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MOX Data Fabrication:
Lack of Regulatory Ability Exposed

(Left) Protest against MOX utilization. (Right) X-ray photo of rejected BNFL fuel rods (source: Kansai Electric)

The criticality accident at Tokai last fall demonstrated the inherent risks of nuclear energy, and forced Japan to review its nuclear power policies. Shortly before, and soon after, this worst-ever accident in Japan's nuclear history on Sep. 30, 1999, MOX fuel manufactured at British Nuclear Fuels plc (BNFL) and Belgonuclaire arrived in Japan. It was later revealed that data for the quality control of the BNFL fuel had been falsified.

The ships carrying MOX fuel left Europe in mid-July and delivered 32 assemblies to Tokyo Electric's Fukushima I plant (BWR) on the eastern side of Japan on Sep. 27, 1999, and eight assemblies to Takahama Plant (PWR) on Oct. 1, the day after the JCO accident. Data fabrication by BNFL was revealed on Sep. 19, after the ship had left the British port, by an article in the UK newspaper, The Independent, which was based on inside information. Kansai Electric announced that it had postponed the loading of MOX fuel into Takahama 3 on

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November 1, and Takahama 4 on December 20. The use of MOX fuel manufactured by BNFL was canceled, and MOX fuel currently under process at French company COGEMA is planned to be loaded.

The UK Nuclear Installations Inspectorate (NII), which investigated the data falsification, released a report on their findings on Feb. 18, 2000. The report states that "one example of falsification has been found dating back to 1996," and that "a systematic management failure allowed various individuals to falsify quality assurance records." - thus making it amply clear that poor management at BNFL was one of the reasons why the data falsification was allowed to continue for so long. Furthermore, John Taylor, the recently resigned chief executive of BNFL who visited Kansai Electric, reported that "two fuel rods were rejected because a small concrete block and a screw were found to be mixed in with the pellets." These problems touch on rudimentary issues, demonstrating that there is inadequate control of stages of the manufacturing process preceding data specification. It seems that the production of MOX fuel is a dubious business from the bottom up.

But the problems are even more serious than this; the fuel with falsified data had passed the inspection of the Ministry of International Trade and Industry (MITI) which is the regulatory body for nuclear fuel in Japan. Kansai Electric witnessed the inspection during manufacturing, and the fuel passed an external inspection by MITI upon arriving in Japan. The agency was also prepared to pass the fuel for inspection prior to its being loaded into the reactor. Kansai Electric only cancelled its application for approval to burn this particular MOX fuel after the news reports in the UK and analysis of the fuel data by Japanese NGOs forced the company to admit that data fabrication had taken place.

These circumstances show that nuclear fuel regulation in Japan is virtually non-existent. MITI's inspections and regulations are done almost entirely on paper; there is no adequate system for detecting such anomalies as screws mixed in with pellets, nor is there a system for determining whether data has been tampered with. Throughout this series of scandals, MITI and the Nuclear Safety Commission have maintained that there are "no problems" with the fuel. They have refused to admit, or even discuss the possibility, that the provisions for inspection and regulation are insufficient.

The data fabrication scandal has cast light on a fundamental problem for Japan's nuclear power program: no one individual and no single institution can determine - let alone guarantee - the safety of nuclear energy.

by Masako Sawai

[We have made the NII report available on our web-site.]

SUBSCRIPTION

Nuke Info Tokyo is a bi-monthly newsletter that aims to provide foreign friends with up-to-date information on the Japanese nuclear industry as well as on the movements against it. Please write to us for a subscription (subscription rates: Regular subscriber - $30 or ¥3,000/year; supporting subscriber $50 or ¥5,000/year). The subscription fee should be remitted from a post office to our post office account No. 00160-0-185799, HANGENPATU-NEWS. We would also appreciate receiving information and newsletters from groups abroad in exchange for this newsletter. (When sending the subscription fee from overseas, please send it by international postal money order.)

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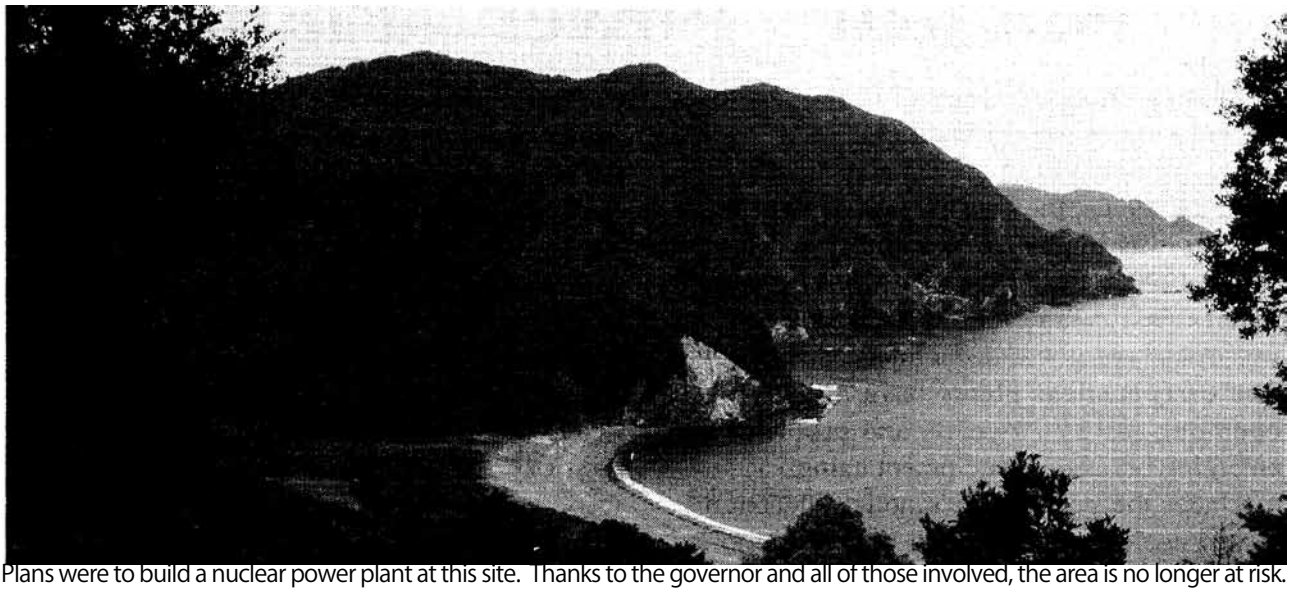
Plans For Nuclear Power Plant at Ashihama Dropped



Plans were to build a nuclear power plant at this site. Thanks to the governor and all of those involved, the area is no longer at risk.

On February 22, Kitagawa Masayasu, the Governor of Mie Prefecture, announced in the course of a policy speech to the prefectural assembly that plans for the Ashihama nuclear power plant should be cancelled. The president of the Chubu Electric Power Co., Hiroji Ota, responded on the same day that the utility intended to abandon the plan. This marked the end of a plan that had plagued local citizens for 37 long years.

Chubu Electric first announced its plan to build a nuclear plant in 1963. The site straddled the border between Nanto Town and Kisei Town in Mie Prefecture, and while the town assembly of Nanto decided in 1964 to oppose the plan, the Kisei assembly voted to encourage it.

In 1993, Nanto's town assembly reaffirmed its opposition. In 1996, over 810,000 of Mie's citizens -- well over half of the electorate -- signed petitions opposing the plan, which they submitted to the governor.

In 1997, the government asked Chubu Electric, Nanto Town, and Kisei Town to observe a cooling-off period until the end of 1999. All three parties consented, and halted their respective activities for opposition and promotion. Meanwhile, Mie prefecture consulted with experts and made inspection tours of nuclear power facilities, and after the cooling-off period concluded, the governor made his announcement.

There is no doubt that many prefectural citizens welcome the plan's cancellation. It must have been good news even to Chubu Electric because, with the leveling off in electric power demand, and the struggle for the electric power industry to hold its own under deregulation, building a nuclear plant was simply not an option for the utility if it wanted to preserve its own corporate well-being.

It is now evident that Japan's plans for nuclear power development are overambitious. Surely now is the time to cancel all such construction plans and take a big step toward phasing out nuclear power.

by Nishio Baku

Problems Caused by the Decommissioning of Nuclear Power Plants

1. Japan's Situation Regarding the Disposal of Decommissioned Reactors

In the 1970s, the construction of light water reactors was implemented rapidly, and by the end of 1999, a total of 53 plants had been built. Japan's first commercial nuclear power plant was Tokai and it was decommissioned in 1998. The early nuclear plants have already been operating for 25-30 years, and problems are emerging because of equipment aging.

Under the government's policy, decommissioned nuclear plants will all be left five to ten years (cooling period), after which another eight to 10 years would be required for dismantling. If we assume a lifetime of 40 years, a cooling period of five years, and dismantling period of eight years, then an increasing number of plants would be decommissioned in the mid 2010s, and the dismantling of those reactors would be concentrated in the 2020s through the 2040s (Fig. 1).

The government's recent energy plan calls for building an additional 20 reactors by 2010 with the goal being 70 GW of nuclear capacity, and under a longer term outlook there are plans for increasing capacity to 100 GW by 2030 (Fig.2). If Japan is to have 100 GW in 2030 so as to compensate also for the capacity loss due to this reactor decommissioning, the country will be required to build two to six 1100 MW-class nuclear plants each year. However, judging by the current inability of Japan's electric power and nuclear power industries to build even one plant a year, such a goal is quite unrealistic.

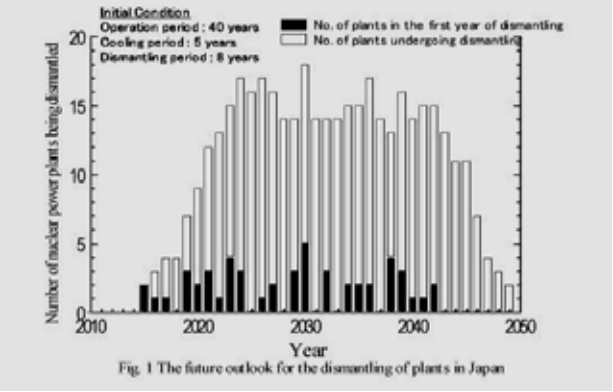


Fig. 1 The future outlook for the dismantling of plants in Japan

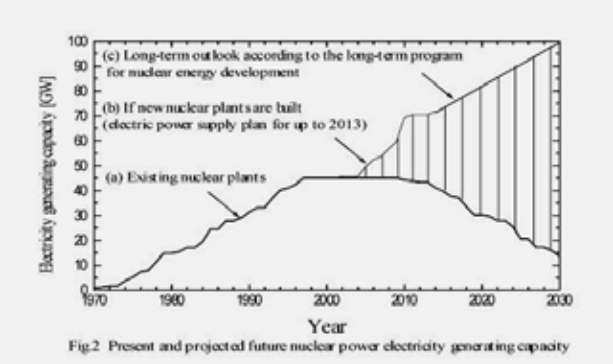


Fig.2 Present and projected future nuclear power electricity generating capacity

2. Wastes from Decommissioned Reactors

2.1 The amount of wastes generated

The Nuclear Power Working Group of the Advisory Committee on Energy claims that radioactive wastes from reactor dismantling belong to the same category as wastes generated in conjunction with plant operation (work clothing worn in controlled areas, etc.). The low concentrations of radioactive substances make them "low-level radioactive wastes." However, the Working Group actually considers everything except highly radioactive wastes as low level. Even items like the

interior structural parts of reactors and pressure vessels are put into the low-level category. Table I shows the classification of wastes by the Working Group.

According to the Working Group, the clearance level is apparently a concentration level of radioactive substances in dismantling wastes that requires no consideration of radiation impact on humans or the environment even when no special measures are taken to treat the wastes. As illustrated in the dismantling waste categories created by the Working Group, the term "clearance level" indicates that wastes whose concentration levels are below 1x106 Bq/t are to be disposed as general wastes, which we believe entails serious problems. The government's idea is that even substances that have been artificially contaminated with radioactivity will be disposed along with ordinary wastes if their concentrations are below a certain level. But there is no reason why, in addition to the radiation we receive in everyday life already, we must also suffer exposure to radioactive substances that will enter our lives due to the establishment of such a clearance level, and it is therefore not right to prescribe a level of this kind. What is more, the Working Group's assumption that we need not consider the human dangers of exposure caused by discarding wastes of a concentration below this level - i.e., in the category of general wastes - is very questionable indeed.

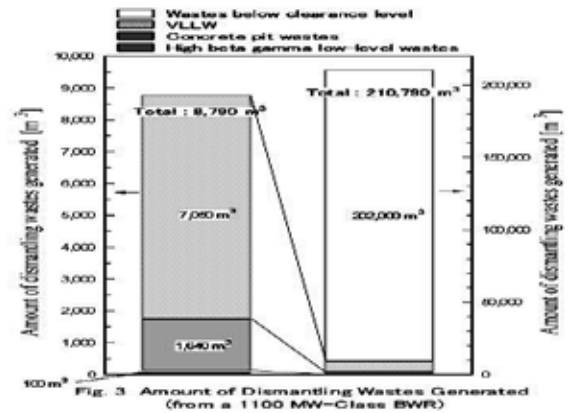


Fig. 3 Amount of Dismantling Wastes Generated (from a 1100 MW-Class BWR)

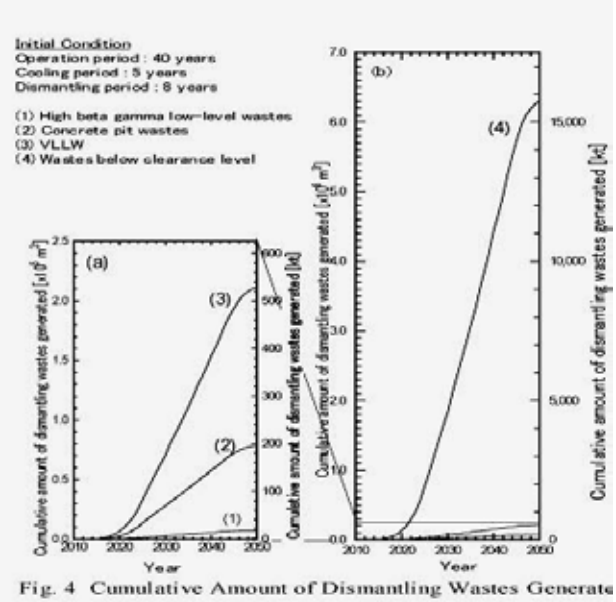


Fig. 4 Cumulative Amount of Dismantling Wastes Generate

Fig. 3 shows the amount of wastes generated when dismantling a 1100 MW-class Boiling Water Reactor (BWR). (a) is the amount anticipated by the government, which totals 8,790 m3. But if we take all wastes into consideration, as shown in (b), the amount generated will be about 20 times as much, or 210,790 m3 per reactor.

Fig. 4 shows the amount of wastes accumulated over the years. (a) does not include wastes below the clearance level. As this illustrates, the low-level wastes above the clearance level alone, will amount to about 2.1x105 m3 (about 525 kt) in 2050. However, when wastes below clearance level are added, as in (b), the amount comes to more than 6x106 m3 (over 15 Mt), which is far larger than in (a).

In the final analysis, dismantling is bound to result in the rapid accumulation of an unimaginably huge amount of waste, and it seems that the only available answer to this problem is to entrust the disposal of these mountains of toxic substances to future generations.

2.2 The Economics of Decommissioning Reactors

The cost of dismantling is considered to be about 40 billion yen per plant. However, an interim report by the Advisory Committee on Energy estimates that in addition to this, about 17.8 billion yen (for an 1100 MW-class BWR) will be needed to cover the processing, inspection, transport, and disposal of dismantling wastes.

According to Japan Nuclear Fuel Ltd.'s annual financial statement, sales data for its underground waste disposal operation indicate that, 11.8 billion yen were spent for 19,520 drums (each 200 liters or 0.5 t), which comes to about 600,000 yen per drum. If we use this as a standard, then, using the results in Fig. 4(a) and assuming that high beta gamma, concrete pit, and VLLW are all disposed in drums, that comes to about 44,000 drums when wastes below clearance level are not included. The disposal of 8,790 m3 (about 22,000 t) would therefore cost about 26.4 billion yen. Thus, a consideration of disposal costs alone shows that, simply for the amount of wastes to be buried, the 17.8 billion yen estimate of the aforementioned interim report is about half of the actual cost, making the government's figure a gross underestimate. If we include the wastes below clearance level, that cost is about 633 billion yen. In other words, if all dismantling wastes are buried according to present law without resorting to the clearance level, disposal costs will be inflated by about 20 times. These disposal costs are about twice the construction costs of 1100 MW-class plants of the respective reactor types.

These massive expenses must be the real reason why the government and electric utilities want to dispose wastes of decommissioned reactors using the dangerous and reckless notion of clearance level. Depending on how this problem is managed, it could disrupt the entire economic foundation of the nuclear power industry, and thus undermine its very basis for existence. From these estimations, beginning in 2010 we will force future generations to pay colossal sums of money, not to generate electricity, but just to decommission nuclear reactors and attend to their wastes.

3. Aging of Nuclear Plants

3.1 Problems of Plant Aging

Ordinarily, the lifetime of a nuclear power plant is assumed to be about 30-40 years. However, the government is considering life extension because of the expense and the enormous amounts of waste produced by decommissioning.

The Japan's Atomic Energy Commission and Nuclear Safety Commission have channels for considering how to manage reactor decommissioning, and there is much technical discussion on matters including methods for dismantling and removal. However, there is no discussion at all on the creation of standards with regard to the vital matter of what kind of indicators are used and what extent of safety margin is expected when deciding on reactor decommissioning. This makes it possible that henceforth reactor decommissioning will be postponed owing to political judgments by the electric utilities, and that aged, dangerous nuclear plants with no economic merit will be kept in operation, necessitating a papering over of their problems. Stopping this will definitely require the vigilance of the citizens. The indications of the dangers posed by aging reactors are easy to see; some of them are described below.

To study the aging problem we assumed the following two types of nuclear power plants.

(1) Nos. 1, 2, 3: Three representative plants that began operating early and have been in service for a comparatively long time (No.1 : Fukushima I-1, No.2 : Mihama 1, No.3 : Tsuruga 1). The years of operation are 28,29,29 respectively (as of 1999).

(2) Nos. 4, 5: Two representative plants not long in operation (No.4 : Sendai 1, No.5 :

Onagawa 1). The years of operation are 15 each.

3.2 Decrease of Capacity Factor and Age-Induced Troubles

Fig. 5 illustrates how the capacity factor changes with the passage of years. We took the average capacity factor for aged plants (Nos. 1, 2, 3), and smoothed the curve using three-year averages. The plots (black dots) show the actual values from the above process, the broken line curve showing the trend. As the graph clearly shows, the aged nuclear plants reached their utilization factor peaks 15-20 years after beginning operation, after which the factor declined. During the first few years the factor is under 50%, which may have much to do with the accident suffered by Mihama 1. in its early years, in which radioactivity leaked from its steam generator tubes, causing a shutdown. Although our results were dependent also on the conditions at the plants chosen for this study, such smoothing revealed a trend that would have been hard to discern by examining only the utilization factor data for each individual plant. The results show that these aged plants are overtaxing their equipment. The as- yet unaged plants (Nos. 4, 5) have capacity factors of about 78%, which is perhaps due to their higher technological levels. However, comparison with these unaged plants shows that the capacity factors of the aged plants will not improve despite major repair or improvement efforts to prolong their life-

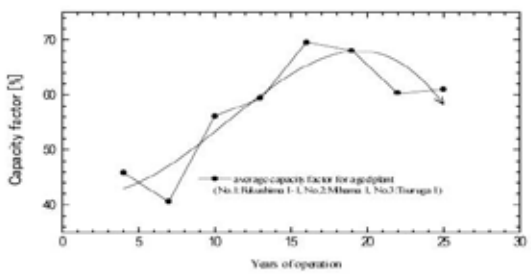


Fig. 5 Time-dependence of capacity factor for aging plants

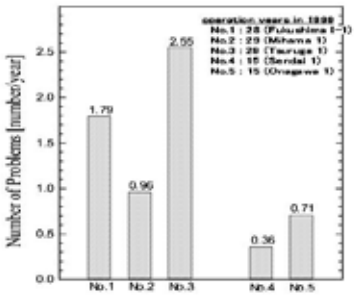


Fig. 6 Comparison of Number of Prolems Occurring

times.

Fig.6 shows the number of problems for each nuclear plants. The number of incidents for each reactor was divided by its years in operation to determine the average annual number of incidents. Troubles include automatic and manual shutdowns during operation, damage to steam generators during shutdowns, etc. These results include not only incidents related to aging, but all reported problems. Nevertheless, they demonstrate that aged nuclear plants clearly have a much larger number of problems. Furthermore, this result shows that while aged nuclear plants average 1.76 incidents a year, newer plants average 0.53 a year, which is a difference of over three to one. This poses a serious safety problem for nuclear power.

4. Conclusion

The notion of a "clearance level" looks very much like a ploy by which the government hopes to underestimate both the amount of waste created by the dismantling of nuclear power plants and the cost of the dismantling process itself.

As this study makes clear, even if we lay aside the many other problems caused by the nuclear power industry, the enormous safety, environmental and economic problems involved in the dismantling of aging plants are sufficient in themselves to justify the belief that the nuclear energy system is anything but "sustainable."

by Tadahiro Katsuta

JCO Criticality Accident: STA Lowers Evaluation Levels of Exposure Dose

On Jan. 31, 2000, the Science and Technology Agency (STA) released the exposure levels of the local residents and the workers who carried out various tasks, such as the extraction of coolant water, during efforts to contain the criticality accident at Tokai-mura, Ibaraki Prefecture in September last year. These levels are drastically lower than the previous dose level evaluations. STA explains that in the case of residents, lower dose levels are the result of considering the shielding effects of buildings, and for the workers, a result of revising sensitivity of the pocket dosimeters and neutron Rem counters.

According to the report, there were 119 residents who were exposed to more than 1mSv, the annual dose limit for the public, and the highest exposure rate is estimated as low as 21mSv. As for exposed workers, the worker who was measured to have received 120mSv during the extraction of coolant water is estimated in the latest report to have been exposed to less than 50mSv. However, this is just one evaluation result which itself contains margins of error, and could easily be several times larger or smaller depending on methods of evaluation.

On Feb. 16, CNIC, acting with the "Criticality Accident Victims' Group," submitted a proposal to the STA and the Nuclear Regulatory Commission regarding the details of the exposure dose evaluation for this accident and the ways these agencies have been treating the local residents.

The proposal contained the following four demands; 1) The withdrawal of, and an apology for propagandizing to the public the false argument that doses less than 200mSv or 50msv are safe, thereby implying that there is a threshold level of safety. 2) A scientific reevaluation of the latest dose level estimates. 3) A repeat of the dose evaluation for the JCO accident on the basis of the 1990 recommendations of the International Commission on Radiological Protection. 4) Exposed residents must be guaranteed health examinations in accordance with those for nuclear-workers, including blood tests, and that they should be issued with health management cards.

JCO plant. The site of the criticality accident on Sep. 30, 1999. (photo by Kenji Higuchi)

by Chihiro Kamisawa

Description of the exposed people	number		Max. exposure in mSv except for the three severely exposed people
JCO employees at the site of the accident	3	A	16~20 (gray-equivalent)
		B	6~10 (gray-equivalent)
		C	1~4.5 (gray-equivalent)
Employees at the plant (measured)	49		over 45 ~ under 50
JCO employees at the plant (estimated)	96		over 15 ~ under 20
Members of task-force for stopping criticality (measured)	24		over 45 ~ under 50
Accident response task-force members who were not JCO employees (measured)	60		over 5 ~ under 10
Residents near the plant (measured)	7		over 45 ~ under 50
Local residents (estimated)	200		over 45 ~ under 50
TOTAL	439		

STA's Estimation on Exposure Dose

Updates on Nuclear Facilities at Rokkasho Village, Aomori

Missing parts at reprocessing plant

Work on construction of the Rokkasho Reprocessing Plant is proceeding on a 24-hour schedule, with three continuous shifts, in an effort to have the plant running by 2005. Work has been hindered, however, by the discovery of a number of missing or faulty parts. The faulty components were found in liquid waste storage vessels, which were manufactured by Hitachi. The company imported reprocessing technology from the French company COGEMA, but it had neglected to transcribe some parts of COGEMA's original machinery structure plan.

Liquid Waste Storage Vessel No.1 was not equipped with an "air lift" (about 10 cm long) which is necessary to extract samples of liquid waste. Out of sixteen cooling coils of each of the two high-level concentrated Liquid Waste Temporary Storage Vessels, only twelve were equipped with 20 cm long anti-seismic supports.

Hitachi had informed Japan Nuclear Fuel Limited (JNFL) of the missing parts on Feb. 17, 2000. However, JNFL did not make this information public until Feb. 25. The information was simply concealed until the high-level waste had arrived. The governor of Aomori, Morihisa Kimura, was furious that the company had not only withheld this information but was not able to detect faults in the construction until recently. The company had deceived local residents and the local government. It is disgraceful that JNFL has resorted to deception in an effort to obviate the reasonable concerns of local residents and government officials. The failure to make an accurate copy of the COGEMA blue-print, as described above, is also a cause of grave concern, since the Rokkasho plant relies solely on imported technology. The safety of the plant is now in serious doubt.

Fifth shipment of high-level waste arrives at Rokkasho

One hundred and four canisters of vitrified high-level waste arrived at Rokkasho early in the morning of February 23, 2000. The transport ship Pacific Swan sailed through the Panama Canal, which has been used twice in the past, and the concerns of the Caribbean people over the transportation are mounting. Representing the voice of the Caribbean people, Tito de Jesus flew from Puerto Rico to join Japanese citizens in their protests against the arrival of the ship at Mutsu-Ogasawara port in Rokkasho.

The high-level waste shipped this time includes liquid waste originating from French gas-cooled reactors and fast breeder reactors. The Federation of Electric Power Companies, which oversees reprocessing contracts, has publicly announced that further shipments of radioactive waste will be returned to Japan, and that 200 canisters will be transported with each shipment.

Uranium Enrichment Facility

JNFL announced on Feb. 28, 2000 that one of the manufacturing lines at the Uranium Enrichment Facility will be shut down. This facility is running with 1100SWU, and has five lines. One of the cascade lines called RE-1A has experienced continual problems, and already over 4000 centrifuge units have shut down. RE-1A was the first one to be operated, and has been running since 1992. According to the officials, the total number of centrifuge units at the facility cannot be made public due to concerns over proliferation of nuclear materials. In any case, the facility has not been able to prepare uranium which meets the specified concentration. RE-1A will be shut down in April, 2000. by Masako Sawai

Anti-Nuke Who's Who

Kazumasa Aizawa

A man to free Tokai of its nuclear burdens

By Hiroshi Kuroha

Anti-Nuke Ibaraki Action Association

Tokaimura is located in North Ibaraki prefecture near the center of Japan. This small village with a population of about 34,000 and an area of 37 square kilometres has lived with nuclear power for more than 40 years. Fifteen nuclear facilities occupy 13.4% of the village area. A third of villagers work for nuclear facilities. The village has enjoyed tax incomes from nuclear facilities, as well as many fine civic facilities and well-maintained roads.

Tokaimura has developed itself as "the Village of Nuclear Power." It was a taboo to criticise nuclear power energy there, and it appeared as if words such as "anti-nuclear" or "nuclear phase-out" did not exist in the Tokai vocabulary.

However, the fire and explosion of the Tokai Reprocessing Plant three years ago and the recent JCO criticality accident have certainly affected villagers. This became apparent at the Village Assembly election which was held soon after the JCO accident - for the first time in a village history dominated by nuclear power, an anti-nuclear candidate, 58 year-old Kazumasa Aizawa, was elected as the Villages Assembly member.

Mr. Aizawa had been a researcher of the modern history of Japan at the Ibaraki Prefecture Historical Museum until becoming the assembly member. He had not intended to join the election until shortly before the election day. However, he was outraged that even after the JCO accident, candidates to the assembly did not talk about the danger

or the rights or wrongs of nuclear power. Thus, he resigned his long-held position and stood for the election.

He has been involved with anti-nuclear movement for a long time. For example, he is the representative of plaintiffs of the Tokai II Plant Case. He is a man of gentle but strong and enduring will.

Many troubles await him as the only assembly member who advocates nuclear phase-out in Tokaimura. But I'm sure that in his effort to make Tokaimura a much safer place for its people, Mr Aizawa will lead Tokaimura in the new century from being "the village of nuclear power" to "a village of nuclear phase-out."

NEWS WATCH

People of Maki-machi Once Again Vote Against Nuclear Plant

In a plebiscite which was held in Maki-machi, Niigata Prefecture, on August 4, 1996, 61% of the voters opposed the plan by Tohoku Electric to construct a nuclear power plant in the area. At the mayoral election in Maki-machi on January 16, 2000, the current mayor, Takashi Sasaguchi, whose platform included the proposal to have Tohoku Electric abandon their construction plans, was reelected. The day after his re-election, the mayor expressed his intentions to personally visit Tohoku Electric and the Ministry of International Trade and Industry to demand that the plan be canceled. The company has refused to meet with the mayor.

Claims of Nuclear Power Costs Mere Propaganda

In December last year, for the first time in five years, the Agency of Natural Resources and Energy published the trial costs of power generation by types of power generators. According to the report, nuclear power costs ¥5.9 per 1 kWh, LNG-fired thermal power ¥6.4, coal-fired thermal power ¥6.5, petroleum-fired thermal power ¥10.2 and hydropower ¥13.6. It is no wonder that the nuclear power is the cheapest, for these figures are propaganda.

Over the past ten years, the Agency stated that the cost of power generation by nuclear power was ¥9/kWh. Why, then, was it reduced to ¥5.9/kWh? The explanation lies in the change of the assumptions guiding the calculation. First, the service life was lengthened: it used to be set to 15 years for thermal power and 16 years for nuclear power, but this was radically extended to 40 years. Then, the capacity factor was raised from 70% to 80%. These changes were made more advantageous to nuclear power plants, whose cost of construction is high and cost of fuel relatively low. There was no change in the conditions of hydropower: the service life was set to 40 years and the capacity factor 45%.

The reason for these changes is that without them the cost of LNG-fired thermal power would become cheaper, and the Agency could not say "nuclear power is the cheapest." For reference, according to a trial calculation published five years ago, the cost of power generation by nuclear power and LNG-fired thermal power was the same, at ¥9/kWh, that by coal and petroleum was ¥10/kWh and by hydropower ¥13/kWh. In recent calculation LNG-fired thermal power was made to be only ¥0.5/kWh higher than nuclear power.

But even now, if we adjust the calculations totally with the current exchange rate of ¥128 to the dollar, the cost of LNG-fired thermal power becomes cheaper. It seems that the Agency will once again have to come up with altered conditions for the calculation to ensure that nuclear power seems to be the cheapest.

The Agency did not show any detailed breakdown when they published the trial values of power generation costs. Those details mentioned include only the cost

of reprocessing (¥0.63/kWh), and the cost of treatment and disposal of radioactive wastes (¥0.25/kWh). If you work backwards and calculate the cost of reprocessing per 1 tHM of spent fuel from the reported reprocessing cost, you get a figure of less than ¥300 million. Since the actual cost of Rokkasho reprocessing plant is believed to be ¥300-500 million, the estimate for spent fuel is clearly too low. The treatment and disposal of radioactive waste is an inordinately expensive process, and for this reason alone there can be no question that nuclear power costs more than the Agency's report has suggested.

Although it is not included in the recent trial calculation, as much as ¥400-500 billion has been appropriated every year from the national budget for nuclear power development. For thermal power development the budget appropriation is ¥20-25 billion. The fact that nuclear power requires a long-distance transmission, also adds significantly to the cost of this form of power.

JGC Corp. Sign Agreement on Business Collaboration with Korean Firm

JGC Corp. announced on February 15 that the company had signed a business agreement with KOPEC, a subsidiary of Korea Electric. Under this agreement, JGC will allow KOPEC to make use of its engineering know-how in all fields of radioactive waste management. Only last year Korea lifted its ban on imports of nuclear equipment and technologies from Japan. This agreement will be the first full-scale technical cooperation between the two countries.

In the immediate future, the major task will be the construction of low-level radioactive waste solidification facilities in nuclear plants in Korea. KOPEC is participating in the project to construct a light-water reactor in North Korea, and JGC is looking for an opportunity to join the project. It also aims at business expansion in the Asian market, including China, in cooperation with KOPEC.

Nuclear Power Industry Plagued by Y2K Glitches

Contrary to some people's concerns, the arrival of the new century brought no major disruptions to nuclear power facilities in Japan. However, there were a number of small Y2K problems, and we cannot be entirely sure that there will be no further such problems in the future.

Some of the difficulties which occurred were caused by computers reading the year "99" as "2099" or "00" as "1900." In many cases, the interruption of data processing meant that the malfunction was quickly recognized, allowing proper measures to be taken to avoid more serious difficulties. At Fukushima II-1, however, there was a bigger problem. For a while, the position of the control rods was unknown, apparently because operators were unaware that a built-in clock was set at Greenwich Mean Time.

Fire at Nuclear Plant in Miyagi Extinguishes Itself

A fire broke out on February 24, 2000, in a control building next to Tohoku Electric's Onagawa 1 plant (BWR) in Miyagi Prefecture. The fire died out by itself, there were no radiation leak, and no one was injured. However, it took the company 15-25 minutes to inform local governments of the accident. Local residents are now greatly alarmed by the existing safety measures in case of accidents. Following the criticality accident at JCO, residents have become extremely sensitive to nuclear-related accidents, and efforts are being made across the nation to become more informed on nuclear issues.