



Nuclear Report from Taiwan

VOLUME 1

NUMBER 6

NOVEMBER/DECEMBER 1993

Plant Number Two Threatens Sea Life

ON JULY 31 Mr. Fan Jeng-Tang, a member of the Taiwan Environmental Protection Union (TEPU), decided to do a little fishing. He had heard stories from the local fishermen about abnormal fish in the waters surrounding the second nuclear plant (Number Two), and he wanted to catch some. He also knew that the pier he planned to fish from, which was near the cooling system outlet, had been kept off limits to fishermen some years ago. After an afternoon of fishing from the pier Mr.

Fan had caught many small fish, some of which had ugly, prominent humps on their backs. The local residents call them "Quasimodo fish," after a hunchbacked puppet character in an old Taiwanese TV program. We will call them "Q-fish." The Taiwan Power Company (Taipower) calls them "trouble."

The Q-fish belong to the species Therapon, which usually grows to 10 centimeters. Mutated ones never grow longer than 5-6 centimeters. X-rays reveal that their spines exhibit both lateral and vertical deformation, often producing a disgusting lump resembling a camel's hump, and twisting the fishes' bodies. Local fishermen report that they regularly see these Q-fish floating dead on the water's surface.

The TEPU presented Mr. Fan's deformed fish to the Taiwan Power Corporation and requested that the utility send

someone over to investigate. Taipower proved uncooperative, saying that their technical staff regularly monitor over 100 sites around Number Two, but had never seen any deformed fish. The TEPU then sent samples to professors in different specialties at several universities, including one in Japan.

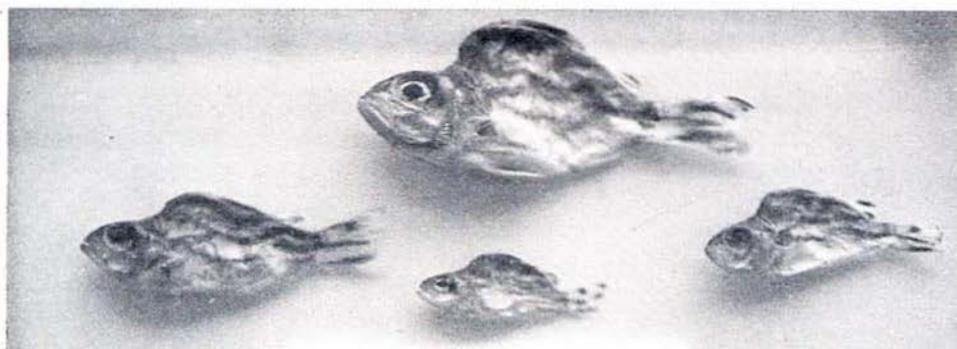
All through August and September these researchers did fieldwork and performed analyses, trying to determine the cause of the fishes' deformation. Since the area around Num-

ber Two has no appreciable industrial pollution there seemed little doubt that it was connected to the nuclear plant. They were somewhat hindered in their work by Taipower's refusal to share its environmental monitoring records. Several hypotheses were put forth: chemical and heavy metal contamination, thermal pollution, and contamination from artificial nuclides.



▲ Normal Therapon Samples ▼ Mutated Therapon Samples

photo: ANCT/EPZ



Radioactive Fish?

Inevitably, it was the idea that the Q-fishes' deformity could be caused by radiation that attracted media attention. During the previous five weeks since the "discovery" of the Q-fish the media had shown little interest in the story. With radioactive steel, lost radiation sources, contaminated

www.See-Q-FISH, page 4
Digitized 2018

Min Sheng Villa**Residents' Health Problems May Be Radiation-Linked**

In our last issue we reported that a group of Min Sheng Villa residents, dissatisfied with the medical exams the Atomic Energy Council had arranged for them, flew to Japan for testing at renowned radiology facilities in Osaka and Hiroshima. The group returned to Taiwan on October 10 with test results which differed substantially from their original exams at Taipei Veterans' General Hospital (TVGH). According to the Japanese experts, more than fifty percent of the thirteen people who were tested show signs of radiation-related diseases. Chromosome studies which can confirm these findings are due to be released shortly.

The group consisted of eight children and five adults. Japanese doctors discovered five of the children are suffering from lymphocyte disorders, while a sixth child has cataracts, which is extremely rare in children. Doctors also found that one of the adults has a thyroid disorder. Ironically, all of these thirteen people had been classified as "completely normal" by the AEC-contracted doctors in Taipei.

Wang Yu-lin, the tireless spokesman for the Min Sheng Villa residents, criticized the original examination, in which the staff at Veterans' General somehow managed to examine 109 residents in a mere two hours. He said the whole atmosphere of the testing showed the AEC's careless attitude towards the problem. The examining physicians turned up nine people with possible radiation-related conditions, including low white blood cell counts, decreased thyroid activity, and anemia, but discovered none of the more typically-encountered radiation diseases which the Japanese doctors found, such as lymphocyte disorders and cataracts.

The most important piece of the puzzle is still missing, because the results of the chromosome studies have not appeared yet. These results will reveal whether or not the residents have suffered radiation damage to their genes. Wang Yu-lin worries that the integrity of these results is in danger, because no sooner had the residents boarded their plane to return to Taiwan than the head of the Atomic Energy Commission's Radiation Protection Division, Chen Wei-li, touched down in Japan to visit some of the doctors involved in the case.

A furious Wang Yu-lin was quoted in the press as saying, "You know, when we first expressed concern that Taiwan may not have the facilities and the experts to do the kind of exams we needed, Hsu (the AEC chairman) told us that if we weren't satisfied with the way the government was handling this case we should just move overseas. Now that almost all our test results are out, they send Chen to Hiroshima, supposedly all concerned

about the results. Who knows what the hell the AEC is up to this time?"

The timing certainly seems suspicious, but the it is the identity of the two people Chen went to see that upset Wang the most. The more influential of the two is Itsuzo Shigematsu, a nuclear energy supporter who heads the Nuclear Medicine and Biology Research Institute at Hiroshima University and is a highly paid consultant to Taiwan's AEC. Ominously, Shigematsu apparently arranged for Chen to talk to Mitoshi Akiyama, head of the Radiation Effects Research Foundation (which grew out of the post WWII US-established Atomic Bomb Casualty Commission), who is responsible for supervising the chromosome testing. The nature of that discussion is anybody's guess.

When and if these results appear, Wang Yu-lin is planning to publicize them at a press conference with members of Taiwan's Medical Professionals Alliance in Taiwan (MPAT). In the meantime, he and the other residents are looking ahead to what other battles might be in store for them. ■

Lab At Min Sheng Villa

Wang Yu-Lin, spokesman for the residents of Min Sheng Villas, announced in early November that a committee of MSV residents plans to turn several rooms of the building into a "living laboratory" for radiation detection and education on the effects of radiation on the human body.

Organizers hope that the center, which will also include displays telling the inside story of Min Sheng Villas, will help create a new generation of activists and alert the public to the dangers of radiation.

Part of the center's mission will be to conduct a thorough search in the Taipei metropolitan area for other buildings constructed during 1982-84, in order to determine the true extent of the irradiated steel problem.

Even though the center is only in the planning stages, it has already attracted interest. Students at nearby Chung Hsing University's School of Business Law have invited the center to examine a girls dormitory on campus which they suspect may be contaminated.

The move by Min Sheng Villa residents to establish this center is clearly meant to goad the AEC into some kind of response, since the center would be stepping on the AEC's existing regulatory turf.

Nuclear Report from Taiwan

Editor Chang Jun-yan
 Editorial Board Prof. Lin Pi-yao
 Prof. Lin Jun-yi

Address Box 843
 Tunghai University
 Taichung, Taiwan 40704

Telephone and Fax 886-4-359-5622

We encourage the use of our material; please give credit when reprinting.

● Nuclear Report from Taiwan is printed on 100% recycled paper.

● We were delighted to receive a copy of the French newsletter Info Uranium, with our piece on the Orchid Island nuclear waste dump (see issues 2 and 3) conflict prominently featured in French translation. Many thanks to Action Environment, which publishes Info Uranium, for making this issue accessible to French readers.

● To all our friends and fellow activists: MERRY CHRISTMAS and HAPPY NEW YEAR! In our first short year of publishing Nuclear Report from Taiwan we've worked hard and learned a lot. Thanks to all the organizations and individuals who have contributed money, time and advice to our efforts at resisting nuclearization here on Taiwan.

Spare Parts Crisis

AEC's Hsu: "Some Commercial Grade Parts Superior to Nuclear Grade"

--AEC Newsletter No. 46, 1992

AFTER shutting down the Unit 1 reactor at the second nuclear plant (Number Two) for routine maintenance in mid-September, engineers discovered cracks in both the blade bases and the rotor in the low pressure turbine. The cracks in the blade bases are a familiar problem which all the reactors in Taiwan have exhibited in the past, but the rotor cracking is a new and disturbing phenomenon, especially since spare parts for Taiwan's generation of nuclear plants are becoming hard to come by.

Some of the cracks extended one-third of the way through the turbine blade base plates, which connect the blades to the turbine axis. When the Atomic Energy Council (AEC) found out that the rotor was also cracked it demanded a report from the Taiwan Power Company (Taipower) on the utility's plans to fix the problem. The Council also formed an ad hoc committee of experts to analyze the problem and scrutinize Taipower's report.

UNHAPPY MARRIAGE

GE + Westinghouse = Trouble

Taiwan's nuclear plants are something of an anomaly; their reactors and generating equipment were supplied by different firms. At Number One and Number Two the reactors are GE-built BWRs, which drive Westinghouse turbines. At Number Three the situation is reversed, with two PWRs built by Westinghouse and turbines provided by GE. After a disastrous fire at Number Three in 1985 (see main article) the GE turbines were replaced with equipment manufactured by Sweden's ABB.

An anonymous source at Taipower expressed confusion over why Taipower would use equipment from two different companies. He said that American utilities invariably contracted a single company to provide both the reactor and the generating plant. He further stated that this approach makes the entire plant run more smoothly.

Taipower is already familiar with the disadvantages of not ordering from a single provider; none of the three nuclear plants have attained their designed efficiency levels. When Taipower approached Westinghouse and GE about this problem, each company predictably blamed the other, leaving Taipower out in the cold. Taipower has still not resolved this issue to its satisfaction, and the nuclear plants are still not running as smoothly as they should. Some experts also suspect that Taipower's mixing of equipment systems may have something to do with the cracking turbine parts problem.

After a month and a half of deliberation Taipower decided to replace the existing rotor with a spare, but they knew they had a problem--the spare, a newer model, weighed 121 tons, while the existing rotor weighed 130 tons. Engineers strongly suspected that the weight difference would cause vibrations unless extensive modifications were made to related turbine subsystems. Taipower contacted the U.S. company Westinghouse, which supplied the original generating equipment, for advice about using the lighter rotor. The utility also wanted to extend the normal 60-day off-line maintenance period to 90 days in order to investigate the possibility of acquiring off-the-shelf commercial equipment to replace the damaged rotor.

Taipower apparently wanted to restart Unit 1 on November 9 without replacing the damaged equipment, but the AEC put a halt to those plans. An AEC expert said that due to the complexities of the replacement operation, the AEC would go over Taipower's plans and report with a fine-toothed comb, and would reject it if there were any unresolved safety questions. The AEC probably wanted to avoid any repeat of the 1985 disaster at the third nuclear plant's Unit 1, where blades in an operating turbine cracked off, causing a fire which burned down the generating building and kept the reactor off-line for over a year.

In mid-November Taipower finally submitted its report to the AEC. The Council was not satisfied with it, however, and rejected it on November 23, demanding that Taipower continue to analyze the problem and submit a revised report.

Inexplicably, the AEC ad hoc committee reversed its decision the very next day. The committee informed Taipower that it could restart Unit 1, but only if Taipower: 1) submits a report for future replacement plans, 2) finds the cause of the cracking problem, and 3) stops Unit 1 again after six months to check again for cracking.

Allowing Taipower to restart Unit 1 before fulfilling the conditions is ridiculous, especially since the AEC had previously taken such a hard line on checking Taipower's plans. "Condition" two, however, is even more laughable, since not even Westinghouse has been able to figure out why its turbines have been cracking in various plants around the world. It is extremely unlikely that Taipower will be able to solve this problem on its own. Number Two's Unit 1 reactor is already back on line, but neither the media nor we here at ANCT know what equipment is running in the generating building. Did Taipower replace the damaged turbine with its spare? Did they just replace the cracked blade bases, as they have done in the past? Or, most ominously, did they simply continue to use the damaged turbine, hoping that it will last until the next inspection in six months? And what of the turbines at Number Two's Unit 2? Taipower engineers have expressed concern that those turbines might have the same problem as Unit 1's, but Taipower has refused to inspect the turbines until Unit 2's scheduled maintenance shut-down "early in 1994."

The AEC admits that the country's nuclear industry will continue to have problems with existing equipment, and will only

See CRISIS, page 5

Q-Fish (cont. from page 1)

workers, and regular scrams much in the new this year, newspapers and TV have been particularly sensitive to the word "radiation."

Taipower and the Atomic Energy Council (AEC) wasted no time in denying the radiation connection. At first, without offering any technical evidence to show the absence of radiation contamination, the AEC neatly claimed that since the outflow water never contacts radioactive systems, it could not carry any radioactivity; thus the fish could not be affected by radioactive materials. In mid-September the AEC released a report based on the results of gamma spectroscopy testing which concluded that the Q-fish contained some naturally occurring nuclides but no traces of artificial contamination. This report was riddled with factual errors, however, and roundly criticized by independent researchers.

Vigorous research by several scholars and constant media coverage of the story finally forced Taipower to do what it had been trying for over a month to avoid—catching its own Q-fish. In late September Taipower sent out a small research vessel to try to catch the elusive Q-fish, but they came back empty-handed. Local fishermen protested that the researchers were obviously using the wrong kind of net, and after they followed the fishermen's advice they started catching Q-fish in the first week of October. The company found itself becoming dragged deeper into the controversy; widespread public awareness of the Q-fish case had made it imperative for Taipower to catch the Q-fish, but after catching some they were under even more pressure to do something about it.

Government Response

With no convincing theory to account for the Q-fishes' deformity, the radiation theory would not go away, and Taipower and the AEC found it necessary to initiate another round of denials. In the middle of October Taipower reported that three years ago their technicians had detected "miniscule" amounts of both cobalt-60 and cesium-137 in the waters surrounding the plant, but maintained that these were simply "background readings," which "could be ignored," and probably only indicated the presence of fallout from nuclear tests carried out by mainland China. The TEPU called this explanation "simply preposterous," and on October 16 organized local fishermen and other environmental groups in a protest at the headquarters of the Environmental Protection Administration (EPA). The groups demanded that the EPA step in to investigate this issue, which clearly falls within the Administration's jurisdiction. The EPA later announced that it would establish a special task force to tackle the problem.

Meanwhile, even in the face of mounting evidence that the cause of the Q-fishes' deformity could be quite complicated, the AEC continued to deny that radiation could play any role in it. The AEC triumphantly trotted out results of a Japanese researcher's gamma spectroscopy study which indicated that Q-fish contained no artificial nuclides. The council seemed happy to admit the possibility of any theory other than radiation. The climax of their denials came when AEC chairman Hsu Yi-Yun, who has an uncanny knack for saying the wrong thing at the wrong time, maintained at a press conference that the Q-fish were perfectly safe to eat. A Democratic Progressive Party legislator presented Hsu with his own bottle of live Q-fish several days afterwards.

The AEC's troubles, however, were only just beginning. On October 28 over twenty people representing various environmental groups and fishermen staged a protest outside AEC headquarters in Taipei. Facing off with AEC security guards, they held banners inviting AEC chairman Hsu to a Q-fish dinner and shouted slogans accusing the Council of downplaying the Q-fish case, avoiding their responsibility as a regulatory agency, and protecting Taipower. After the protesters had been chanting and marching for half an hour, AEC head secretary Pao Cheng-Kang came out to negotiate with them, promising that in the future the council would maintain a trustworthy, open attitude about investigations into the Q-fish. Eventually, he invited ten of the protesters into the building for further discussion, during which he learned from the fishermen's contingent that seaweed, shellfish, and certain commercially valuable fish varieties have practically disappeared from around Number Two.

The day after the protest, the AEC unexpectedly reversed its position, stating in a new release that before sufficient research has been performed no potential cause of the Q-fishes' deformity can be ruled out. Even chairman Hsu joined in this sudden reaffirmation of scientific objectivity. He also clarified his position on seafood, saying he had never stated that one could eat Q-fish, but that if someone invited him to a Q-fish dinner, he would not refuse.

EPA to the Rescue, Finally

The EPA, entering the fray rather belatedly, began to announce the composition, structure and goals of its Q-fish task force in late October. The participants are to include independent environmental protection groups, the AEC, Taipower, the Academia Sinica, the EPA itself, universities, and two foreign scientists. These personnel will work in three groups, each with different responsibilities: field surveys and research, research methodology and results appraisal, and administrative coordination.

The amount of research this task force has set for itself is daunting; their preliminary research, going on as we go to press, will focus on 1) rate of spinal deformation incidence, 2) effect of cooling system water temperature on seawater temperature, 3) detection of artificial nuclides in seawater, 4) presence of heavy metals, and 5) effects of any effluents from mechanical systems. Further, the task force is scheduled to make a report in late December on the ecological conditions in the sea around Number Two, which will include data on water quality, possible contamination of bottom sand and mud, and yet more analysis of fish samples. Altogether, the task force expects to work on the project for one year.

Key to the credibility of the task force's work will be the judgements of the research methodology and results appraisal group. The EPA was careful to point out that this group would include representatives from the TEPU and three other environmental protection organizations, as well as two researchers from abroad, at least one of whom will almost certainly be Japanese.

Evidence Grows

Among all the potential culprits which may be causing the Q-fishes' deformities, two stand out as particularly suspicious. One is the abnormally high temperature of outgoing water from Number Two's cooling system, and the other is an organic tin coating material which Taipower may have used as an anti-

fouling agent in the cooling system pipes. The evidence accumulated so far clearly shows the bewildering complexity of industry's effect on local ecology.

Shao Guang-jao at the Academia Sinica discovered that the highest recorded temperature within a five hundred meter radius of the outflow port was 40° C, eleven degrees higher than the average summer water temperature of 29° C. This exceeds the EPA's limit (average water temperature + four degrees C) by seven degrees. When he raised some normal Therapon in a tank with water set at 38° C, he found that after two to three weeks the fish all developed the same kind of spinal deformities as the Q-fish caught near Number Two.

Shao cited several factors which support his conclusions. Therapon is a species which is especially sensitive to temperature, so it should follow that the higher the temperature, the greater the incidence of deformity. Indeed, in early August when the ambient water temperature is highest and both reactors at number two were running at full capacity, surveys within the 500 meter radius showed over 90% of the Therapon had deformities. When Unit One went off-line for maintenance on September 13 the water temperature quickly fell from 40° to 32°C, and Shao caught far fewer Q-fish after that date. The ones he did catch were fairly large, indicating that they had probably become deformed before Unit One's shutdown.

Why is the water around Number Two so hot? Taipower recently admitted that design flaws in the cooling system outflow are mostly to blame. Instead of flowing directly out to sea, the cooling system water is directed at an oblique angle along the shoreline, collecting in a small bay, where the temperature reaches its highest. According to Shao's research this area is where the Q-fish become deformed.

Taipower has made much of the fact that they initiated redesign and reconfiguration of the outflow system last year. Of course, one might ask why they waited almost ten years to do this, since the company clearly knew of the temperature problem when Number Two's Unit Two came on line in 1983. One might also ask why the EPA did nothing to force Taipower to correct the problem at an earlier date. In an ironic twist, Taipower blamed its slow progress on local fishermen, who apparently had complained that the dredging and other construction activities in the area raised so much silt that they couldn't fish. The EPA says that Taipower's reconfiguration of the outflow system has already cost US\$4,000,000 and should be finished within two years.

Shao's high water temperature theory seems quite comprehensive, but there is also a strong argument for organic tin contamination. Organic tin occurs in a series of chemical compounds called TBTO's, which have been widely used as marine biocides; applied to metal or other surfaces which contact seawater, they slowly dissolve, preventing the growth of seaweed and shellfish. In the last few years Japanese fish farms had been seeing some fish with mutations similar to Taiwan's Q-fish, and it wasn't until early this year that Japan's EPA discovered that the cause was organic tin contamination emanating from TBTO coating materials on the insides of the fish containers. Japan now controls the use of TBTO's. Their findings are backed up by the US Environmental Protection Agency, which recently added TBTO's to its list of poisonous substances after research showed that they can cause cell mutation. Organic tin is especially damaging to the nervous system.

The big question now is whether Taipower has been using TBTO compounds to coat the insides of the cooling system outflow pipes. Research performed by Lin Pi-Yao, a chemistry professor here at Tunghai University, shows that water samples taken from the sea around the outflow port at Number Two contain 12 parts per trillion of organic tin. The international regulatory standard is 10 parts per trillion. Lin cautions that his research is only preliminary, but warns that if his results are confirmed by the EPA's task force, untangling the cause of the Q-fish problem could be extremely complex.

Present Mishandling, Future Uncertainty

The government's handling of this issue has been truly disappointing. All the scientific research and pressure for change has come not from so-called government regulatory agencies but from independent researchers and environmental groups. Professor Yang Jao-yueh of Taiwan University's Marine Research Institute blames the government's fifteen-year monopoly on supervision of marine areas and nuclear power plant operation for leading to the ecological damage around Number Two. If a framework for public input on ecological issues had existed before now, many of these problems could probably have been avoided.

Taipower has not put its best foot forward, either. Lately, the utility has been shooting itself in the foot, first covering up and denying safety problems and then suffering the embarrassment of being forced by environmental groups and public outcry to fulfill the responsibilities it should have fulfilled from the start.

The greatest victim in this affair is undoubtedly not simply the fish species Therapon, but rather the entire natural environment surrounding Number Two. It now seems likely that the Q-fish problem has more than one cause, and that Number Two's impact on the environment is much more complex than first suspected. Until the EPA report on the local ecological situation appears, Number Two's effect on other forms of marine life remains unclear. ■

Crisis (cont. from page 3)

face more difficulty acquiring suitable spare parts in the future. In a press conference in July 1992 AEC chairman Hsu Yi-yun told the press that since the nuclear industry in the U.S. is declining, many firms which produce specialized components are closing, making it difficult to find replacement parts. But he went on to state, "The problem is really not all that serious, because the quality of some 'commercial grade' components is now superior to some 'nuclear grade' components."

Recent Taipower inquiries at Westinghouse about custom-building new rotors seem to belie Hsu's optimistic boasting. If these "superior" commercial grade components are readily available, why would Taipower investigate special-ordering rotors at a reported cost of US\$4,000,000 per unit?

The spare parts problem could have serious consequences for future operations at the three existing nuclear plants. Based on past performance records (see table) it is a virtual certainty that Taipower will have to deal with more cracked

continued next page, column 2

AEC: Regulator or Advocate?

ACCORDING to Mr. Peng Bai-Hsian, a legislator from the opposition Democratic Progressive Party, the Atomic Energy Council last year subsidized the Taiwan Power Company's nuclear program to the tune of almost US\$52,000,000. The assistance, which had nothing to do with regulatory and safety work, came mostly in the form of research and public relations work performed by the AEC and its research arm, the Nuclear Research Institute. Mr. Peng's report maintained that hiding Taipower money in the AEC's budget not only violates the spirit of open budget organization, concealing the actual size of Taiwan's expenditures on nuclear power development, but also makes a mockery of the AEC's supposed role as an objective regulatory body.

The report broke down the \$52,000,000 into two parts: public relations and administrative work performed by the AEC, and research and development work in nuclear power performed by the NRI. Of the first part US\$1,100,000 went for "Taipower propaganda," and US\$1,470,000 went for various nuclear energy publications, technical applications, and international information exchange. The second part accounted for over US\$48,000,000, divided into five areas: 1) administrative work, 2) worker safety and operational improvements, 3) research and development in nuclear technology, 4) promotion of applied nuclear technology, and 5) physical plant. The report maintained that this is all work which Taipower could and should perform in-house.

Mr. Peng also said in the report that from the NRI's budget structure, it seems clear that the AEC shortchanges safety and regulation in favor of efforts in nuclear power development. As the table shows, the NRI devotes only 9% of its budget to regulatory activities, while it commits 61% to nuclear power development and 30% to research and development in other areas.

The report, which was based on research carried out by Mr. Peng's legislative office, strongly recommended that to "cut off this black hole that is bleeding the national treasury," the government should cut all funds related to advertising that the AEC carries out for Taipower, work not related to supervision of Taipower's nuclear power facilities, and research which the NRI performs for Taipower.

Although the point of the report was budget reform, we at ANCT take this information as yet another indication that the AEC is more of a nuclear power advocate than regulator. Until the intimate financial and organizational connections between the AEC and Taipower are severed, the AEC can have only very limited credibility as a regulatory agency. ■

Crisis (cont. from previous page)

turbine parts in the future. In the last few years Taipower has dealt with the problem by either replacing whole turbines (at Number Three after the 1985 fire) or replacing only the affected blades or blade bases. Replacing a cracked rotor, however, is a more complicated operation. In any case, replacement cannot bide the underlying problem--nobody knows what causes the cracking in any of these components. Until the cause is discovered any replacement operations can only be considered stopgap measures.

Year	Unit	Problem	Manufacturer
1983	No. 2, Unit 1, turbine B	blades cracked off	Westing-house
1985	No. 3, Unit 1	blades cracked off, starting fire	Westing-house
1992, June 6	No. 1, Unit 1, turbine C	blades cracked off	GE
1992, Nov. 22	No. 1, Unit 1, turbine B	blades cracked	Westing-house
1992, Nov. 25	No. 1, Unit 2, turbine A	blades cracked	Westing-house
1993, October	No. 2, Unit 1	turbine rotor, blade bases cracked	Westing-house

The other side of this issue is regulation. Why did the AEC suddenly and mysteriously reverse its decision to keep Unit 1 closed until Taipower had submitted a satisfactory report? Did the fact that each day a reactor stays off-line costs Taipower over half a million US dollars play any role? Why did Taipower not reveal what steps, if any, it took to fix the damaged turbine? It appears that the urgency of this problem may be distorting what little integrity the regulatory process has in Taiwan's nuclear establishment.

Unfortunately, this is not the kind of problem which attracts a lot of public attention; it does not possess the media value of, for example, the mutated fish swimming in the waters surrounding Number Two. Without heavy media pressure it is even more difficult to obtain reliable information about how Taipower and the AEC are dealing with this situation. More disturbingly, there are literally no experts in nuclear engineering, nuclear physics or related fields who are willing to criticize the Council, because the AEC has been extremely thorough in either hiring them as consultants or making their research dependent on Council grants. This kind of AEC influence extends even into Japan's academic nuclear community, where the Council also retains many scholars as consultants. Under these constraints, finding out what Taipower and the AEC are really doing to solve the spare parts problem will continue to be an uphill battle. ■

Nuclear Research Institute's 1993 Budget

(All figures in New Taiwan Dollars; 26.9NTD=US\$1)

Category	Research and Development	Promotion of Applied Technology	Totals	Percentage of Total
Research and Development	62,117,000	237,698,000	202,608,000	502,425,000
Promotion of Applied Technology	49,264,000	457,470,000	147,070,000	653,804,000
Totals	111,381,000	695,168,000	349,678,000	1,552,227,000
Percentage of Total	9%	61%	30%	100%

Collection by www.inka.org
Digitized 2018