the constituents want to invite the plant. However, it is true that in the face of a rapidly decreasing population, there are people who have great expectations of receiving large sums of money by having a nuclear plant built in the town. Thus, this referendum should be followed with vigilance.

MHI Participate in the AP 1000 Program

On 6 Sep. 2001, Mitsubishi Heavy Industries, Ltd. (MHI) announced that it reached a basic agreement with the United States' Westinghouse (WH) company to participate in the "AP 1000," the program for the next generation of PWRs which WH has launched for the U.S. market. Electricité de France (EdF) and British Nuclear Fuels plc (BNFL) also plan to join this project.

AP 1000 is a larger version of WH's "AP 600" (output 600 MW), which received its final design approval from the Nuclear Regulatory Commission (NRC) at the end of 1999. AP 1000 has the more impressive output of 1000 MW. Described

as a passive reactor, it is said to be distinctive because it is designed to use pumps or electric valves as little as possible, and instead circulates cooling water naturally by gravity.

MHI will participate in three areas: core development design; system development design; and equipment development design. WH hopes to obtain NRC's final design approval by the end of 2004 and to receive an order for the first reactor in 2005. By taking charge of manufacturing major equipment, MHI intends to make a full-scale incursion into the U.S. market.

However, as with AP 600, there is a great possibility that there will be few or no orders for AP 1000, even if it obtains a final design approval.

On 17 Aug., MHI also announced that PBMR Co. had unofficially asked to conduct a feasibility study for a helium turbine generator for the Pebble Bed Modular Reactor (PBMR), a small-sized high-temperature gas reactor. The PBMR will have a similar output to that of AP 1000. The word "pebble" refers to the reactor's ball-shaped fuel.

The Japanese power companies are indifferent to MHI's move, saying that it is after all uneconomical to construct several of these low-output reactors in order to be able to meet the electricity demand.

The Ironic Effects of Electricity Market Deregulation

For yet another year, METI will not be using nuclear-generated electricity in its offices. As a result of the competitive tender held on 10 August 2001 for electricity to be used at the METI's main building, TEPCO lost the tender for the second year in a row, and an independent power producer, Diamond Power, was announced as the successful bidder.

This means that not only will METI not use nuclear-generated electricity, it will not be paying fees to cover subsidies to local governments where nuclear plants were built, or fees for the treatment of high-level rad-wastes, which are included in bills for electricity produced by TEPCO.