ANUMUKTI

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Myths about Power

A macabre myth has been doing the rounds in the country: that India will have to double its installed capacity from its existing level of 66,000 MW to 140,000 MW by the year 2005. This as 'experts' in the Union Ministry of Power will be only to glad to explain, will involve total investments of Rs. 245,000 crores at current costs. Since India cannot raise such vast sums of money, it must look to richer countries (read multinational corporations) for funding support

The Ministry of Power is wrong. So are some of the most ardent defenders of such myths. True, their estimates are baaed on a growth of 6.5 percent per annum in the demand for power. But they fail to realise that India does not suffer from any shortfall in power generation capacity. It only suffers from the problem of power utilisation.

An analysis by Prof. Michael E. Porter (the renowned management guru) and Prof Pankaj Ghema wat of Harvard Business School shows up two important points: (a) that India does not produce as much power as it should, and (b) that India does not use all the power it can produce. In their stucty, they also arrived at the conclusion that of the 65,000 MW of power that it can produce every year, India actually finds itself using barely 21,000 MW of power annually, (see table next page)

As much as 7,800 MW of power is lost every year because of planned maintenance. Since such maintenance cannot be avoided, if power plants are to be run at their optimum levels over a period of time, this is a loss which India's planners must accept as being inescapable.

* That leaves India with 57.000 MW of power. But even at this stage the country is confronted with the problem of the manner in which unplanned repairs take place, which collectively account for a loss of an additional 10.400 MW every year.

* Lack of logistic support in ensuring timely availability of coal and other requirements causes an annual loss of 9.800 MW.

* Around 1.000 MW a year Is Just not used because the state electricity authorities have not managed their respective power consumption patterna effectively enough.

* Lastly, a whopping 15.000 MW of power ia allowed to slip away through transmission and distribution losses.

* It is because of the cumulative effect of losses at every stage, that India ia in a position to use Just 21.000 MW of power every year. Even If one discounts for loss of capacity utilisation due to planned maintenance, one still arrives at a total avoidable loss of an Incredible 36.200 MW of power every year.

The magnitude of the loss can be better comprehended if one

urea it by a proper yard-stick: the Governments first (reckless) award of a power generation project to Enron. The total amount of power lost in India is equivalent to 18 Enron projects. Alternately, working on a normative cost of 3.4 crore per MW for all private sector plants which have been guaranteed profits by the government, the government could have saved Rs. 126,700 crores by not installing additional power generating capacity. But then if such losses were contained, how could India's bureaucrats in the power ministry and the prime minister's office, as well as the ministers themselves bestow largesse on their favourites!

Stage	Power Available	Loss	Causes
	I 65,000	7,800	Scheduled unavailablity / planned maintainance
	II 57,200	10 400	Unscheduled unavailability / unplanned repairs
	HI 46,800	9,800	Forced outages due to lack of coal etc.
IV	37,000	1,000	Power not used
V	36,000	15,000	Transmission and distribution losses
	VI 21,000		Net available power

Not Out of Ignorance

The above facts are known to the government. That is why India's planners thought it fit to set up the Power Finance Corporation almost a decade *ago* to refurbish old and ailing plants. That is why some planners insist there is a crying need to let the private sector take up ailing plants on lease for 15 years or so, and help turn them around. That way, the government could save as much as 36,200 MW of power every year.

Yet the government does precious little about reconditioning existing power plants. It is in a hurry to award even more new power projects to private sector entrepreneurs. The centre's recklessness has been matched by the MoU mela recently introduced by the state governments of Andhra Pradesh and Karnataka.

The reasons for such aberrations are not hard to find. Obviously, when such large sums of money are involved, why bother if the country loses Rs. 36,000 crores every year?

That is how, despite all the talk about power, the people of India are condemned to a state of continued powerlessness.

R.N.Bhaskar
Indian Express 272.1996

Manohar Singh

Anumukti deeply regrets the untimely and painful death of Shri Manohar Singh of Tamlao village. He was a brave man who fought his misfortune with courage and fortitude. His outspoken condemnation of nuclear power operations gave courage to many others. Below we reprint his story in his own words:

"I used to work in Waste Management. Once, I received a dose of 2,200 mrem in half an hour. Others have been laid off after getting a dose of 800-1,100 mrem. Most workers get this much dose in six to ten days of work. One needs to work for just half an hour to one hour every day. You receive more exposure during shut-downs. The work involves moving material. Machines are used for heavy loads, but if the load can be lifted by one or two persons, then machines are not used. My lungs have become bad. I dont smoke. I have gone to many different hospitals for treatment They treat you for T.B. After a few days, the doctor tell you to stop taking the drugs. Then, they restart the treatment all over again. I have developed these burn-like red marks (keloids) all over my body. One of my mates in the plant, suffers from exactly the same problem. I have a seven year old son. He was born with a sternal deformity. Ever since birth his rectum comes out when he shits. Despite knowing the dangers of working in the plant, people go there because they get better wages. If I have to starve, I will starve, but I will not work at RAPS."

Editor's Comments:

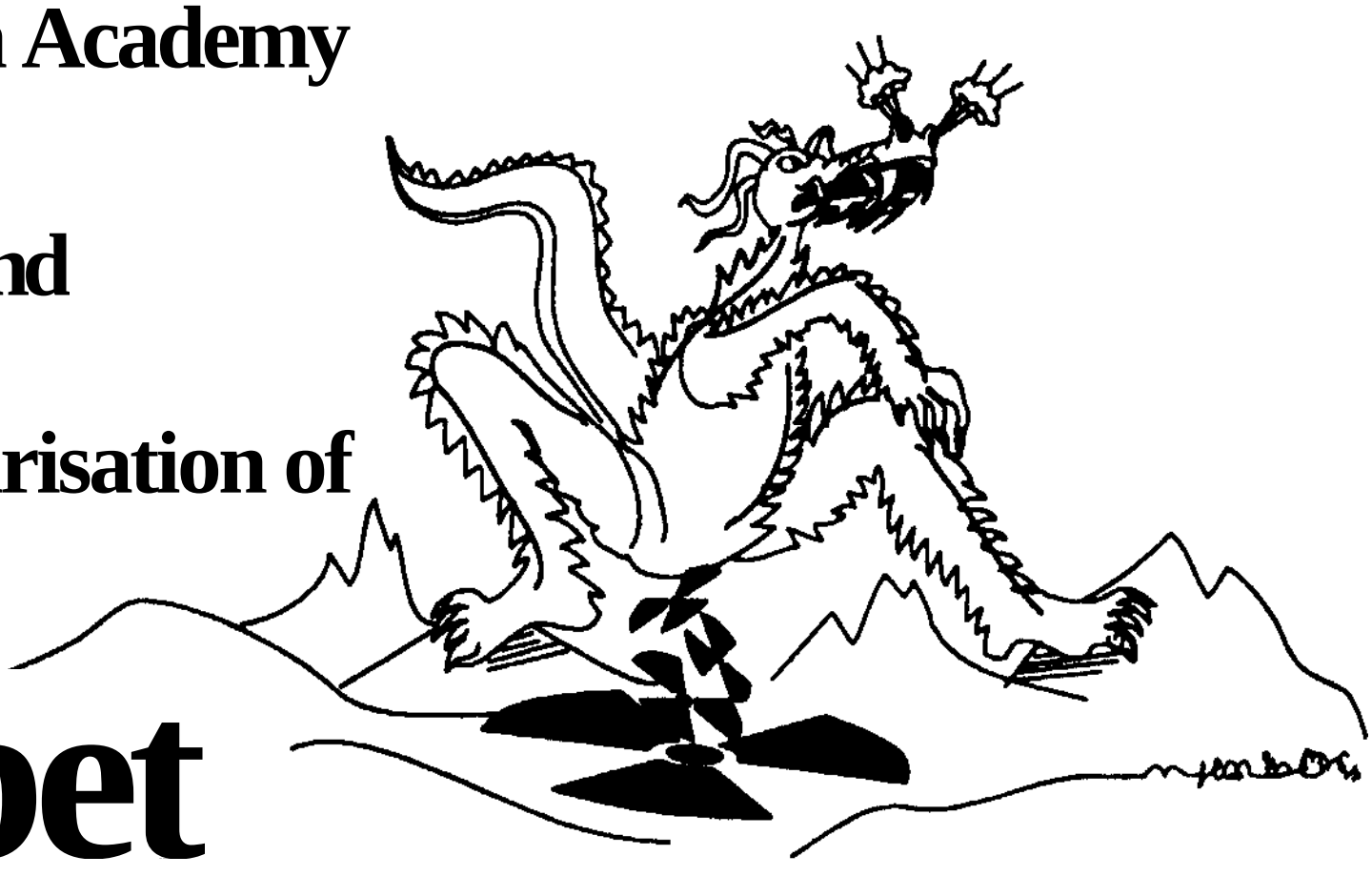
This article makes no mention at all about nuclear power. That is but natural, since in any serious discussion of the power situation in India, nuclear power which contributes a mere two percent of the capacity and much less than two percent in terms of electricity, just does not count.

Transmission and distribution losses are generally said to be around 20—25 percent in India. The figures quoted in the table seem to say that this figure is not really correct. While these losses are 25% of the total capacity, they are an enormous 42 % of the electricity actually being produced. I would be surprised if any other country in the world conies close to us in such profligacy.

The Ninth Academy

And

The Nuclearisation of



Tibet

Tibet, the high plateau in the magnificent Himalayas, the land where many major rivers of the region including the Brahmaputra (Tsangpo in Tibet), Indus and Yangtze originate, has been a victim of the nuclear madness. It is an irony that the land of the gentle Buddhists is being ravaged by nuclearisation. We give below some extracts from a comprehensive report, NUCLEAR TIBET, by the International Campaign for Tibet (ICT) which is a Washington-based, Tibet monitoring advocacy group. The report is the result of a year-long research effort. The methodology of the report included library research of Chinese and English language materials; interviews with Chinese nuclear experts, government officials and Tibetans, fact-finding missions, laboratory sampling of soil and biotic materials; and measurements of selected sites for radioactivity with Geiger counters. The Report is dated April 1993. In this article, we focus on just the Ninth Academy—the nuclear weapons research facility. We will have a separate article on the other Chinese nuclear activities in Tibet in a future issue.

Highlights of Nuclear Activities in Tibet

The nuclear activities of the occupying Chinese authorities include:

- Building a top-secret nuclear city, the "Ninth Academy" where moat of Chinese nuclear weapons were designed and inbricated.

* Dumping an unknown quantity of radioactive waste from this facility, and near uranium mines. There are credible reports of illness and death among tribes In the area.

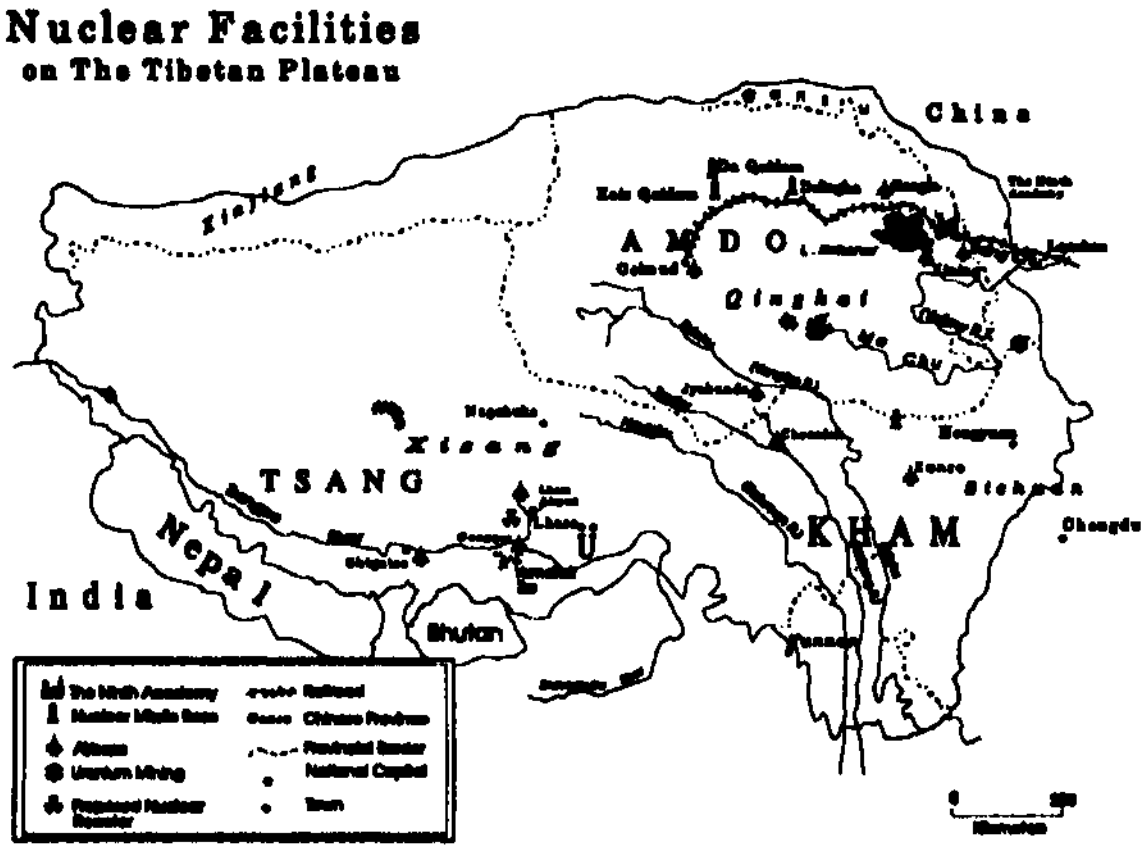
Deploying nuclear weapons in at least three sites, one of which Is accessible only by a rugged dirt road posing transportation risks. By these deployments of nuclear missilles and facilities. China has negated the historical buffer tone role of Tibet.

Aliegations of dumping of other countries' nuclear waste wars unconfirmed. But the resesrch team thinks that though this is unlikely to have happened in the past, it is vary possible in the nature. Shipment of high-level Taiwanese nuclear waste to China for disposal is very likely and that waste may go to the Tibetan Plateau, according to credible sources.

There is also a proposal to build s nuclear reactor in Lhasa to meet the increasing energy demands of Chinese settlers and enteterpries.

Chinas nuclear programme is only a fraction of the size of those of the US or the ex-USSR in terms of the nuclear arsenal, number of test axplosions and the volume of nuclear

waste generated. But in the areas of nuclear proliferation, lack of worker safety and irresponsible waste disposal, China's record is as poor or even worse than those of other nuclear powers. The implications of this situation for Tibetans, Uygurs and Mongolians is truly frightening. Any movement toward making Tibet a nuclear free zone, as proposed by the Dalai Lama and others, will have to address the nuclear ambiguities between China, India and Pakistan and each of their security needs.



The Ninth Academy

The Northwest Nuclear Weapons Research and Design Academy was called the "Ninth Academy" because it was under the jurisdiction of the Ninth Bureau. It was constructed in the early 1960's in the Haibei Tibetan Autonomous Prefecture, Quinghai Province, Haiyen County, near the shores of Lake Kokonor. Parts of this huge facility are located underground to deter detection and possibly attacks. All the functions of the Academy are not known But it is clear that it was responsible for designing all of China's nuclear bombs through the mid-1 9701B. For this purpose the facility designed and carried out non-nuclear explosions. It also served as a research centre for detonation development, radiochemistry and other weapons related activities.

Although its primary function was research and design, it also assembled components of nuclear weapons. According to Indian researcher, S. Devakinandan, the plant produces approximately 300 kgs, of weapons grade uranium and that China's hydrogen bombs were probably fabricated at Haiyen. The Ninth Academy is one of China's most closely guarded secrets and rarely mentioned in Chinese or Western publications.

History of Ninth Academy

China's occupation of Tibet began in 1949. In 1968 the Chinese Communist Party's General Secretary Deng Xiao Ping formally approved construction at the site. By the end of that summer, over 10,000 construction workers were working in the sheltered valley to the east of Lake Kokonor. Geographically, the area is a high altitude desert and was called "gold and silver sand". Due to the isolation and climatic factors of the site this construction force was found insufficient. Authorities reinforced the work-force by including prisoners. The use of prisoners to construct industrial infrastructure is well documented in Communist China and Qinghai is considered China's "Siberia". Harry Wu, a former prisoner and China prison expert, reports that labour reform camps in Qinghai use prisoners to excavate radioactive ore and they are forced to enter nuclear test sites to perform dangerous work.

The Ninth Academy was partially opened in 1963 and was fully operational by 1967, during the Cultural Revolution. Prior to the opening of the Academy, nuclear weapon design was conducted at the Beg ing Weapons Research Institute. After the Academy was opened, the top scientists and the principal work were relocated from Beijing to the Tibetan Plateau.

Nuclear Weapons Production

In 1964, the Ninth Academy conducted the first 1:1 model blast experiment at a site near the facility. China's top nuclear scientists continued to gather at the Ninth Academy to refine, update and develop all of China's nuclear weapons technology through the late 1960's and early 1970's. In the late 1970's, the Academy established a Chemical Industry Institute which conducted comprehensive experiments" on reprocessing highly enriched uranium fuels. In the area of low-concentration fuel reprocessing, the Academy's vertical shearing machine had a daily processing capacity of as much as 400 kgs of uranium. In 1987, China disclosed some more information about its highly secretive nuclear programme in a book, *Con-*

temporary China's Nuclear Industry, by Lie Jue et al. Lie Jue was the men instrumental in selecting the locale of the Ninth Academy in the Tibetan Plateau. In late 1991, the most authoritative publications maintained that the Haiyen facility was "still China's main nuclear weapons research and design centre. However, it appears that various functions of the Ninth Academy were gradually moved to different locations, mainly to Sichuan Province to the south, where they remain today. It is possible that all of the Academy's nuclear functions were moved away from Haiyen by or during the 1980's. Tibetans in the area who were interviewed said that many of the soldiers guarding the facility were removed in themid-1980's.

The economy of the Haiyen County is dominated by the Ninth Academy. But there is substantial agriculture and animal husbandry activity. Per capita income is more than double that of other counties in Qinghai. Heavy industrial output is 72 million yuan, about seven times that of surrounding counties. These figures are likely to account only for the supporting infrastructure of the facility and not for the output of the facility itself

Radioactive Waste and Health Effects:

The nature and quantity of radioactive waste generated by the Academy is unknown. Waste disposal methods have been reported as being extremely casual. Initially, waste was put in shallow, unlined landfills. Since no records were kept, the nature and location of much of the waste will be extremely difficult to ascertain. Understanding the hydrology and geology of Haiyen county will play an important role in assessing the methods and pace of the haxardous dispersal of the radioactive waste.

The shallow landfills created in the 60's and 70b may be leaking into the groundwater and watershed at a faster rate now than in the past

On the peaceful nuclear front

Full Steam

China plans a rapid expansion of its nuclear power generation programme. This makes it the most promising market for nuclear suppliers. Presently three nuclear power stations are operating, one at Qinshan near Shanghai with a capacity of 300 MW and another at Daya Bay near Hongkong with two reactors of 900 MW each. A district heating system with energy provided by a small nuclear reactor of 5 MW is operating in Beijing.

By 2010 China hopes to have an installed nuclear capacity of 15,000 to 20,000 MW. At present more than ten provinces plan to build nuclear power stations and have conducted site selection. Advanced planning has been made in Guandong, Liaoning and Zhejiangprov-**inces.**

years. Underneath the Ninth Academy are a series of natural aquifers, which are charged and replenished by surface waters, streams and underground streams and sometimes comprise of underground lakes. Underground water supplies in Qinghai have been diminishing at a rapid rate and usable underground water is very limited. This may make any radioactive contamination of ground water a matter of great concern.

There have been no known systematic studies of health effects of the Academy. There have been periodic stories about mysterious and unnatural deaths around Lake Kokonor. But they have been not specific enough. Some of these reports came from a Tibetan physician who lived in the area. In 1984, a Tibetan doctor, Dr. Tashi Dolma was sent to the Academy to take a blood sample survey which was part of an effort to prove that Tibetans were genetically and inextricably linked to the Chineee. Dr. Tashi Dolma and other physicians sampled over 2,000 people from three counties. But the samples were never analysed for effects of radiation. In two villages, Reshui and Gansihe, Tibetans reported to the medical team that there were strange diseases in their villages. These villages were closest to the Ninth Academy. But the team was not allowed to pursue these reports further. Dr. Tashi Dolma also worked in a hospital in Chabcha (Gonghe in Chinese) in Hainan Tibetan Autonomous Prefecture directly south of the Ninth Academy. There, Dr. Tashi treated Tibetan nomads whose sheep graced near the Academy. The children were found developing a cancer that caused their white blood cell count to rise uncontrollably. Seven of the children , aged 7-14, died during the five years she was at the hospital. A doctor from Pittsburgh, whom the I CT has been unable to locate, reportedly came to Chabcha to conduct research at the hospital and told Dr. Tashi that these symptoms were similar to cancers which followed the bombing of Hiroshima and Nagasaki. Tibetans interviewed in the area in September 1992, said that meat from animals in the valley surrounding the Ninth Academy was banned by authorities from stores. "Everyone was told not to eat the meat from there, but not told why." One parson complained that the meat was much more effectively kept away from the Chinese communities in Qinghai,

but impoverished Tibetan sometimes ate the meat out of ignorance or necessity. It is unlikely that nuclear waste from China or abroad would be disposed far from the railway line that leads west into Amdo. That railway line crosses headwaters of the Yellow River - but not the river itself- at the Ninth Academy and elsewhere.

The only other potentially dangerous activity likely to be in the headwaters of the other rivers is uranium mining which does not produce the high-level waste which poses significant threats to populations far downstream. Another potential threat would have been the nuclear plant that was planned for Lhasa on the headwaters of the Brahmaputra, which would have produced high-level waste. But its construction has been cancelled, at least for the time being.

Unsafe waste disposal practices from the Ninth Academy threatens health in Xining, located approximately 70 miles downstream and inhabited by more than 700.000 people. The section of the Yellow River downstream of the Ninth Academy has been documented as containing huge quantities • approximately 100 tons - of liquid mercury. The mercury is believed to come from the nuclear facilities located further downstream at Lanzhou, Gansu Province, which lies at the base of the Tibetan Plateau. Liquid mercury is one of the principal waste products of military nuclear weapons development. During the 1960's and early 70's, China dumped enormous amounts of liquid mercury directly into the rivers. Mercury and other highly toxic solvents are commonly mixed with high-level military waste resulting from plutonium production. Even the Chinese official records on nuclear development admit that their attempts to dispose of mercury waste from nuclear military development "were rather poor". River section in Gansu, directly downstream from the Tibetan Plateau, also contains phenol and arsenic more than 11 times the permissible standards.

Waste in Lake Kokonor

In the former Soviet Union, disposing of nuclear waste was often done by dumping it into the nearest water-body. This practice was partially due to the frantic nuclear preparation for the Cold War. The pace was equally, if not more frantic in China. As a result, many nuclear experts fear that China engaged in some of the most dangerous disposal methods such as dumping waste directly into the rivers and lakes. This waste management philosophy and practice -"dilution is the solution to pollution"- is still widespread in China.

Lake Kokonor (Qunghai Hu in Chinese) , the largest salt water lake in Tibet, is located 10 miles east of the Ninth Academy. A railway line leads directly from the plant to the lake and stops at the water's edge and could have been designed by the Soviet advisors who helped build the facility. The line may have been used to dispose barrels of waste. Experts speculate that this rail line may have been used to dispose radioactive waste when the waters of the lake was higher. Galen Rowell, an eminent Himalayan photographer and naturalist, remembers seeing this rail line in 1980, along with unusually heavy truck traffic in the area, neither of which he could explain at that time.

The ICT received numerous reports of top-secret military manoeuvres on Lake Kokonor in the early 1970s. One came from a Chinese man whose father worker as a nuclear scientist and was living in Lanzhou in the 1970's. According to this man, there was an accident involving nuclear pollution of Lake Kokonor in 1974. Fishing was banned temporarily and at least the scientific community in Lanzhou refrained from eating fish from the lake for many years as a result of the accident.

Public Opposition

The security concerns for the Ninth Academy included rebellions by Tibetans against direct Chinese rule. Tibetans have a long history of protest against Chinese domination in Qinghai. Qinghai was run by a Muslim warlord, Ma Bufang, during the first half of the Century and was independent of any Chinese rule. Construction of the Ninth Academy displaced some villagers, nomads and monks. Though there is no record of fighting and resistance around Haiyen, some of the fiercest resistance has come from the Golok nomads who live south of the Lake Kokonor. Maps show that there were several Buddhist monasteries in the vicinity which were destroyed and have never been rebuilt, probably due to their proximity to the sensitive facility. From the orientation of its fortifications, it appears that the facility was prepared for an attack from the south of the Lake. Now one finds abandoned trenches, bunkers and barbed wire.

China has, sometimes, simply created a separate administrative district to side-step a local government that may pose problems, or established a friendly local government. Both these tactics have been used in Tibet. For example, to facilitate the construction of the Ninth Academy, the authorities "set up" a friendly local government. Parcels of land for nuclear missiles sites were also removed from the jurisdiction of prefectures, made into their own administrative unit and controlled directly by Beijing.

K.Krpa

Mescalero Apache Tribe Votes Down MRS

In a vote that shocked the nuclear power industry, the Mescalero Apache tribe January 31 decisively rejected a plan to build a radioactive waste dump on their land. The plan, promoted by nuclear utilities and tribal leaders, would have established a private "monitored, retrievable storage" facility for high-level nuclear waste on the tribe's New Mexico land. The final vote was 490-363, or 58%-42%, against the proposal. The question drew a record voter turn-out for the tribe.

The size of the margin against the dump, and the record turn-out, appeared to leave little option for the 33 nuclear utilities which had hoped to set up a private nuclear waste dump, or at least create a viable radioactive waste alternative if current efforts fail to force US taxpayers to take the waste by 1998. Indeed, the day after the vote, Northern States Power (NSP) lobbyists already were at work in the Minnesota legislature seeking new concessions to allow the utility's nuclear reactors to operate beyond 2002. Northern States Power was a key mover in the effort to site a dump on the Mescalero land Last year, the Minnesota legislature narrowly approved construction of a limited number of dry cask storage units for NSFs Prairie Island reactors, while setting up a method for the utility to switch to renewable energy sources and close its reactors.

The industry's Nuclear Energy Institute appeared to concede further defeat on the private MRS concept, saying that the vote made it imperative for Congress to act this session to require the Department of Energy to build an "interim" nuclear waste storage facility by 1998. Senator Bennett Johnston (D-La) has introduced S.167, which would require construction of such a dump at Yucca Mountain, Nevada.

The Mescalero's clear rejection of the MRS appeared to take the industry by surprise. The project had the support of the tribal leader, Wendell Chino, and the tribal council. But in the days before the vote, opposition efforts led by Humans Against Nuclear Dumping, a Mescalero-based group, and Joe Geronimo, grandson of the legendary Apache leader, began to turn the tide. Nearly every Mescalero household received fact-sheets prepared by Nuclear Information Resource Service, and heard donated radio ads - in Apache -from Geronimo.

The size of the anti-dump vote appeared to preclude concerns that Chino and the tribal council might attempt to force the MRS on the tribe anyway. Indeed, Chino now may face a battle over tribal leadership. However, there were rumours that Chino might press for a second vote, with substantially increased funding from nuclear utilities. Unconfirmed reports indicated that Mescaleros were told that they could receive $2,000 for switching their votes in favour of the dump.

The Nuclear Monitor February 13, 1995.

Not Only Through Radiation

"What lf :A Case Study of Kaiga

Normally when one thinks of a nuclear accident or a safety hazard during its routine operations, what immediately comes to mind are only the radiation hazards. Compared to these, the non radiation ones may even seem trivial. On the one hand, the first reaction of the nuclear establishment in any accident is that it has no radiation impact! Even the Chernobyl accident has been dismissed by Dr. Raja Raman na (the erstwhile chairman of the Department of Atomic Energy) as a "curious fire accident". There are several experts in the Health Physics Division of Bhabha Atomic Research Centre who are willing to assure us that the genetic damage and deformities at Rawatbhata are due entirely to non radiation causes. Also our most recent nuclear accidents, the fire at Narora, the flooding of Kakrapar and the crash of the Kaiga dome, have opened up the possibilities of genuinely non radiational but nonetheless serious hazards arising from our nuclear power stations. This perhaps is a unique feature of the Indian nuclear programme.

However, the fundamental reason for studying the non radiational accidents is that they raise disturbing, What if questions. What if the Narora fire had spread another 50 feet, with all the safety systems inoperative? What if the Kakrapar flooding had occurred when the reactor was running? What if the Kaiga Containment had collapsed onto a critical core and damaged it? One can also use the non radioactive accident as a pointer to the safety culture in the nuclear establishment. Analysis of the causes and the way such accidents are handled, provide us with valuable insights into how real, radioactive accidents will be managed by the establishment and the level of public safety that one may expect during such emergencies.

The Unthinkable Crash

On Friday, the 13th of May last year, the inner containment dome of the first reactor at Kaiga caved in for no immediately discernible reason. Reports said that concrete slabs weighing several tens of thousands of tonnes came crashing down from a height of about 40 meters, the height of a 12 storied building, Normally the containments of nuclear power plants are built strong and are built to last. They are supposed to withstand not only the intense radiation from within but also natural disasters like hurricanes and severe rain. They should not be breached even in case of a massive earthquake of the magnitude of 6.5 or a bomber attack by air. In the last earthquake at Kobe, Japan, there were 11 nuclear reactors in the quake hit area. All of them survived, shutting down safely. (However, none were near the epicentre of the crash. If the epicentre had been a hundred miles to the north where most of the reactors are located it is unlikely that the reactors would have survived, since the earthquake produced accelerations which were for in excess of design basis of the reactors,—Editor) But in India, we have containment structures which do not seem to withstand their own weight! The very strict requirements of integrity are necessary because, despite claims of Defence in Depth, containment is the sole barrier between the radioactive core and the environment. The collapse of a containment dome in any reactor at any stage is simply unthinkable.

Implications

To understand the true implications of the Kaiga accident, one has to ask what would happen if the containment of a working reactor comes crashing down. The worst possible accident scenario in a nuclear power plant is a core out of control coupled with breached containment. In the case of Chernobyl, the reactor core went out of control and blew the containment, whereas in Kaiga the sequence would be in reverse, but the end result would be the same. The falling debris of the dome would damage the core, the coolant pipes, and many of the safety systems as well. With cooling and safety systems inoperative, the core will suffer a loss of coolant accident. With the containment already breached, the result would be a nuclear disaster of the same magnitude as Chernobyl.

Various possibilities come to mind when one looks for the causes of the accident. Kaiga after all is a Government building and no one needs two guesses as to why Government buildings collapse during construction. On the one hand NPC claims to have procured the best quality construction materials, and on the other, the people of Karwar claim that the local markets are flush with huge quantities of the same high quality cement and steel. Investigative reports have been published detailing several corrupt practices at the site, including the diversion of materials. It should be noted that the fire station building at Kaiga had also collapsed earlier.

The Official Explanation

The official explanation of the dome crash is equally damning. It has been admitted that the design of the dome was changed at the site. But the serious safety questions raised by this admission have not been answered. Who decided to change the design? Were they authorised to do it? More important, were they competent? What kind of safety culture prevails in the nuclear establishment where something as critical as the containment design can be changed by incompetent and unauthorised persons? Was the AERB clearance taken for the design changes or was it bypassed altogether? What is the value of the claims made both by AERB and the NPC that all major design aspects of the power station are audited by the AERB have not been ignored by the NPC?

Nucteocratic Mindset

It is also important for us to analyse the response of the nuclear establishment. The reactions from its senior officials can be grouped into several attitudinal categories.

The first response was to hush it up. The injured were immediately taken out of the reactor building which was sealed. Till today the death toll has not been disclosed. Normally at least a hundred workers are inside the dome at any given time. We have been told that (by God's grace, no less) the dome crashed during the lunch hour. Lunch break at 11.45 AM at an Indian construction site strikes one as an innovative idea.

The Real Surprise

There are two committees appointed separately by the NPC and AERB to investigate the accident with an assurance that they would submit their reports within three months. No one is certain as to when they will do so. Recently Dr. Gopalakrishnan, Chairman AERB has made the remarkable admission that the delay is due to non availability of important documents from NPC. This is not surprising. The real surprise is that AERB is actually insisting on documents from NPC. But no matter when released, one thing we can be certain of - both of them will be suppressed. There is a saying: He who has a secret to keep, keeps it a secret that he has a secret to keep! Therefore, even the fact that there is an official report on the accident will be suppressed so that no one would think of asking for it!

The Veil of Darkness

At no point of time did the NPC take the local administration into confidence. The Karwar District authorities were informed of the accident only late at night. The injured were kept incommunicado in the hospital so that they did not talk. Till today no group of citizens or the local administration has been permitted to see the damage.

Allaying Public Pears

When the news broke out anyway, there were attempts to trivialise it. This comes under the favourite pastime of the nuclear establishment viz., "allaying fears in certain sections". The crash of the dome was described in the officialese as "certain sections of the containment getting delaminated". When repeatedly asked about such an accident in a working reactor, some of the most bizarre explanations have been offered for the accident. A few samples are

a. Not even a spec of cement would have got into the core.

b. So what? If the roof of your car gets blown away wont the engine be still working?

c. What if one dome collapses? We have another dome around it!

Given the seriousness of the accident such frivolity can only be de-

scribed as irresponsible and in extremely bad taste.

Serious Repercussions

In a more sophisticated attempt to gloss over the failure, it was stated that the dome was undergoing prestressing at the time of collapse. In reality the dome construction was over nearly four months earlier. The NPC's desperation in the matter is indicated by the fact that even the Prime Minister has been fed with this piece of misinformation.

In a case of a real accident, such bureaucratic attitudes can only lead to serious repercussions for the safety of the general public. While openness, accountability and transparency are desirable at all times, they are of critical importance in the event of a massive nuclear disaster where large populations have to be evacuated in a short time. It also demands perfect co-ordination with the local administration and other agencies. But if the ostrich like attitude displayed during the Kaiga dome collapse is any indication, the nuclear establishment is more likely to be busy denying or trivialising the seriousness of the accident, jeopardising the life of thousands.

Too Hot to Handle

Kaiga is also unique in posing non radiation hazards even without an accident. One such hazard which is not generally understood is the thermal pollution. Much has been said about the folly of setting up a reactor complex in the middle of a tropical rainforest. This has been countered by the nuclear establishment with claims of minimal damage to the ecosystem. Figures like "only 125 hectares of forest will be lost because of the project" have been touted but have already been proved hollow.

A nuclear power plant is essentially a boiler with highly radioactive nuclear fuel which generates tremendous amounts of heat. The heat is used for boiling water which in turn runs a turbine. In this process, only about one third of the heat is converted to electricity. Thus for every unit of electricity is generated, two units of waste heat is also put out which must be dissipated in the environment. A 235MWe reactor at

Kaiga produces about 470,000 units (KWh) of heat every hour which will be released into the surrounding rainforest. This is equivalent to the heat required to heat 4 million litres of ice cold water to its boiling point.

The environmentalists were assured earlier that there will not be any cooling towers in Kaiga spewing out enormous quantities of steam into the valley. This decision too has been reversed. If the planned complex of six reactors is actually carried out in Kaiga then we would be releasing the heat equivalent of 24 million litres of boiling water every hour into the rainforest. The nuclear establishment in India is blissfully unaware of any tropical environmental issues and has done no studies on the hazards of thermal pollution from its plants in Kaiga. The sloppily done NEERI report has also ignored this important point. Tropical flora and fauna are very sensitive to the heat content of their environment. The impact of such massive heat release will be a total destruction of the ecosystem. The only redeeming aspect is that because of poor siting and management, the Kaiga reactors will be shut down more that 50% of the time and consequently the heat pollution will be less to that extent.

Transmission
Line Vandalism

Another non radiation hazard to the Kaiga reactor is the deforestation being carried out in the name of transmission lines.
Through a series of multiple sub contracts the clearing of forests and encroachment of private properties for laying transmission lines is taking place in Karwar district. There is widespread resentment in the region against this vandalism and people are organising themselves to launch an agitation.

In conclusion one can say that non radiation related hazards of nuclear power plants are real and significant. The analysis of the Kaiga dome collapse reveals the absence of accountability and lack of safety culture among the nuclear agencies in India. The implications of such complacent attitudes during a major accident should be a matter of grave concern. Nuclear power plants also pose serious thermal pollution problems which will lead to a total destruction to the sensitive ecosystem in Kaiga.

Sanjay Havanur

Some Generic Safety Issues of Indian PHWR Stations

An article from Dr. Gopalakrishnan, the Chair of the Atomic Energy Regulatory Board seems to have become a regular feature of Anumukti. The following are some excerpts from a speech he recently made at a seminar on Nuclear Power and the Public Safety organised by INTACH in Delhi. They detail some of the safety issues that are common to all Indian nuclear power plants with the exception of Tarapur.

Inservice Inspection of Reactor Coolant Channels.

Recognising the possibility of failure due to contact between the pressure tube (PT and the calandria tube (CT), as a result of garter spring movement, Atomic Energy Regulatory Board (AERB) has directed the Pressurised Heavy Water Reactor stations to carry out inservice inspection (ISI) of coolant channels on an urgent basis. The following criteria have been adopted for the prioritised selection of channels for inspection:

a) channels having history of failed fuel bundles

b) the high-flow and high-power channels in the central zone

c) channels near adjuster rods, and

d) channels which exhibit high creep deformation.

Based on the above considerations, the Rajasthan and Madras atomic power stations have carried out ISI of 16 & 14 channels respectively, using an indigenous tool (BARCIS) specifically developed for this purpose. The results reviewed and suspected channels were defuelled and quarantined. MAPS was asked to carry out chemical decontamination of the Primary Heat Transport system before undertaking the next campaign of ISI of MAPS-1 coolant channels. This has also been done and the results are presently under review.

End-shields of earlier generation PHWRs.

The two units of RAPS and the first unit of MAPS have their End Shields made of 3.5% nickel steel. Contrary to the original design expectation, it was found that this material gets embrittled at a much faster rate. However, the material of end-shields from MAPS-2 onwards has been changed to austenitic stainless steel. Feasibility studies are underway for replacement of the embrittled end shield. In the meantime, in view of the leaky south end shield of RAPS-1, the regulatory body has restricted RAPS-1 operation to 50% Full Power.

RAPS-1 Calandria Over Pressure Relief Device (OPRD):

During the early seventies, OPRD of the Douglas Point Nuclear Power Plant in Canada had developed a leak. By the time this (act came to be known, RAPS-1, whose design is similar to that of the Douglas Point NPP, had already started operating and the OPRD became inaccessible. For subsequent NPP's the OPRD has been located in accessible areas, so that appropriate maintenance and inspection can be carried out without difficulty.

As at Douglas Point, the nickel gasket employed in the OPRD of RAPS-1 also developed a leak, forcing the unit to be shutdown. As an interim measure, certain operational stipulations such as imposition of a modified dump tank pressure control and ensuring the availability of calandria vault dryers, have been made. Meanwhile, an action plan for repair of the leaky gasket is being pursued,

Damaged inlet manifolds of MAPS Units

During 1989, the moderator inlet manifolds situated inside the calandries in both units of the Madras Atomic Power Station (MAPS) suffered damage, forcing shutdown. Detailed evaluation of the extent of damage was carried out.

NPC approached AERB with a proposal to modify the flow path in the moderator circuit and operate the units at a reduced power level. This proposal consisted of cutting and balancing the existing 8" size calan-

dria inlet line and rerouting the outlet line to convert it as an inlet line. Moderator pumps then take auction only from the dump tank. Fast pump-up logic would be kept inhibited, while the maximum moderator outlet temperature at heat exchanger outlet would be restricted to 65 degrees Centigrade.

After review of the proposal and taking into account the modified stress contours and thermal hydraulic performance, permission was accorded for operation of both units of MAPS in the modified mode at 75% Full Power as an interim measure.

Meanwhile, studies are being carried out with the help of the Indian Institute of Technology (IIT), Bombay to determine the flow pattern of moderator in the modified mode and the consequent thermal effects on the rolled joints. The determination of the heat transfer coefficient in the flow mode, estimate of the average tube sheet temperature, and determination of the pull-out strength of rolled joints at the elevated temperatures etc. will form part of these studies.

A Gopalakrishnan and
S.V.Kumar
Atomic Energy Regulatory Board

The Pileup at Pickering

A serious nuclear accident on December 10 caused the emergency core of coolant injection (ECCI) system at a Canadian nuclear reactor on the shore of Lake Ontario to activate for the first time in the province's 23-year history of CANDU reactor operations.

This last-resort emergency, injected cooling water to avert core damage and possible meltdown at Ontario Hydro's Pickering Nuclear Generating Station, located 20 miles east of Toronto. The accident raises the question of whether unknown design flaws exist in the Canadian design CANDU reactor, and the possibility that nuclear safety margins are decreasing as the reactors age, increasing the risk of a major accident.

The unprecedented accident and the resulting heavy water spill at one of the facility's eight nuclear reactors also involved an off-site radiation release. Regulatory concerns about the accident and public concerns over nuclear safety at Pickering have delayed the relicensing of the antiquated station by Canada's Atomic Energy Control Board (AECB).

Pickering town councillor, Maurice Brenner is reported to believe that Ontario Hydro failed to provide "open and honest communications" with the town concerning the accident. The *Tbronto Star* newspaper is asking whether the accident caused damage to the reactor's nuclear fuel.

The accident at the 500 MW unit 2 started when a fault caused a pressure relief valve on the primary heat transport system to open, There are four pressure relief valves in the heat-transport system and they are designed as a "fail-safe" mechanism. They are supposed to pop open whenever the pressure in the reactor—either from excessive heat or from high volumes of water — builds up. Once the valves are open, the heavy water flows into the bleed condenser tank, where it is collected and later recycled. However, the pressure valve malfunctioned when an air line that keeps the valves closed failed.

As the water rose in the bleed condenser tank, the pressure dropped in the heat-transport system and tripped a sensor that stopped the turbines. When the turbines stopped **running, the system backed up. Pressure increased in the heat-transport system, a situation that the plants fail-safe mechanisms are designed to handle.**

However, in this case, a pipe in the bleed condenser broke dumping 130 tonnes of tritium-contaminated heavy water to the boiler room floor. This accident sequence is similar to that which caused the Three Mile Island accident, where a preesuriser performs similar functions to the bleed condenser, normally maintaining the balance and pressure of

A Pragmatic Perspective

"Area residents acknowledged that it was frightening to live so close to a nuclear reactor, but maintained a pragmatic perspective:

'If there's going to be a major nuclear disaster, we'd prefer to be close by and wiped out immediately rather than suffering and dying three days later from radiation sickness," said Sally Charbonneau, a mother of two who lives less than two kilometers from the reactor.

From the Toronto Globe and Mail

water in the primary heat transport system.

The ECCI system then automatically activated, dumping cold water into the heat transport system. For four and one half hours it kept the reactor fuel from overheating and the reactor from a severe core damage accident Six employees were operating the plant at the time of the leak. They were not moved out Another 100 were at the plant, but not in the area of the leak.

Pickering director Pierre Charleboifl said the incident "demonstrated the integrity of the safety systems and the ability of the staff to respond."

However, the community watchdog group, Durham Nuclear Awareness, which has the support of Toronto City Council, municipalities in the Pickering area, and several members of the Canadian parliament, urged the AECB to order a full investigation into safety at Pickering. The loss of coolant accident should serve to emphasise ongoing problems that would benefit from a public review by the AECB."

Durham Nuclear Awareness wants Hydro's nuclear power plants mothballed, and says it has new evidence that Pickering sits in an area that is threatened by earthquakes.

Norm Rubin of the Toronto-based public interest group Energy Probe says The accident developed in a way that compromised the vaunted 'defence in depth'principle of nuclear safety, ьecause one fault led to another." He points out that the reactor shutdown systems of the first four Pickering reactors (Pickering A, one of which experienced the accident, are the least capable of Hydro's reactors. Also the Emergency Core Cooling Injection system was not part of the original reactor design, and was retrofitted.

The Pickering nuclear accident occurred while Ontario Hydro and federal GANDU seller, Atomic Energy of Canada Ltd. are promoting a plan for the US Department of Energy to fuel CANDU reactors at the Bruce nuclear power complex (north-west of Toronto on the shore of Lake Huron) with pluioniuro freed from the US atomic arsenal mixed with the reactor's natural uranium fuel. The proposal is deplored by Canadian environmentalists as unsafe and unsound, would leave the country with increased nuclear waste, and blur the line between civilian and military use of nuclear materials. Additionally, the Bruce reactors are already facing premature shutdowns for technical and economic reasons, with the first reactor of eight at the Bruce complex slated for permanent shutdown in 1996.

Based on reports by David Bright & Stephen Salaff for industry publications and by Ameer Nasrulla for the Toronto Glob and Mail*

Editor's Note: The accident at Pickering is of special relevance to us in India since the much touted "Pressurised Heavy Water Reactors of our own design" are in reality copies of Canadian reactors. The Rawatbhata and Madras reactors are based on the Douglas Point reactor (which was a

precursor to Pickering) whereas the later reactors at Narora, Kakrapar and Kaiga are "improvements" on that design. There are very serious implications of the accident at Pickering for us. On a world-wide scale CANDU reactors are few in number and there is comparatively less operating experience. Thus, their safety features are not that well understood and they are quite capable of springing unpleasant surprises.

As the reactor population ages, it is more prone to have accidents. Old reactors in India like the one at Rawatbhata have not been retrofitted to have newer safety systems like ECCI as was done at Pickering. Thus, a similar sequence of events at Rawatbhata could have led to a bigger disaster. While newer reactors like Kakrapar-1 do have an ECCI system, it has not been properly tested, so its behaviour in actual accident conditions is a matter of conjecture and prayer. Editor's Note: The accident at Pickering is of special relevance

Poor Taste and Poorer History

The US Postal Service has announced a commemorative stamp marking the atomic bombings of Hiroshima and Nagasaki

The stamp, which marks the 60-year anniversary of the ending of World War II, shows a mushroom cloud and carries the caption, "Atomic bombs hasten war end."

Besides being in poor taste, the stamp is also poor history. Nearly 60 years ago, the "Big WAR" ended with the "Big Lie"; that the bombings were necessary to force Japan's surrender, thereby avoiding a bloody, costly invasion.

While the US government kept the record about the decision to bomb

secret for decades, enough material is now declassified to debunk the "Big Lie."

The Japanese communications code was cracked early in the war. So when Japan was seeking Soviet diplomatic help in securing acceptable terms of surrender in June and July 1945, the United States knew it.

President Truman's journal, discovered in 1979, reveals his knowledge of Emperor Hirohito's early peace overtures through the Soviets. Towards the end, moreover, Japan's desperate state forced her to make peace overtures directly to the United States.

Japan's desperation was partly the result of a massive US fire-bombing campaign aimed at her cities. The naval and aerial blockades of the island nation were tight; food was short and raw materials were scarce. Bombing, blockade and an unsuccessful Japanese attempt at industrial dispersion had significantly reduced their production capacity.

The official US Strategic Bombing Survey reported, "Based on a detailed investigation... and supported by the testimony of the surviving Japanese leaders involved, it is the Survey's opinion that certainly prior to 31 December 1945, and in all probability prior to 1 November 1945, Japan would have surrendered even if the atomic bombs had not been dropped..."

The official explanations that the bombings were needed to save American lives also contradict a secret study conducted by the War Department's Operation Division in early 1946. Discovered in the National Archives in 1989, the study plainly stated that a full-scale invasion was no longer necessary by the summer of 1945 and that it would have never occurred in any event. While these reports were written with hindsight, the authors of the first report stressed to Truman in June that an invasion was not needed. The met is, the President had accurate foresight aplenty.

We now know that he received similar advise from nearly all his top military advisors, including Gen. Hap Arnold and Gen. Curtis LeMay, certainly no dove. Eisenhower told Secretary of War Stimson, "Japan was already defeated and that dropping the bomb was absolutely unnecessary." According to Gen. Omar Bradely, Eisenhower also conveyed this to Truman in a June 20 meeting, challenging the President on his stated intention to use the new weapon.

The primary reason for the bombings appears to have been the desire of Truman and his advisors to keep the Soviet Union out of the Pacific war, thereby solidifying US economic and political control in post-war Japan and Asia. As the President somewhat crassly put it, the bomb "would keep the Russians straight."

Truman postponed the Potsdam conference until July 17 so it would occur after the secret July 16 atomic test. At Potsdam, with his atomic card concealed, Truman got the Soviets to amend the agreement reached at Yalta in February. At Yalta, the Soviets agreed to enter the war with Japan three months after the surrender of Germany, which came on May 8. All agreed that the Soviets would declare war on Japan on August 8,1945. Until mid-April, the United States felt that it needed the Soviet entry to break the Japanese military. But Japan's deterioration had come so quickly the Soviet Union was no longer needed. At Potsdam, Truman got the date for the Soviet declarations of war set back a week to Aug. 15, giving him time to push the new bombs into production and delivery. Hiroshima was bombed on Aug. 6, Nagasaki on Aug. 9. As Winston Churchill observed at Potsdam on July 23, It is quite clear that the United States do not at the present time desire Russian participation in the war against Japan." A primary architect of US policy, Secretary of State James Byrnes, said he was Anxious to get the Japanese affair over with before the Russians got in." His diary reveals he was doping for time, believing that after (the) atomic bomb Japan will surrender and Russia will not get in so much on the kill, thereby being able to press claims against China."

The only nation to use atomic weaponry in warfare has a peculiar responsibility as the 50th anniversary year of the bombings approach. Many Americans are already repeating, perhaps unknowingly, the old lie that without the bombings more American and Japanese lives would have been lost than the 200,000 Japanese killed in the ongoing tallies of the bombings.

But the historical record clearly shows - for those Americans patriotic enough to embrace it - that not even these Japanese's deaths were necessary. As the people of the old Soviet Block have shown us in recent years, confronting national falsehoods is never easy. Still we must do it. Our commemorations ought to be solemn, sensitive and above all truthful. We owe the Vaporised dead, some of whose shadows are burnt into the concrete of Hiroshima, nothing less.

Patrick G. Coy
The Post Standard, December 7,1994.

Later news-reports said that the proposal to issue the stamp had been dropped because of strong public opposition—Editor

Seminar on Nuclear Energy and Public Safety

On February 3 and 4,1995, Indian National Trust for Art and Cultural Heritage (INTACH) organised at the India International Centre in Delhi a seminar on "Nuclear Energy and Public Safety" in its series on 'Science and Public Policy." Originally, high officials of the nuclear establishment had agreed to attend the seminar, but at the last moment thought discretion to be the better part of valour. However, representatives from the Atomic Energy Regulatory Board were present as were two nominees from the Department of Atomic Energy (DAE). Also present were Dr. M. R. Srinivasan, the erstwhile chairman of DAE, and Mr. S. K. Chatterjee, the recently retired Managing Director of the Nuclear Power Corporation. A serious lacunae of the seminar was the scarcity of 'neutral' observers. The seminar thus became more a harangue of the converted to the unconvertibles. Despite this inherent limitation, the seminar did manage to reach a consensus on the following points, and thus serve a useful purpose. The person most responsible for guiding this disparate group of individuals towards a conclusion was Dr. Vinod Gaur.

Resolutions and Recommendations

Discussions and presentations made at the seminar clearly showed that a divergence of perceptions and understanding of some of the crucial public safety issues of nuclear power, clearly exists between scientists of BARC and the AERB on the one hand and other independent scientists working in the public domain, on the other. These differences could be substantially bridged, if appropriate steps are taken to ensure transparency of related information systems and the scientific vigour of the investigations made and their analysis. In order to bridge these gape with genuine understanding necessary to evoke a constructive criticism and public response, the seminar accordingly makes the following recommendations and earnestly appeals to the Government to implement these forthwith.

1. That in the interest of instilling public confidence in all matters relating to public safety issues of nuclear energy, the Government should restructure the Atomic Energy Regulatory Board (AERB) as a truly independent agency outside the control of the Atomic Energy Commission. Further, the restructured AERB be appropriately furnished with requisite technical facilities, expertise and resources to enable it to fulfil its mandate to the nation.

2. That the Government should also initiate necessary steps to develop expertise in nuclear engineering in higher technological institutes.

3. That the Government may take appropriate steps forthwith to introduce a consultative mechanism through open public hearing at all crucial stages of setting up and operating nuclear installations.

4. That the Government may promote joint discussion meetinp, between officers of the Atomic Energy Establishments and the public and voluntary organisations to provide a forum for promoting mutual understanding of the diverse aspects of complex safety related issues.

5. That in the interest of promoting accountability and constructive public response, the AEC and AERB should hence forth make publicly available all data and information relating to safety, in particular, the technical report of Site Investigations, Environmental Impact Assessment, Safety Analysis, Emergency Preparedness Plans, Compilation of Operational Data, Analysis of Unusual Occurrences and Accident Analysis Reports.

   Further the report of Investigations of the Kaiga dome failure, ordered by the AERB, be released for public information.

6. That in the interest of allaying public fears of the long-term hazards associated with the decommissioning and retrofitting of ageing and impaired nuclear power plants and of waste disposal, the Government should bring out detailed scientific documents giving information on the scientific approaches and plans of inspection and repairs of the ageing Tarapur plants, re-tubing of the impaired Rajas than Plants, as well as long-term disposal of radioactive wastes.

7. That the AERB should seriously consider involving NGOs in the scientifically designed investigations of important issues of public safety as well as in the important task of creating an informed opinion amongst communities living in the neighbourhood of nuclear installations,

8. The Atomic Energy Regulatory Board and the AEC should make effective use of technological expertise and advice available abroad for timely resolution of safety-related issues, in addition to relying upon those available in the country.

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