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Citizens' Nuclear Information Center

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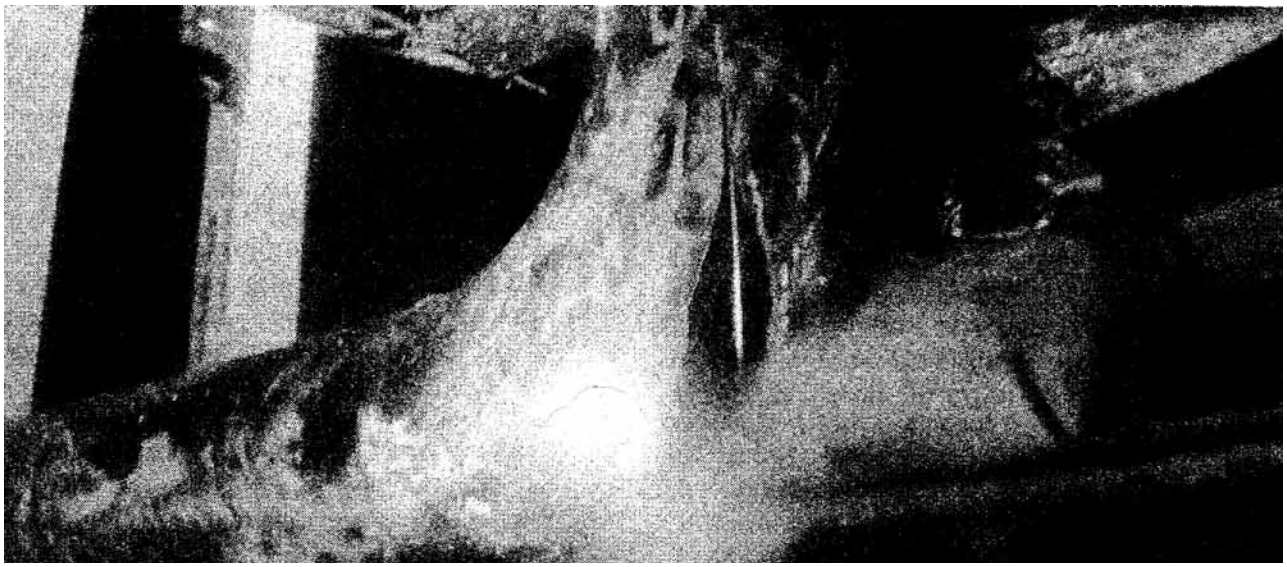
Tsuruga 2 Reactor: A Large Amount of Coolant Water Leak

- The Crack That Went Unnoticed -



There was an accident on July 12th at Japan Atomic Power Co. (JAPCO) owned Tsuruga 2 Reactor (PWR 1160MW) in Fukui prefecture where a large amount of primary coolant water leaked for over 14 hours. It was only after over 10 hours that the company confirmed that the leakage was from a cracked pipe in the primary coolant system, and it was around 8:30 p.m. that night that JAPCO was finally able to confirm that the water had stopped leaking.

Exactly how much did leak?

There are a couple of peculiar points regarding this accident; beginning in the fact that water leakage was first detected by a fire alarm. The most intriguing mystery is the fact that the amount of the leaked water has not been made clear. The figures for the amount of leaked water calculated by JAPCO differed on each public announcement: 89 tons at 8:30 a.m. on the 12th, 20 tons in the early morning of the 13th, 25tons at 9:30 a.m., and 51 tons in the evening of the 13th.

The amount of water pumped into the reactor was about 183 tons. However, JAPCO has not released a specific number on the net amount of leaked water. The amount of water recovered into a tank was 51 cubic meter. Thus JAPCO concluded that the leaked water was 51 tons. Where did the 132 tons

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of water go if 183 tons of water was pumped into the reactor and only 51 tons of it was recovered? According to JAPCO, it was confirmed that 19 tons of the water were recovered in the recycle holdup tank, and 25tons of it collected in the pressurizer. They further explained that the volume of the primary coolant water had decreased by 30% due to the temperature drop, and thus some vacancy was created within the whole primary system, and that this attests to why the left over 88 tons of water hadn't been accounted for.

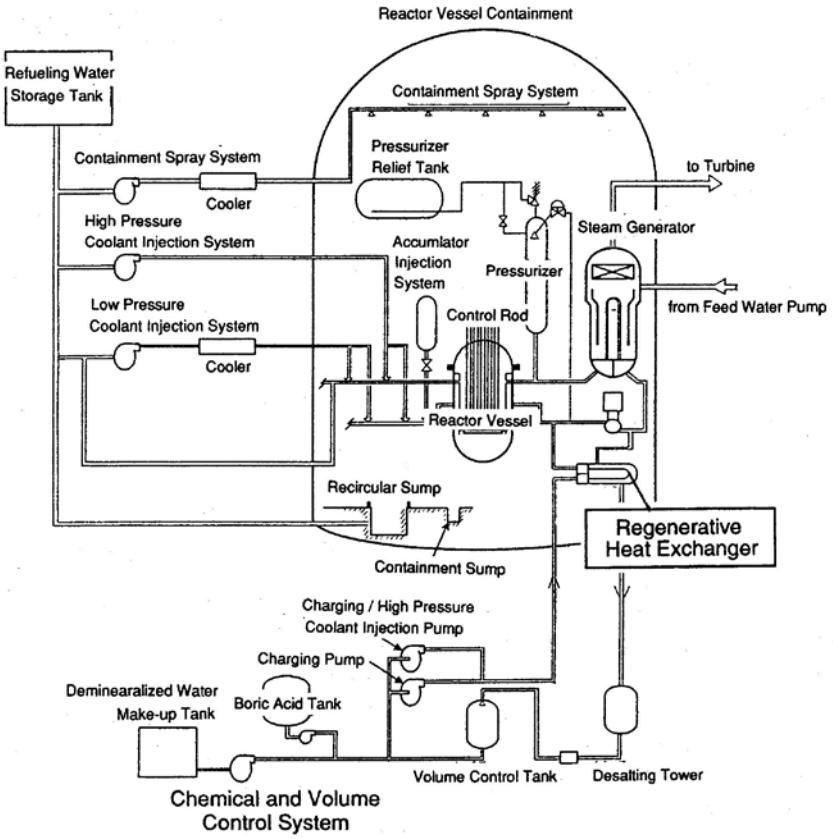
However, this is not a clear explanation by any means. They should be observing the amount of water put into and discharged from the reactor, thus they ought to be able to conduct a precise calculation.

The inside of the reactor containment radioactively contaminated

Initially, the coolant water that leaked out of the pipe came out as a mixture of water and steam. This steam spread through the reactor containment through ventilation ducts. Because of the enormous amount of leaked coolant water, all floors of the containment were contaminated. The maximum level of contamination was found on a floor directly under the cracked pipe. A level ten thousand times higher than the permissable surface contamination, 46000 becquerels per square centimeter, was detected on this floor. Because of such contamination, a dose of 1-2 mSv per hour was detected from the room containing the cracked pipe. However, the area was not designated for decontamination by the law.

The crack responsible for the leakage

The crack was found in an L shaped pipe that connects the shells of the regenerative heat exchanger of the chemical and volume control system. The chemical and volume control system is a system to control the boron concentration in the primary coolant and the quality of the water. To control the number of neutrons in the reactor, boron is added as a neutron absorber into the coolant at PWRs. The regenerative heat exchanger cools down the water of about 300 C flowing in from the primary coolant system into about 150 C and sends it into the chemical and volume control system. In return, it warms up the water flowing in from the chemical and volume control system and sends it back to the primary coolant system. Thus the regenerated heat exchanger is sort of a device that



links primary coolant system and chemical and volume control system.

This pipe was made of stainless steel called SUS316, said to be corrosion resistant. However, the crack was found in a manner and at a place utterly unexpected. The crack was found on the surface of the L shaped pipe and was in a straight line stretching from the side to the back of the pipe. This crack is not a typical crack usually seen in welded parts of pipes in nuclear power plants. There is a strong possibility that this crack was not as a result of corrosion caused by residual heat stress, but because of a combination of causes such as a deficiency in the material of the pipe, a flaw during the manufacturing or assembling process, or an exceptional force put on the pipe during operations.

The worn out pipe

According to the investigation done by the Nuclear Development Co., 11 cracks were found on the L shaped part of the pipe up until August 2. Only one crack mentioned earlier penetrated to the surface of the pipe. The full length of this crack is 151 mm, and 47 mm in length at the point where it had penetrated. However, the inside of the pipe was quite worn out. There were three axial cracks, five circumferential cracks near the welded area, and two other small cracks. A striped pattern called "beach mark" that indicates metal fatigue was found on some of the cracks that were examined by microscopes. This leads to the possibility that the cracks could have been caused by heat cycle fatigue, or vibration fatigue.

The regenerated heat exchanger

By August 13, a number of cracks were found in the shells of the regenerated heat exchanger. There are three shells to the heat exchanger and the cracks were found on the shell placed in the middle. Becuase the cracks were found in the middle shell where two streams of water of differnt temperatures flow in, it is speculated that there was a structural failure in this regenerated heat exchanger.

The same regenerated heat exchanger model is installed in Hokkaido Electric Power Co.-owned Tomari 1 and 2, in Kyushu Electric Power Co.-owned Sendai 2, and in Kansai Electric Power Co.-owned Takahama 3 and 4 where MOX fuel is to be loaded.

The inspection system and the routine inspection of the installation

Although the cracked pipe was directly connected to the main piping of the primary coolant system, the pipe was not included on the check list for detailed routine inspection because of the relatively small size - a caliber of about 9cm - of the cracked pipe. The operators are only required to conduct a visual inspection once in ten years. They fill the pipe with water and create about 159 atmospheric pressure, which is the standard pressure applied during normal operations. This is done for four hours to see if water leaks. In addition, this test is done without removing the thermal insulation on the pipes. Thus, dents or cracks on the pipes cannot be detected. This accident is the direct result of such faulty inspections.

No signs were detected to predict a serious accident of this kind. The key to this accident lies here. The inspection system needs a complete review. A whole new set of objectives and inspection methods should be introduced.

by Chihiro Kamisawa

HELP WANTED

Job describtion

While researching the safety of nuclear energy, our organization is also putting forward a research program concentrating on "Nuclear Power and Energy." This research program concentrates on the economy and the efficiency of nuclear energy as an energy system. In addition, we are working on building a network on sustainable energy in Asia. This project is already in process and we held a workshop in Korea last year. We plan to hold another workshop in Thailand this November. We are seeking one researcher who will join us in the above mentioned project and one staff member who will help us coordinating the Asian Network.

Qualifications

Researcher: Masters Degree (No departmental preference)

Staff Member: Able to perform clerical work in English (Fluency in both English and Japanese a plus)

Send in resume MID-SEPTEMBER

Update on MOX

Transport Ships On Their Way to Japan

Two nuclear fuel transport vessels carrying MOX fuel left ports in the UK and France on July 21, and are now on their way to Japan. The ships, Pacific Teal (4,648 tons) and Pacific Pintail (5,087 tons), are owned by British Nuclear Fuel Ltd. (BNFL)'s subsidiary company - Pacific Nuclear Transport Ltd. (PNTL). For security reasons, the route was revealed to the public a day after the freighters left port. It was announced that both transport vessels would sail down to Africa, pass the Cape of Good Hope, cruise through the Indian Ocean to the Tasman Sea between Australia and New Zealand, and finally arrive in Japan in the middle of September.

The Pacific Pintail was loaded at Barrow, south of Sellafield, on July 19 with 8 MOX fuel assemblies for Takahama 3 (PWR), owned by the Kansai Electric Power Co. The Pacific Teal which had left Barrow earlier, sailed to Cherbourg in France and was loaded on July 20th with 32 MOX fuel assemblies for Fukushima I-3 (BWR). The total amount of plutonium being transported is about 440 kg. The two ships met at sea and are traveling together to Japan, guarding each other for two months with no other armed escort.

The ships rounded the Cape of Good Hope on August 13. BNFL has said that it intends to send one or two shipments of MOX fuel every year. The future shipments are also to be in the form of twin-shipments with no other armed escort. Together with the shipments of spent fuel and high level radiaoactive waste, the company expects about five shipments every year through the current route.

There are a number of problems regarding this shipment. The uranium that was reprocessed into this MOX fuel originally came from the United States. Plutonium in the MOX fuel being transported to Japan was specified as weapons-capable grade in a report released in January, 1997 by the US Department of Energy. Japan, the UK, France, and the United States spent several years discussing methods of protecting the transport of such MOX fuel. There were strong urgings within the US that Japan dispatch an armed escort vessel as it had when the Shikishima, owned by the Maritime Safety Agency, accompanied the Akatsuki-Maru that transported plutonium oxide in 1992.

However, it was decided this time that there would be no escort ship, mainly for economic reasons. If all of the 45 tons of Japanese-owned plutonium in Europe was converted into MOX fuel, it would require over 40 shipments to transport the reprocessed fuel back to Japan. It would be extremely costly to have an armed vessel accompany every such shipment.

These vessels are equipped with three 30mm machine guns and are expected to guard each other. Thirteen specially trained UK Atomic Energy Authority Constabulary police armed with automatic rifles are on board to prevent terrorist attacks. Many assert that these lightly armed vessels are inadequately equipped for transporting plutonium. However, it is absurd in the first place that the cargoes being shipped for Japanese private corporations are requiring British transport vessels and armed police.

No environmental impact assessment has been done and no prior consent was obtained from any of the en route countries. The South Pacific Forum has been unable to convince the three countries involved in the shipment to discuss a liability regime for compensation. Under such conditions, there are strong concerns and criticism raised by many countries along the sea route. The Pusan City Council in Korea passed a resolution asking Japan not to use the Korean Strait for the shipment. The Caribbean Community, Mauritius, and the republic of Guyana have issued statements of concern about this shipment. New Zealand and South Africa have requested that the ships stay out of their territorial water. The Mauritian Government has announced that the two ships will not be allowed into their Exclusive Economic Zone. The latest news is that the ships are going to navigate through the Tsuruga Strait instead of using the Korean Strait because of the strong opposition in Korea.

by Masako Sawai

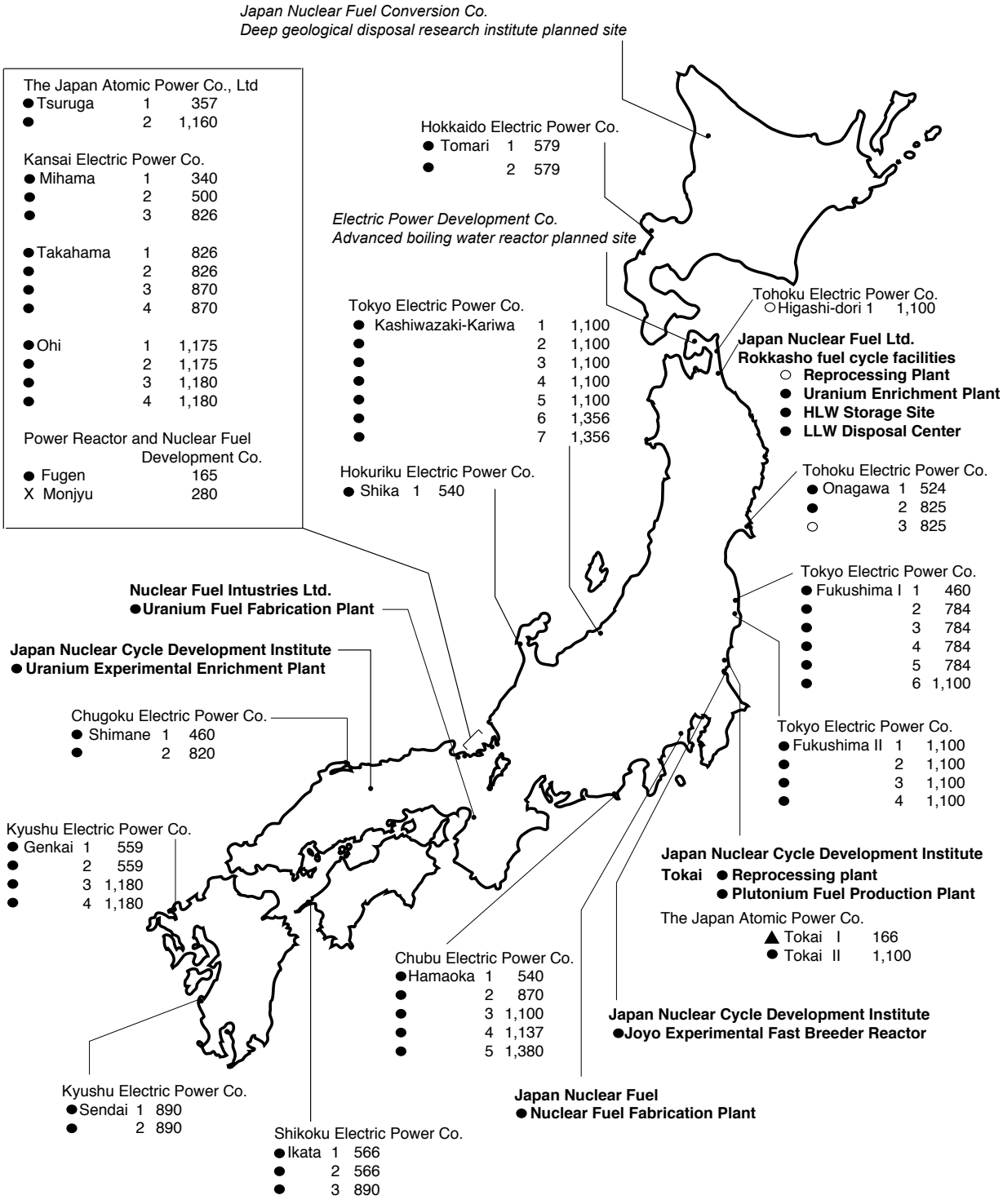
DATA: Significant Incidents at Nuclear Power Plants (1998)

Date	Plant	Short Description of Events
Jan. 9	Kashiwazaki-Kariwa 5	2 workers injured by fire at reactor building.
Jan. 10	Shika 1	Reactor manually shutdown due to leak of sea water into secondary coolant circuit caused by crack in condemner tube. Parts of feed water heater plate dropped on and damaged condenser tube.
Jan. 16	Kashiwazaki-Kariwa 1	Reactor manually shutdown due to radioactive leak from fuel rod. Crack found on fuel cladding during inspection.
Jan. 28	Monju	Worker injured at maintenance and radioactive waste management building when lifting maintenance flatcar with crane.
Jan. 29	Kashiwazaki-Kariwa 1	Spacers of 2 fuel assemblies found drastically misplaced during fuel rod inspection.
Feb. 4	Turuga 1	Crack found at turbine grand steam condenser tube during periodic inspection.
Mar. 5	Onagawa 2	Reactor manually shutdown due to malfunction of feed water drain system valve.
Apr. 5	Kashiwazaki-Kariwa 3	Reactor manually shutdown due to malfunction of electric circuit which stopped recirculation pump.
Apr. 17	Mihama 1	Power reduced due to condenser plug up by sea shells.
Apr.22	JNC Tokai site	Stack sampling pump and radiation monitoring system stopped due to power failure at LLW bituminization facility.

Date	Plant	Short Description of Events
Jun. 5	Fugen	Reactor scrammed due to rapid drop of reactor vessel heavy-water level during shutdown operation.
July 21	Fukushima II-2	Primary coolant leak from steam control valve of feed water pump during periodic inspection.
July 30	Fukushima I-6	Reactor manually shutdown due to steam leak from drain piping of turbine extraction steam system.
Aug. 26	Fukushima I-1	Reactor automatically shutdown due to generator trip caused by lightning.
Aug. 29	Kashiwazaki-Kariwa 6	Reactor automatically shutdown due to generator trip caused by lightning. Faulty wiring of electric detector cable of main transformer found during inspection.
Sep. 3	Ohi 2	Cracks found at reactor thermometer housing welds during periodic inspection.
Sep. 12	JNC Tokai site	Total power failure due to mis-operation of power switch at substation of JNC Tokai site.
Oct. 8	Kashiwazaki-Kariwa 1	Water overflow found at sump pit below reactor pressure vessel(RPV) when filling main steam pipe and RPV with water. 3 valves of vent tube were left open by mistake.
Oct. 18	Mihama 3	Sea water leak into secondary coolant circuit due to crack in condenser tube.
Nov. 3	Hamaoka 2	Reactor manually shutdown due to coolant leak from drain piping of feed water pump.
Nov. 5	Tsuruga 2	Emergency diesel generator failed at test operation due to pressure abnormality during periodic inspection.

Date	Plant	Short Description of Events
Nov. 10	Sendai 1	Reactor manually shutdown due to increase of containment drain water caused by foreign substance mixed into drain valve.
Nov. 13	JNC Ningyo-tohge site	Workers' skin and nasal cavity exposed to uranium hexaflouride at refining and conversion facility of Ningyo-tohge environmental technology center when exchanging filter observer medium.
Nov. 14	Onagawa 1	Primary coolant leak due to hole in drain piping in reactor containment caused by corrosion during periodic inspection.
Nov. 24	Fukushima I-3	Reactor automatically shutdown due to neutron flux high alarm triggered by overcurrent at lightning.
Nov. 30	Kashiwazaki-Kariwa 1	Fire at basement of containment due to weld piping during periodic inspection.
Nov. 30	Genkai 2	Damages to 68 steam generator tubes found during periodic inspection.
Dec. 1	Ohi 2	Primary coolant leak due to crack at outlet pipe drain valve of residual heat removal system pump caused by mechanical cycle fatigue during periodic inspection.
Dec. 7	Fukushima I	Small explosion in LLW management facility due to inflammable gas coming out of low-level radioactive waste(LLW) drum when opened.
Dec. 15	Takahama 3	All three sea water pumps stopped due to misoperation during periodic inspection.
Dec. 25	JNC Tokai site	Stack sampling pump failed during electric power supply test at separation and purification facility of Tokai reprocessing plant.

Nuclear Power Plants and Related Facilities in Japan
(as of the end of July 1999)



● In Operation	Nuclear Power Plants		
○ Under Construction	In Operation	52	45,082 MW
x Stalled	Under Construction	3	3,305 MW
▲ Decommissioned	Stolled	1	280 MW
	Decommissioned	1	166 MW

by Citizens' Nuclear Information Center

Announcement

The 1999 Workshop: Sustainable and Peaceful Energy Network - Asia in Thailand

CNIC will hold the second Workshop of Sustainable and Peaceful Energy Network-Asia (SPENA) in Thailand in the end of November. About forty energy experts and environmentalists from around the world belong to SPENA. The workshops are opened to non-members as well. If interested, please contact Ohbayashi at CNIC.

Organizers: Citizens' Nuclear Information Center, Japan
The Association for the Development of Environmental Quality, Thailand

Date and Place: Friday, 26 November 1999 to Sunday, 29 November 1999; Thailand

Workshop Schedule:

26 November 1999

AM: Plenary Session I: Sustainable Energy System
Creating Our Own Future: Energy Saving
Promoting a New World: Renewable Energy
Nuclear Power Today and Its Problems

PM: Workshop I: Nuclear Waste, Restructuring of Electric Industries in Asia, etc.

27 November 1999

AM: Plenary II: Sustainable Energy Path for Asia
Selecting New Energy Scenarios
The Recent Scenario Studies on Asian Countries
Economic Analysis of Energy Systems in Asia

PM: Workshop II: A field trip to local renewable energy sites

28 November 1999

AM: Plenary III: Strategy for Sustainable Energy Future
Climate Change and the Environment
The Role of NGOs and Our Future

PM: Workshop III: Discussions, Closing Sessions, and Valedictories

Expected participants: Dr. Chirapol Sintunawa (ADEQ + Mahidol University, Thailand), Prof. Shiqiu Zhang (Center of Environmental Sciences, Beijing University, China), Prof. Gloria Hsu (National Taiwan University, Taiwan), Prof. Jong-dall Kim (Research Institute for Energy, Environment and Economy, Kyungpook National University, S. Korea), Prof. Jung Wk Kim (Graduate School of Environment Studies, Seoul National University), Girish Sant (PRAYAS Energy Group, India), Gurmit Singh (CETDEM, Malaysia), Anung Karyadi (WALHI, Indonesia), Roberto Verzola (Philippine Greens, the Philippines), Prof. Jorgen Norgaard (Technical University of Denmark), Prof. John Byrne (Center for Energy and Environmental Policy, the University of Delaware), Dr. Kenichi Ohshima (Takasaki University of Economics), Tetsunari Iida (Lund University, Sweden), Baku Nishio (CNIC), Tadahiro Katsuta (CNIC), and others.

Anti-Nuke Who's Who

Shoji Kihara

The Son of Hiroshima Fiting for a Peaceful, Nuclear-free World

by Kazunari Mizota, Hiroshima City

Shoji Kihara established the Nuke No-Thanks Hiroshima Citizens' Group in 1978, and has been a leader in consistently opposing the commercial use of nuclear power for over 20 years.

He began anti-nuclear campaigning with his friends in 1978 when he traveled around America and participated in conferences and meetings in response to the first United Nations Special Session of the General Assembly Devoted to Disarmament. He was stimulated by the activists he met through those meetings who declared that they would carry out anti-nuclear activities in front of nuclear power plants on Hiroshima and Nagasaki Day. He later strengthened his conviction that the peace movement of Hiroshima should not merely address A-bomb suffering, but should include all problems related to nuclear energy and be a movement that would reach people worldwide.

Kihara is a second generation hibakusha (A-bomb victim) and this is the core of his activism. His parents were exposed, and his father past away eight years after the bomb was dropped. His two elder sisters are A-bomb victims as well. Unfortunately he lost his 85-year-old mother last year. Her support had always given him strength, and he was not able to concentrate on the movement for a while. However, the fact that there are 52 nuclear power plants in this crowded Japan and that there is a reckless governmental plan to build 20 more power plants, would not leave his thoughts. Furthermore, while other developed countries with nuclear power plants have refrained from building new plants and have renounced plutonium utilization, Japan is going forward with fast breeder reactors and a MOX utilization plan. He has once again risen to oppose such rash plans and to struggle to put an end to commercial and military use of nuclear power.

There is a town named Kaminoseki-cho, 80 km southwest of Hiroshima. There has been a plan to build a power plant there for 20 years. The utility company has not acquired any rights

over the ocean or the land, and many strong voices of opposition have been raised. In spite of these conditions, the utility is pursuing its plan. The utilities' blind persistence has infuriated him and he has vowed, together with the local people, to stop the construction of a nuclear power plant in Kaminoseki. He often visits Kaminoseki and is always welcomed warmly. They have great faith in him and his leadership. "There cannot be a nuclear power plant in Hiroshima. I will definitely stop it," Kihara asserts.

Three years ago, 10 years after the accident, he visited Chernobyl and its vicinity. He observed symptoms and illness in the people there comparable to those in Hiroshima citizens 10 years after the A-bomb was dropped. He returned with many problems on his mind and commented that he "came back with more luggage" than when he had left Japan. However, he is determined to continue to oppose all types of radiation exposure and to work for a peaceful, nuclear-free world by uniting with all the peace loving activists and friends.

NEWS WATCH

Shipments of Spent Fuel to Rokkasho to Be Resumed

On July 6, the Governor of Aomori Prefecture announced that he would allow resumption of shipments of spent fuel to the storage pool of the Rokkasho reprocessing plant. On July 29, 1998 the Governor and the Mayor of Rokkasho approved a test shipment for the purpose of calibrating combustion measurement equipment. The first shipment was carried out on October 2. However, immediately afterwards it was revealed that the data on the transport casks had been altered (See NIT No. 69), and so further shipments were suspended.

This first shipment of spent fuel was from Fukushima 2, a BWR. The subsequent planned shipments were to originate from two PRWs, at Ikata and Sendai. The shipments from these PRWs have now been delayed by roughly one year. Nonetheless, plans are in place for the main plant of the reprocessing facility to begin operation in July 2005.

The problem of fabrication and alteration of data on the transport casks has been solved by altering designs to match those of the casks used in the shipment and subsequently by having the Science and Technology Agency approve the changes. By June 17, all the casks were officially approved as having met official safety standards.

The Kushima City Council Withdraws Its Resolution Opposing a Nuclear Plant

On June 25, the City Council of Kushima City, Miyazaki Prefecture, withdrew a resolution opposing a nuclear power plant that had been passed by the Council three years earlier. In violation of customary practice, the withdrawal proposal was brought to the floor on the last day of the session by pro-nuke legislators, and was adopted after just 40 minutes of discussion.

Kyushu Electric Power Co. has plans to construct a nuclear plant in the City, but there has been a great deal of local opposition. As a result, the Council passed a resolution in September 1996 opposing the plan. In the mayoral election in November of the same year a candidate who pledged his opposition to the construction plan won a landslide victory. Because of this, an atmosphere that "the nuclear issue is finished" gradually settled in. However, the mayor's other promise, to hold a referendum, has not been implemented as it was said to be "no longer necessary."

In the City Council election this April, the spotlight moved away from the nuclear plant issue. The election became a contest over local power interests. As a result, the number of opponents to the nuclear plan dropped from 11 to just 5. The proponents of the plan saw this as a golden opportunity. They introduced the bill to withdraw the previous opposition resolution. However, very few candidates during the election campaign said that they were proponents of the construction plan. It is fair to say that residents were deceived.

Putting into Operation Intermediate Storage of Spent Nuclear Fuel

There has been a sign of change in Japan's nuclear energy policy, a basic principle of which has been reprocessing of spent fuel. A plan has now been approved to construct "intermediate" storage facilities that will serve as a storage place between nuclear power plants and reprocessing plants. The plan calls for the storage of spent fuel for several decades. A bill to amend the law concerning businesses related to nuclear power was passed by the Upper House on June 9.

In the background to this change has

been a number of requests to the central government by local governments where nuclear power plants are sited. Local governments have called for the removal of an ever-increasing amount of spent fuel accumulating in their jurisdictions. The requests also reflect a concern about delays in the construction of the Rokkasho reprocessing plant. With the development of fast-breeder reactors bogged down, and a resulting surplus of plutonium, the reprocessing of spent fuel has been inevitably slowed down. The new "intermediate" storage facilities will be constructed to accommodate the spent fuel for which there is no reprocessing plant.

Though the new storage facilities will be called "intermediate," it is not clear how long fuel will actually be stored at the site. The claim, of course, is that the fuel will be stored for several decades and then sent to a reprocessing plant. But there is no guarantee that this will happen. In fact, it is likely that spent fuel will end up being placed in semi-permanent storage in the new facilities. The power industry says that they hope to have one or two storage facilities start operations by 2000, but as yet there are still no concrete plans for exactly where they will be constructed. According to the revised law, these facilities could be operated by power companies or by other firms.

Majority Opt for a "Change to a Flexible Path"

The Atomic Energy Commission held the first two meetings of the Round Table Conference on Aromic Energy Policy this year, on June 15 and July 13 respectively. CNIC Co-Representative Hideyuki Ban attended both meetings. On June 24, CNIC Co-Representative Baku Nishio attended the second public consultation meeting of the Nuclear Sub-committee of the Advisory Committee for Energy .

At these meetings, a lack of flexibility in current nuclear fuel recycle policy was debated. Questions along these lines were even raised by proponents of nuclear power. A majority of those who testified expressed the view that policy indeed ought to be more flexible. In concrete terms, these majority views included a call for review of the FBR development program, more restraint on reprocessing, and a slowdown in plans regarding the disposal of high-level nuclear waste (consider, for example, options other than geologic disposal). With respect to the disposal of high-level waste, there was an emphasis in the debate on "extractability." Again, the majority opinion called for continuing to hold waste on-site for the time being. Ban and Nishio, while basically maintaining a stance against the use of plutonium and in favor of de-nuclearization, were active in developing a majority opinion in support of the points outlined above

However, this does not mean that any immediate change will take place in Japan's nuclear power policy. The Long Term Program Council, which was established by the Atomic Energy Commission, held its first meeting on July 2, and began work to revise the Long Term Program for Research, Development and Utilization of Nuclear Energy (N.I.T. No. 71). As this process continues, CNIC will press for clear changes in existing policy.

SUBSCRIPTION

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