ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

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WINDS OF CHANGE ?

Sometime in the beginning of this century, Gopal Krishna Gokhale remarked, "What Bengal thinks today, rest of India thinks tomorrow." Times Change. Today we live in the global village. What the Russian leadership thinks in the morning is well on its way to becoming the official Indian dogma before noon. Today's key word : GLASNQST.

Thus, after four decades of close-door operation, of being answerable only to the Prime minister, even the Department of Atomic Energy (DAE) has felt the need to justify its activities to the general public. As is well known, leopards do not change their spots. Neither do nucleocrats. Their prefered mode of educating the public has been to organise a series of lavishly funded seminars entitled "Atoms for Peace, Power and Prosperity." In these tamashas more than half the time is spent on enunciating the various uses of radioisotopes in nuclear medicine, agriculture, pharmaceuticals and the like. Not a word is said about the fact that all the radioisotopes used for these many purposes, come from the research reactors in Trombay and have nothing to do with the real reason behind these public relation exercises - the need to 'sell' the vastly expanded programme of power generation.

The "National Workshop on Nuclear Power with Special Reference to Kalga" held in Bangalore on December 10 and 11, was in stark contrast to these stage managed exercises. Organised by the Karnataka state government, it allowed for almost equal time between the antagonists and the protagonists of nuclear power. The workshop - the first of Its kind to do so - heralded the coming of age of the antinuclear movement in India. It showed rather Impressively, that even on narrow technical grounds, the antinuclear spokespersons well able to hold their own against the best 0 that the nuclear establishment can offer.

The major demand voiced at Bangalore was for free and unrestricted access to information. To a very limited extent, this demand was conceded. The Indian atomic anergy chief, Dr. M. R. Srinivasan agreed to make available reports on some nuclear establishments. This piecemeal approach is not enough. What we need and need right now is free and easy access to all Information. The 1962 Atomic Energy Act is a disgrace. No 'peaceful' programme need hide behind its cloak. For Glasnost to be more than a mere buzzword, sections 3c, 7 and 18 of this infamous act need to be scrapped forthwith.

AN APOLOGY

This issue of Anumukti Is appearing after an inexcusably long delay. Circumstances conspired to play a cruel Joke. There were deaths in the family, pressure of other work like the National Workshop *of* Kaiga and finally we had to shift our residence from Varanasi to Vedchhl. We deeply regret the very late publication of this double issue. Readers will hopefully also excuse the very dated appearance of some of the articles.

DISASTROUS DRILL

If the way things went at Tarapur during the disaster management exercise of the Tarapur Atomic Power Station (TAPS) on October 8 are any indication, then the residents of the surrounding village did a wise thing by fleeing. It is another matter that the Department of Atomic Energy (DAE) ex udes confidence on the infallibility of the TAPS reactor.

The whole exercise has brought to light that in case and DAE officials do not fail to stress that there won't be a "in case'!— of a radiation leak at TAPS, only providence can save the farmers and fisherman of the Palghar taluka of Thane district, 120 km away from Bombay.

However, the blame for the failure of the exercise has to be shared by the DAE, the district administration and the state government. Also the various agencies under them proved how incapable they would be In case of a real disaster.

The seriousness of the whole exercise was ignored and it was with an air of lightheartedness that the entire drill was conducted. So much so that an Atomic Energy Regulation Board (AERB) observer, who was on site along with scores of other observers, remarked, "Saturday's TAPS exercise was a sort of a mela."

A colorful tent, tea, cool drinks and a lunch session was spread out for officials of various organisations, local and an overdose of the local press corps, along with a few from Bombay gathered at the site. Absolute chaos and confusion prevailed.

The AERB official further pointed out that, according to regulations, the first man to be in charge of the situation once a site emergency is declared should be the TAPS superintendent. And the man to take Over from him the moment an off-site emergency Is declared should be the Collector of Thane district. However, while it was required of TAPS superintendent, K. Nanjudeswaran, to sit In the emergency control, room (ECR) set up at the Environmental Survey Laboratory, 14 km away from TAPS, till the arrival of the Collector he was out for most of the time in the mela, the AERB observer alleged.

Thane Collector G. B. Pingulkar was informed of the disaster at 8.15 pm, when the off-site emergency was declared. He reached the ECR at 10.50 am. This considering that it was an emergency. Pingulkar seemed to be going about the whole thing as if he was attending just another function where he was asked to perform the role of the chief guest.

Apart from the essential presence of these officials, the participation of the locals during the drill was also lacking. The panicky villagers, in the midst of the melee, had "evacuated" themselves.

There were many reasons for the panic, the main being disinformation. It was quite important that the message of the drill and its necessity be brought home to the common man. This message percolated down: but in an unexpected fashion.

The Collector claimed to have met about 500 teachers from the five villages, specially chosen for the exercises, and explained to them that there was going to be a drill. After that the teachers were supposed to have Informed the students who on their part, were to inform their parents. But the whole procedure failed.

The TAPS officials themselves were unsure about the distribution of an emergency information pamphlet which seemed to have caused more fear among some villagers who laid their hands on It. While some TAPS officials said that the pamphlets - in English and Hindi - were not meant to reach down to every villager but only upto the sarpanch level who in turn would explain It to the villagers'xerox copies were available with some villagers who could not understand it.

Another slip-up on part of the officials with regard to the pamphlet distribution was the illustration of an owl on the pamphlet with the heading "Words to the wise: Be prepared." Among the villagers, an owl is regarded as an omen of calamity.

The exodus started on September 5, three days before the drill. The first to leave were the comparatively affluent people of the villagers, and the poor followed them.

On September 7 morning, TAPS officials visited the villages. A village elder of Unbhat claimed that one official had stated : "We will release

some gas. for about 10 minutes, but nothing will happen."

On September 6 and 7, police vans mounted with public address system went round the villages announcing that there was nothing to worry and "Strict action" would be taken against rumour mongers.

But by now the people became more suspicious and panic had set in strong.

More rumours made their way into the villages. One was that there would be a Bhopal type disaster. The villagers also had Chernobyl in mind, a disaster they had come to know through television.

The local press corps also added fuel to the fire and disinformation, such as five people killed after falling out of overcrowded trains, and 95,000 tickets sold at Boisar railway station, were also reported. Local villagers also blamed some of the Palghat fortnightlies for creating panic.

Inspite of the warning, there were a few who stayed back to "guard their houses". A woman said, "One day we all have to die. I want to die here."

Since then, people have started returning to their houses. They are cursing the government, TAPS and all other connected with the drill. The attitude prevailing in the villagers is that the next time there is a drill, they wont run away.

Courtesy : Shrikant Shenoy, The Indian Post I7/1088

RUN, RABBITS, RUN

On October 8, 1988 the country's nuclear authorities organised an emergency drill at the Tarapur Atomic Power Station (TAPS). The evacuation drill was designed to train the population in the villages in the vicinity of the reactor on how they should respond In the case of a nuclear accident.

The experiment failed. In advance, Much before it was even tried.

As The Indian Post reported in its edition of October 9, "over 80,000 people from several villages around the TAPS deserted their homes and fled the area after **a** drill scheduled for today gave rise to rumours about an Impending radiation leak."

All Indian nuclear reactors are anyway candidates for "impending radiation leaks." So when "concrete" rumours of such a leak surfaced (no matter that this was actually a "hypothetical" leak), nobody wanted to take a risk. Certainly not with the kind of nuclear experts we have in service.

Time **and again** In the twentieth century, the public (whether literate or Illiterate) has demonstrated, that the best thing to do in circumstances where hi-tech hazards are Involved, Is not to waste time listening to reassurance from experts, but to flee like the rabbits in the Adams **novel, *Watership Down.***

In the case of TAPS, more than 60 percent of the villagers turned out to be unbelievers in the assurances deployed by Indian nuclear experts. Bus stations and railway platforms were packed with people getting out of the area. Schools and shops were shut, streets deserted.

India looked on at Bharat in chagrin, and fumed.

They shouldn't have been that surprised. Aren't we soon going to commemorate 4 years of the Bhopal gas tragedy, which alas we have almost forgotten as an event. But who will forget "Operation Faith" which turned out tobe another exercise in faithlessness ?

Operation Faith was the slogan given to the official effort to get rid of the remaining MIC in the storage tanks of the Union Carbide plant The man who coined the phrase " Operation Faith" was none other than Chief Minister of MP, Arjun Singh, whose immense faith in Union Carbide had earlier got him more than Rs. 2 lakh from the company for children's trust controlled by his family members In his hometown. But this kind of faith rarely moves mountains. The public in the days prior to "Operation Faith" did the best thing It could : it bolted. Shortly thereafter, even the copywriters of the operation lost faith : they hastened to bring in buses from the mofussil areas to transport those who wanted to get out of the old city.

At the Union Carbide plant, the men we were supposed to have faith in were actually only pretending to run the show. Dr. Varadrajan and Co were basking in the media headlines, announcing daily decreases in the storage levels of the stored MIC. But two things were happening which everyone knew.

First, despite the government decision to shut down the factory permanently, the company was being permitted to convert the MIC into sevin, which the company would still dispose in the market.

Two, the scientists were not really in charge. If they had been, the entire city would have fled. Imagine untrained persons operating such a complicated (and run-down) plant. Union Carbide people operated the plant, as they had always done. But it was put across as an effort at "detoxification". What a nice label for what was actually nothing more than the old process of sevin manufacture.

So why should the public have faith in liars, politicians and crooks ? In those who practice and participate in deceit ? Arjun Singh said that to allay fears he would himself be within the factory during the "detoxification" process. Ordinary villagers murmured that he would flee by helicopter the first sign of trouble and the scientists with him, leaving them to their helpless fate.

Perhaps, one is making too much of all this. This Is India, and we Indians tend to over react. Is this true ? Take the Three Mile Island disaster. It wasn't really very much different there either.

At the Three Mile Island atomic plant in Harrisburg. in March 1979, a pump driving water to a steam generator packed up, setting in rapid motion a bewildering sequence of events that ended In a partial meltdown of the core, and the creation of massive bubble of hydrogen within the reactor (1000 cubic **feet In size).**

Had the bubble exploded or expanded further, a full meltdown of the core would have been inevitable. The scientists were unable to do anything about the bubble. Eventually, after a number of terrifying days the bubble reduced in size of its own accord.

During the crisis, the Harrisburg public was given the option of staying on or moving out at the utility's expense. I don't know much of the education levels of the townspeople of Harrisburg, but I presume these are at least a little higher than those of the villagers of Tarapur or Bhopal. The US Is after all an advanced country. So how did the Harrisburg townspeople react ?

As at Bhopal during Operation Faith, people in Harrisburg preferred to run rather than stay. Nobody had faith either in the capacity of the men to control their machines or in the assurances of the experts that nothing would happen.

Neither at Chernobyl, or at the Sandoz chemical factory in Basel (Switzerland) or Bhopal plants or at Harrisburg, did the experts know what the hell was happening. The malfunctions commenced, events moved totally out of control and relief came only after the process had run out of steam on its own. At Bhopal, the MIC exhausted itself, at Sandoz on the Rhine a similar pattern was repeated. Similarly at Chernobyl.

There are two major reasons why experts have begun to stink. The public now acknowledges that experts generally have tunnel vision and stunted minds. Earlier, the expert could pretend that his expertise in one field automatically equipped him to talk authoritatively on any subject. Now that seems a distinct disadvantage. If one Is still forced to rely on expert assurances for survival, one also opts wisely at the same time for insurance cover.

But the other reason is more significant. And that is that experts are as shifty as weathercocks. The Government of India for instance knows that the state of scientific knowledge is such that one set of experts can always be relied upon to underwrite whatever decision it wants to take for extraneous, undisclosed reasons. Experts today are not merely flexible and pliable, they are In addition expert in lying. In order to protect their salaries and privileges, they may even sell the nation down the nearest sewer.

Examples there are galore. Take the experts from the dairy sector for instance. Once we required experts to say that there was nothing wrong in getting free imports of milk powder from the EEC for Operation Rood. It would have no economic consequence, they said. Now that we are purchasing milk powder from the EEC market, and are hooked onto such commercial purchases for good, those experts have done the vanishing trick.

This year we required experts to state that there was nothing wrong in using radioactivtly contaminated butter given free by the EEC for Operation Flood. We got them. They even got together for a national seminar on "Public Health Aspects of Radioactivity In Dairy Products- in New Delhi, and proceeded to give us sermons on how the milk was safe. Nobody would enlighten us on how we had landed ourselves in a position In which we were being forced to drink radioactive milk even while every other Third World country from the Philippines to Bangladesh had refused. Not for nothing that many people preffered to go without milk altogether.

Finally, consider the case of the Silicon con. Experts after experts said we needed foreign collaboration in silicon technology because the country's demand for the material (for use in photovoltalcs and electronics) would be 200 tonnes by 1990. So we went In for collaboration with Hemlock, USA. Then we cancelled that, paid Hemlock millions of dollars as punishment, and decided on the advice of experts to get Indian made silicon. Then the same group of experts certified that all that India actually needed now was only 40 tonnes of silicon. Why ? Because this was all the Indian sector was capable of. In the process, the country lost its option to learn to make electronics grade polysilicon. When the government wanted experts to state that Indian technology was adequate, it got a committee to do that too.

So the villagers living In the shadow of TAPS were acting purely In their self-interest, and quite rationally too, when they heard that our experts were going to simulate a nuclear emergency. Since modern science is bound to explode and erupt, time and again, for the most humdrum reasons such as falling motors and dumbfounded computers in socialist and capitalist environment, it is best to take all precautions. After all, as we found at Bhopal and Chernobyl, those who design these monsters, our scientific and technological experts of the 20th century, have only one course of action to recommend when such disasters commence: a wholesale reliance on physical flight. Run, rabbits run!

Courtesy: Claude Alvares

THE MAZE OF NUCLEAR MYTHS

The Indian nuclear programme began early. At the time when Hiroshima and Nagasaki were lust two obscure Japanese towns, Bhabha had dreamt the nuclear dream. Nuclear energy was to be the vehicle to launch an Independent and self reliant India Into the the modern age.

Four decades on, the time has come to take a second look. Nuclear enterprise has given rise to a very rich mythology. Nuclear arguments, which have **a** habit of shifting ground, often leave the uninitiated lost in the maze of myths. Let us examine some of the myths one by one.

"Pinnacle of Scientific Achievement"

Mastery over nuclear power is the key to scientific sophistication." The future belongs to science and to those who make friends with science."(Jawahar Lal Nehru) Nuclear technology may have problems - all technology does. Mankind has met all previous challenges to existence. So why doubt now?

The terrible and awful demonstration of the power of the atom at Hiroshima and elsewhere has implanted this myth very deeply Into all of us. But the very relentlessness of the scientific advance has left it somewhat in tatters. Specially since the late seventies, high energy prices have encouraged dramatic improvements In hundreds of energy technologies. Many technologically advanced nations, which had trudged much further down the nuclear road than India are now making vigourous efforts to extricate themselves. Thus, going nuclear In a big way today, Is not a sign of technical sophistication but rather its very opposite.

The threat posed by nuclear technology to human survival is far greater than that posed by any previous technology. Nuclear power uniquely combines several different threats. The process of nuclear fission itself produces some of the most toxic substances known. Miniscule quantities of these have been shown to cause

cancers and genetic abnormalities. All the processes connected with nuclear technology - the entire nuclear fuel cycle - produce huge (order of tonnes) amounts of these toxins. There Is no solution to the problem of disposal of nuclear waste. Thus the threat is not only from (the a catastrophic accident due to human fallibility ala Chernobyl. There Is the possibility of deliberate sabotage of a nuclear facility by a deranged operator. (This actually happened in 1961 In U.S.A.) or, like Kyshtym in the Soviet Urals (1957), there is the chance of an explosion in a nuclear waste dump which can devastate hundreds of square miles. On the top of all this is the perpetual threat of nuclear war between nations and nuclear terrorism by subnatlonal groups. A technology that can end the world both by a bang and a whimper.

Breaking the vicious Circle of Poverty

Development - Growth - Ever increasing energy use

Energy - Electricity - Bulk generation + Grid distribution

The only sources that need to be considered for bulk generation are coal, hydro, oil and nuclear. The sources of all except nuclear are limited and geographically maldistributed. Hence, if the hungry millions are ever to be fed, nuclear energy is a must. Q.E.D.

All the steps in this argument are questionable and some are patently false. By now, it is well documented that the fruits of development seldom reach the poor while the thorns Invariably do.

Domestic fuel is the biggest contributor to the real energy crisis facing the country today. This crisis urgently needs a solution, it is the cause both of deforestation as well as decline in soil fertility through the burning of cow dung. Producing more and more electricity is no solution to this problem at all. Energy-wise, electricity is the most Inefficient way of cooking food. Nuclear power, which can deliver energy only in the form of electricity is thus no answer to the real needs of the rural poor. In fact, because of the massive diversion of resources it entails and the very long construction times of nuclear infrastructure, nuclear energy is one of the causes of the present energy crisis.

Nuclear resources are far more scarce and limited than other resources. While the coal deposits within the country are sufficient to last hundreds of years at present rates of consumption, the uranium deposits would be hard put to last another fifty.

"Only Source for the Future"

"True, our uranium resources are limited and of poor quality. But in a programme based on the fast breeder reactors, they along with our very vast thorium deposits can sustain a very enhanced (350.000 megawatts as compared to the present 1,000 megawatts) power generation capacity. We already have a prototype fast breeder reactor in development at Kalpakkam."

There is many a slip between the prototype and the lip. The trouble is that nobody has as yet run a commercial scale fast breeder reactor successfully. The French programme, which is the most advanced, is in doldrums. The environmental and safety Implications of the breeders are many times more horrendous than the already horrible enough problems of the conventional reactors. The electricity they might produce is also likely to be many times more expensive.

Besides, the past performance of India's nuclear industry gives no cause for optimism regarding its abilities to deliver on its promises. in 1962 for instance, Bhabha had projected a nuclear generation capacity between twenty and twenty five thousand megawatts, for the year 1987. The actual Installation of Just over a thousand megawatts Is an indication of the magnitude of failure on the performance front. Teething troubles' are the perpetual excuse for poor performance. Fast breeders which have yet to be properly born, are certain to have their share of 'teething troubles'. Hence, It is a sure bet that this mantra will often be invoked by the next generation of nuclear technocrats.

" Indian Scientists are Second to None "

" We have done it all by ourselves. There have been problems and delays, but the lessons learnt have been invaluable in our march to self sufficiency and mastering of nuclear technology. it is an achievement the nation can justly be proud of."

As a proud member of the Indian scientific community myself, I know, that in fact we are second to none. But do the big shots of the nuclear establishment know the same? With the fast approaching advent of the 21st century, they have developed cold feet. Otherwise, they would not have acquiesced to the insult delivered to the

self esteem of the entire Indian nuclear community. By signing the agreement for the import of two Russian built reactors and by negotiating with the French for the Import of two of their reactors, the political leadership has expressed its no-confidence in the abilities of Indian nuclear technologists. It is a mater of shame that this humiliation has invoked no public cry of protest and the nuclear establishment is willing to fritter away the hard won benefits of self reliance so casually.

" **It Can't Happen Here** "

" There is no free lunch. People die in coal mines. Large dams can suddenly fall killing thousands. Think of Bhopal. The chances of a large nuclear disaster are mlnlscule. There are now more than 400 reactors operating safely all over the world. Only 32 people died at Chernobyl. And In any case, Chernobyl cannot happen here since our technology i s different, we have double containment and we use graduate engineers instead of high school pass people as operators."

The overwhelming majority of the victims of radiation disasters die unknown, isolated from each other in both space and time. This makes it possible for nuclear propagandists to continue this barrage of bilge. Independent scientists have estimated Chernobyl's human toll at around a million cancers, half of them fatal and more than half of them outside the Soviet Union The financial toll of the disaster, which is less subject to dispute, stands at an astronomical $14 billion. It is an awesome warning that even a single major nuclear accident could completely ruin the entire Indian economy.

Accidents have been taking place more frequently than the schedule chalked out for them by nuclear risk analysts. The fact that our reactors are of a different design, does not make them fool-proof. A study conducted in the wake of Chernobyl, concluded that reactor designs in operation all over the world had shortcomings. Given the 'right' errors and even graduate engineers have been known to make errors - these design shortcomings could lead to disasters, double containments or no double containments.

Too Cheap to Meter "

The economics of nuclear power is a subject which closely resembles magic. Research costs, insurance costs and all the social costs vanish without a trace. Nobody yet knows what the decommisionisng costs are even likely to be. The costs of waste storage for thousands of years are donated for kind rememberance to our children. And the costs that are Included in the calculations have a surreal quality. The Comptroller & Auditor General's office (CAG) recently commented on a strange practice It observed In the heavy water plant at Tutlcorln. The cost of the heavy water produced calculated by the Department of Atomic Energy turned out to be Rs. 4120 per kg. as compared to Rs. 13800 per kg. estimated by the CAG. Investigations revealed that achievable Instead of actual production figures were used in cost computations. After all this, one gets a statement like, " Our calculations show that while the nuclear power plant at Kalpakkam produces electricity at the rate of 48 paise per kilowatt hour the thermal power plant at Tuticorla produces electricity at more than 60 palse per Kilowatt-hour." Applause.

In countries which allow a freer flow of market forces, economic compulsions have already spelt the doom of nuclear industry.

"Well Within Internationally Accepted Safe Limits."

" The radiation releases from our nuclear establishments are well within the Internationally accepted safe limits and there Is no danger to our workers or to the people in our neighbourhood. Just look at the greenery around our establishments. We have not only maintained the environment but significantly improved It."

No other group of internationally renowned experts have fallen flat on their collective faces as often as those belonging to the radiation community. There was a time when the ICRP (International Committee for Radiological Protection) believed that there was a 'safe' threshold level of radiation exposure, below which the radiation was harmless or may be even beneficial. In the 1960s It was forced to admit that there is no safe threshold - the risk of radiation simply increases with the dose received. Thus the so-called 'safe' limits are In actual fact 'acceptable risk' limits. However, as the ICRP already concedes, the limits presently set are far too high. The latest revaluation of the Hiroshima data left the ICRP on other choice. They have however, as usual, delayed action on setting a newer, lower limit by two years. Even Britain, a country not particularly distinguished for the zeal of its nuclear officials in protecting

public health, has already lowered its radiation dose limits.

The Myth of the 'Peaceful Atom'

This is the one myth which everyone knows to be a myth. Hence the great demand that it be publically rejected and the country embark upon a programme of building a nuclear arsenal. In all this jingoistic talk one point gets invariably lost. We have already exercised the nuclear option. The nuclear facilities have already been built. They await the enemy's pleasure. Israel, by demolishing the nearly completed Osirak reactor in Iraq by conventional bombing, has demonstrated to the world, the vulnerability of reactor containments to high penetration bombs. Nuclear facilities, seen **in this** light, **are** more In the **nature of** massive nuclear time **bombs** or ammunition dumps **awaiting** detonation.

"I, a mere Individual, can do nothing"

The most immobilizing myth of all. This monstrous programme continues because you and I have done nothing to stop it. Edmund Burke put it well long ago: " All that is necessary for the triumph of evil is that good men do nothing."

S.N. Gadekar

BENEATH THE VENEER OF PROGRESS : A SICK INDUSTRY

At 1.00 on the morning of May 26, 1988 the Long Island Lighting Company and the State of New York reached an extraordinary settlement. The utility agreed to sell Its completed but never operated nuclear plant at Shoreham to the State for one dollar, while the State promised to permanently close the $ 5.30 billion facility and grant the utility rate increases intended to save it from bankruptcy.

To one not familiar with the current status of nuclear power, the Shoreham saga has an Alice In Wonderland quality. How. might one wonder, could nuclear planners have sited a plant in a densely populated part of Long Island, and then pushed the project forward despite overwhelming local opposition?

How could the original schedule of construction have been missed by more than a decade and the budget by more than $4 billion? How could a private company have tied its very survival to the completion of a single power plant whose cost exceeded the value of all Its other assests? And how could the Nuclear Regulatory Commision have allowed a utility to load radioactive fuel into plant unlikely to ever get a full operating license, an act that will add hundreds of millions of dollars to New York' s expense for decommissioning Shoreham?

The Shoreham case is extreme, but it Is symbolic of the problems currently facing unclear power. It Includes colossal mismanagement,cost overruns and fierce political battle's that pit citizens and local officials against government bureaucracies commited to expanding nuclear power.

Two years after the Chernobyl accident, the political and economic tide around the world is running strongly against nuclear power. Nuclear power has become expensive, its growth has been mismanaged, and an increasing number of citizens are rejecting It. The daunting problems of nuclear waste disposal and nuclear materials proliferation grow ever more Indomitable as governments fall to come up with solutions and the materials themselves accumulate.

Despite the lack of such solutions, some officials are now calling for a revival of nuclear power. The new Impetus: global warming and other environmental threats caused by the world's reliance on fossil fuels. The world's current energy trends are beginning to undermine the health of the environmental system crucial for humanity's survival

As governments and international agencies look for alternatives to oil and coal, nuclear power Is once again presented as a candidate. Societies are now in danger of banking on a new generation of nuclear reactors without fully understanding the enormity of problems that ruined the last generation.

A Decade of Setbacks

When disaster struck the Three Mile Island nuclear plant in March of 1979, the global nuclear

industry was running at full throttle. New plants were being built at a record pace, governments were almost universally In favour of nuclear power, and public acceptance of these plans was unquestioned. Three Mile Island, however, was the first In what would be a series of setbacks for nuclear power. Now, almost ten years later, the nuclear programmes of nearly every country have been touched by the ripple of doubt set off by that accident and the one at Chernobyl.

At first glance, It would seem that nuclear power has continued to flourish in the past decade. Generating capacity for example, has risen fourfold to 290,000 megawatts. But beneath this veneer of progress is a sick Industry that is getting few new orders and In many countries Is clearly winding down.

In the United States, Three Mile Island was a pivotal event. As the pioneering nuclear nation, the U.S. had by far and away the world's most ambitious nuclear programme In 1979. Yet, not a single nuclear plant has been ordered In the United States since, and 108 have been canceled, Including all those ordered after 1974. The U.S. business magazine Forbes has called the failure of the U.S. power programme "the largest managerial disaster in U.S. business history," Involving perhaps $100 billion in wasted investments, cost overruns, and unnecessarily high electricity costs.

The U.S. nuclear construction Industry has for the most part disappeared, and the pipeline of new projects is nearly empty, sustained only by a handful of plants that are a decade behind schedule on average. It now appears that the nuclear share of U.S. electricity production will peak no later than 1992 - at something less than 20% and then begin a slow decline as older plants are retired.

It was economic more than political or technological failure that doomed nuclear power in the United States. As with the Shoreham plant, most U.S. nuclear facilities completed In the eighties are grossly uneconomical, providing power that is five times as costly as that from plants completed a decade ago.

Hundreds of changes introduced to make nuclear power safer have added billions of dollars to costs. The industry attempted to blame regulators for requiring expensive change, but it is clear in retrospect that the changes were needed to help avert accidents that would have caused the nuclear industry even greater damage.

Europe After Chernobyl

Advocates oi nuclear power often argue that the *VS.* nuclear programme Is beset by problems of little relevance to the rest of the world. The supposed strength of nuclear power throughout Europe and much of the rest of the world is often held out as evidence that If nuclear managers and regulators would simply clean up their acts, the problems would soon be resolved.

As attractive as this argument may seem, It is belled by the declining fortunes of nuclear power across a wide spectrum of countries - from Western democracies to the Soviet Union and the developing world. A process of gradual attrition during the eighties has mushroomed into a massive rejection of nuclear power since Chernobyl - more for political reasons than for technological or economic ones.

In Europe several countries have made formal commitments to shut down their nuclear programmes In the wake of Chernobyl. Months after the Soviet disaster, Austria abandoned its only nuclear plant, at Zwentendorf - a plant that like the one at Shoreham had never been operated. Greece decided at about the same time to scrap plans to build Its first nuclear plant.

After a protracted political debate that contributed to the collapse of two governments, Italian voters decided in March 1988 to block the expansion of the country's already stalled nuclear programme. Two months later, under Intense political pressure, the Italian government decided to stop work on the country's only remaining nuclear construction project, at Montalto dl Castro, leaving three completed reactors operating Intermittently. Though not quite officially dead, Italy's nuclear programme shows few remaining vital signs.

Early In 1988, the government of Belgium, which is already heavily nuclearized decided to indefinitely postpone expansion plans. The Netherlands, which has no large reactors, has also canceled Its plans.

Switzerland, which has not completed a nuclear plant since 1980, decided this year to

cancel 22 - year old plans to build the country's sixth nuclear facility at kalseraugst. Swiss voters will decide later this year whether to abandon the country's nuclear programme.

Scandinavia's nuclear programmes have also been moving In **reverse.** Finland, with a substancial nuclear capacity, Indefinitely postponed expansion **plans after** Chernobyl. Sweden decided In a **1978** referendum to phase out nuclear power by 2010, despite the fact that nuclear plants supply 40% of the country's electricity. The Chernobyl accident forced the government to firm up these plans by scheduling the shutdown of the first two plants in 1995 and 1996. Denmark and Norway, meanwhile, have reaffirmed their vows never to develop nuclear power.

Europe's second and third largest nuclear power programmes remain in a state of Umbo. Nuclear opposition has flourished in West Germany since Chernobyl, further weakening the already remote possibility of the country's building additional unclear plants. Several state governments and the major opposition party In the federal parliament **are** vehemently opposed to nuclear power.

In Great Britain, the Thatcher government got to work on a nuclear plant at Sizewell after It concluded an eight year debate in 1987. Should this plant be followed by Several more, Britain **will still be hard-pressed** to outpace the scheduled retirement of nuclear **plants** In the nineties.

France meanwhile remains Europe's pronuclear holdout. Four more plants were completed In 1987, leaving the country with a nuclear capacity second only to that of the United States. Nuclear power now supplies over 70% of the country's electricity.

But even France's nuclear programme Is plagued by a growing number of technical malfunctions. In the spring of 1988, one plant at Flamanville lost its cooling capacity twice, a plant at Nogent sur Seine released radioactive steam, and several other plants were closed due to radiation leaks. France has so far avoided a Three Mile Island or Chernobyl-style debackle, and It Is uncertain whether the pronuclear consensus would survive such an event.

The more obvious problem In France Is too much nuclear capacity. The country has been forced to sell electricity to neighbouring countries at bargain prices and to run its plants at reduced capacity. The gap will grow larger as another ten plants come on-line in the next few years. Frances nuclear expansion has been slowed to less than one plant per year, a level Intended Just to barely support the government owned nuclear manufacturing Industry.

The French state utility **has** built up an enormous debt of $39 billion, which continues to grow as high-cost nuclear electricity Is subsidized so as to encourage consumption and justify the Investment. Nuclear power has helped reduce the country's oil Import bill, but It has also tended to starve other parts of the French economy of Investment capital.

Second Thoughts in the **Soviet** Union

Prior to Chernobyl, the Soviet nuclear programme - third largest in the world - was generally thought to have avoided the morass of political problems that derailed programmes in the West. The Soviet government maintained a firm commitment to nuclear power In building an Industry that supplies \\% of the country's electricity.

Since Chernobyl, the Soviet nuclear consensus has broken down. Top Soviet officials regularly contradict each other as to the status of nuclear power and the capacity of the Soviet Industry to manage it. The cleanup at Chernobyl has not gone well, and the total cost of the accident is now calculated at $14 billion - nearly three times the original estimate.

Meanwhile, rumours of radiation related sickness continue to circulate In the Ukraine, and citizens report a general sense of tearfulness and unease two years after the accident. Public confidence has been further undermined by reports of subsequent mismanagement at the remaining Chernobyl reactors, breaches serious enough to require disciplinary action against key officials.

Such stories have fueled an outburst of antinuclear protest throughout the Soviet Union Indeed, Soviet press reports indicate that all of the country's operating nuclear plants face local opposition, as do most of those being built. Even

in the era of Glasnost, such protest betray a remarkable degree of dlsquite with government policy. Some local officials even used the occasion of the landmark Soviet Communist party conference in June to call for the abandonement of particular nuclear plants.

The most vociferous protests, not surprisingly, emanate from the Ukraine, where Chernobyl is located. Both the Ukrainian Writers' Union and the Ukrainian Academy of Sciences have drafted a "manifesto" condemning the policies of the Ministry of Atomic Energy. Antlnulcear petitions demanding a change of course have circulated at Moscow State University and the Crimean Agricultural Institute.

Soviet nuclear officials have stuck to their pre-Chernobyl plans, agreeing only to phase out production of reactor design used at Chernobyl. Nuclear capacity in the current five year plan is scheduled to advance by a substancial 40,000 MW towards the goal of supplying 21% of Soviet electricity by 1990. This target, will almost certainly, not be met. In the past year an obvious gap has opened between official plans and reality.

In May 1987, It was announced that the two additional units planned at Chernobyl would not be built. Then in November a high Soviet official conceded that citizen opposition had forced a halt to construction of two more nuclear plants, one near Odessa and the other near Minsk. Later that month the Ukrainian council of Ministers halted construction of a plant south of Kiev. In January 1988, the Krasnodar plant In the Caucasus was also stopped, reportedly dueto seismic dangers that had been neglected earlier.

It is impossible to read this litany of setbacks without suspecting that the Soviet nuclear programme is in the process of coming seriously unglued. The growing cost of safety measures in the aftermath of Chernobyl will likely cast further doubts on the efficacy of nuclear investment.

It is only a matter of time before the current, unrealistic five year plan for nuclear power Is revised downward. Portions of the Soviet scientific community now seriously question the nuclear programme, and an important faction of scientists and economic planners now favour an alternative approach to energy policy - In the direction of efficiency, renewable resources and decentralized power generation.

The Shifting **Case** for **Nuclear Power**

As nuclear power programmes continue to slip into oblivion the question remains whether countries can afford not to have nuclear power. Many key officials think not. Valert Legasov, who headed the Soviet commision that investigated Chernobyl accident, has stated that "the future of civilization is unthinkable without the peaceful use of atomic energy."

This line is nothing new from the pronuclear camp. Although they have remained stalwart in their conviction of the necessity for atomic power, many nuclear advocates have Justified It by repeatedly shifting among various arguments. In the sixties, nuclear power was pressed as an Inevitable next step in the technology of energy systems. Few problems were seen as beyond the reach of scientists, and it was assumed that nuclear power would be inexpensive If not actually "too cheap to meter."

In the seventies, nuclear power was seen as an essential alternative to dwindling oil supplies, not without its own problems, but essential to stave off economic collapse. Now, In the late eighties, with oil prices down and nuclear power programmes in disarray, nuclear advocates have become environmentalists, urgently arguing that only nuclear power can ease acid rain, global warming and other threats posed by heavy use of fossil fuels.

The "technological inevitablity" argument was first to go. Since the late seventies it has become clear that that evolution of an energy technology does not necessarily have to take a nuclear path. High energy prices have encouraged dramatic improvements In hundreds of energy technologies, ranging from more-efficient oil refineries to less-expensive solar power.

During the past fifteen years, for example Improved energy efficiency has saved far more oil than has nuclear power. Many countries now persue the long term development of hydroelectric and wind power, solar energy and biomass fuels as an alternative both to oil and nuclear power. Whatever the arguments for its development, nuclear power must now be fairly weighed against its alternatives.

Using nuclear power to fuel the economy on a large scale is possible only if it is affordable.

And the best evidence available indicates that investing in nuclear power has become a risky proposition, in the United States, where financial reporting requirements are the strictest, the latest generation of nuclear plants has proven to be decidedly uneconomical. These plants cost more than three times as much to build as equivalent fossil fuel plants, and significantly more than a number of renewable energy facilities, Including wind, geothermal and blomass-flred power plants. As other power generating technologies evolve, nuclear power's financial disadvantage only widens.

Operating costs - an area In which nuclear power has traditionally enjoyed an economic advantage - are also growing malignantly. The equipment must be repaired or replaced far more frequently than was supposed. Recent surveys in the United States indicate that real operating the average nuclear plant than it does to operate a coal plant-including the cost of coal. A study by the U.S. Department of Energy suggests that some plants have become so costly to operate that it may be more economical to retire them early than to continue operations. Even writing off the $5.3-billion Shoreham plant may in the end turn out to have been a **wise** business decision.

At the root of these enormous cost escalations is a technology whose complexity defies human management and leads to continuing, unpredictable changes In equipment and operating procedures. Even in countries, where regulatory pressures have not been **as** Intense or public opposition as vehement, cost overruns have become endemic.

When planning a nuclear plant today, It is impossible to know how much it will cost to build, how much It will cost to operate, how long it will last, or what it will cost to decommission. This is the kind of Investment that only a government or utility would make, and even they are now generally investing elsewhere.

As an alternative to oil, nuclear power's potential is also severely constrained. While nuclear power generation did substitute for oil-fired generation in Europe and Japan during the late seventies and early eighties, the power sector's use of oil is now extremely low, offering little potential for further displacement.

Throughout the world, the major claimants on the world oil supply are automobiles, trucks, buses and Industrial plants, Improved efficiency offers by far the most effective means of displacing oil in these areas.

False Hope for the World's Climate

The environmental argument for further nuclear **expansion is** at first glance more compelling **than the** other two. Continuing expansion of **fossil** fuel combustion is now causing ecological havoc around the world. Air quality in most of the world's cities continues to deteriorate, particularly in developing countries, and air pollution carried over long distances has damaged at least 22 percent of Europe's forests.

As serious as these problems are, the ultimate limit to future energy growth may lie with the earth's climate. Scientists now believe that the 5.4 billion tons of carbon being added to the earth's atmosphere each year from the combustion of fossil fuels is contributing to Ireversible climate change. Average global temperature have already increased by about 1 degree Fahrenheit during the past century, according to a U.S. government-sponsored study published in the spring of 1988.

Global warming has begun, according to the best available scientific evidence, and climate models suggest a 9-degree rise by the middle of the next century, a faster warming than the earth has ever experienced. This would be sufficient to upset weather patterns, damage agricultural output, raise sea levels and expose humanity to wrenching change. With population expanding rapidly and the world food system already stretched tight, societies would probably find it impossible to adapt to such sudden change.

New scientific evidence along with severe droughts and heat waves in several countries this summer have lent a new urgency to the problem of global warming. In this light, many policymakers around the world are reassessing nuclear power. An International conference of scientists and public officials, meeting in Toronto, has called for a worldwide effort to cut fossil fuel use by 20 percent by 2005. Nuclear power was one of the energy, sources the conferees suggested reevaluating for its potential to combat global warming.

Some argue that a few Cheraobyls would be a small price to pay head off global warming. Unfortunately, this Is the kind of thinking that has misled nuclear planners In the past. Nuclear power is beset by problems that go well beyond its propensity for occasional accidents. Technologically, economically and politically, nuclear power faces a series of obstacles that will prevent it from coming close to displacing enough fossil fuels to significantly delay global warming.

Analysts at the Rocky Mountain Institute, a nonprofit research organization In Colorado, have developed a nuclear scenario that reduces global warming by 20 to 30 percent by the middle of the next century through the substitution of nuclear plants for all coal-fired power plants. They found that this would require the completion of one nuclear plant every one to three days during the next 40 years. Many countries would be almost blanketed by nuclear plants, and the total cost would run to as much as $9 trillion.

A nuclear power program of this scale would require not just a reversal of a worldwide trend, but a program of nuclear construction that is ten times as large as any the world has seen. Such an effort Is unthinkable, both economically and politically. Indeed, a democratic government that tried it would most likely soon be voted out of office.

Most nuclear technologists agree that a new generation of "inherently safe" reactors will have to be developed before nuclear power expands, even modestly. If governments were to throw their support into research and development programs large enough to accomplish this, It would be after the turn of the century before the first of the commercial reactors could possibly by Installed

Were such a program carried out, it would contribute virtually nothing to the 2005 goal of the Toronto conference, and would contribute only a small part of what is needed by 2050. One problem is that power generation is only part of the reason for global warming, and displacing a substantial part of even this use of fossil fuels would require an Inpossibly large investment in nuclear power.

Toward a Viable Energy Strategy

As the world faces the problem of global warming, it is important to come to grips with the timing of the problem. The earth now appears to be warming at a rate of about 1 degree Fahrenheit per decade, and because of time lags in the process, we are already committed to a significant increase of 3 to 4 degrees. Therefore, immediate action is needed to head off a catastrophic warming during the next several decades.

Nuclear power is clearly Incapable of making a meaningful contribution during this period. The global climate would be undermined before an Improved technology could even be tested, a fact that many nuclear advocates seem to be unwilling to confront.

Improved energy efficiency, however.does have the potential to reduce the projected warming in 2050 by up to half. Such a scenario requires that energy efficiency be improved by 2 percent per year beginning immediately. The technologies needed to accomplish this are at hand, and they can be economically installed. However, policy reforms are needed If we are to continue the enormous efficiency improvements made during the past decade.

ln the long run, of course, societies will have to develop energy sources that replace the fossil fulse on which we rely so heavily. There are really only two alternatives: nuclear power or renewable energy sources such as solar, wind and blomass. Since the seventies, energy policymakers and analysts have been debating the question of which path to follow. The global warming problem adds new urgency to this debate but does not make the answers any easier to come by.

Renewable energy technologies have advanced rapidly during the past 15 years of research funding, and many are being used commercially on a fairly large scale. They have a long way to go before being ready to provide the predominant share of world energy, but it is quite possible that before Improved energy efficiency begins to reach technological limits in the middle of the next century, a diverse mixture of geothermal power, wind power, blomass and solar energy will have picked up the slack.

Nuclear advocates believe that a new generation of nuclear technologies will be ready (or mass deployment as well. This is certainly an arguable point. Technological evolution is notoriously difficult to predict. However, societies are likely to find that nuclear power continues to fall short of Its proponent's dreams and that It In the end faces technological, economic, and political limits that are far more intractable than those confronting renewables.

I Projection of Worldwide Nuclear Power Generating Capacity

1 Source and Year of Projection	* 1980	Projection For 1990	2000
		(thousand megawatts)	
International Atomic Energy Agency			
1972	**315**	**1,300**	**3,500**
1974	**235**	**1,600**	**4.450**
1976	**225**	**1,150**	**2.300**
1978	**170**	**585**	**1.400**
1980	**137**	**458**	**910**
1982	–	**386**	**833**
1984	·	**382**	**605**
1986	-	**372**	**505**
World Watch Institute			
1988		**320**	**360**

Source : International Atomic Energy, Agency, Annual Rreports *(Vienna 1972-80); IAEA.* Reference Data Series No. 1. *Vienna, September 1982, IAEA,* Nuclear Power: Status and Trends *(Vienna : 1984-86); World watch Institute.*

Nuclear power requires increasingly centralized energy systems and intense safety measures and security systems. Renewables are by nature diversified, decentralized, and based on relatively safe technologies. Although renewables will cost large sums to develop, they have the advantage of being more politically palatable according to public opinion polls.

Most major governments have managed to skirt this central question by funding development **of** both nuclear power and renewables. The broad trend has been away from nuclear power and toward renewables, though the latter still receive a smaller share of most budgets.

The question now is whether to continue the current approach or to attempt to accelerate the development of either nuclear or renewables. There is no simple answer to this question, but if the lessons of the past decade and a half mean anything for the future, attempts to resuscitate the nuclear option will yield political friction, economic waste and serious accidents, not a solution to the global warming problem.

Courtesy: Christopher Flavin : World Watch, July-August '88. Christopher Flavin is vice president for research at the WorldWatch Institute and author of the 1987 Worldwatch Paper "Reassessing Nuclear Power: The Fallout From Chernobty".

SOVIET REACTORS FOR INDIA

In anticipation of the flnallsation of the India-USSR inter-governmental agreement on the supply of two 1000 M We nuclear power units by USSR, India concluded recently an agreement with the IAEA for implementation of safeguards In respect of these nuclear power stations. According to Mr. K. R. Narayanan, the minister of state In the department of atomic energy, the safeguards agreement, signed on September 27, 1988, was broadly similar to those in respect of the Tarapur atomic power station and the Rajasthan atomic power station. According to the minister, the safeguards agreement Inter-alla provides for IAEA safeguards for all nuclear fuel used in the reactors supplied by the USSR. The reactors will be under IAEA safeguards till the IAEA, India and the USSR jointly determine that the reactor in question is no longer usable for nuclear activity relevant from the point of view safeguards. In addition, it provides that safeguards on spent fuel will terminate in case it is transferred to the Soviet Union.

Different Reply

A study of the agreement in question reveals that the reply given by the minister differs sharply from the provisions of the agreement. The safeguards applied by IAEA are far more stringent than any accepted by India so far. They require safeguards on:

i) The reactor facilities supplied by the Soviet Union to India under the agreement, *and the reactor facilities produced therefrom or as a result of their utilisation;*

il) Any nuclear material supplied by the Soviet Union to India for use of the reactor facilities;

111) Any nuclear material, including subsequent generation of special material, produced, processed or used in or by the use of any other items referred to In this section;

iv) Any other Item required to be listed in the Inventory referred to in section 6.

The main part of the inventory listed in section 6 of the 100 safeguards agreement is more or less a reiteration of the above. The subsidiary part of the Inventory also listed In section 6, Includes 'any nuclear facility while containing, using processing or fabricating any nuclear material referred to In the main part of the Inventory.'

The list is broadly similar to the list outlined In the safeguards agreement in connection with the supply of heavy water from the Soviet Union, except for the underlined item in (1) above and another section of the safeguards agreement, section 5, which states, 'in the event that India should construct or operate reactor facilities, as defined in the section 1 (d). It shall arrange to submit such reactor facilities to agency safeguards before such construction or operation commences.'

These two taken together require that India should place under similar safeguards all reactors, based on the Soviet design, constructed in future in India, Irrespective of whether these were constructed with foreign help or by indigenous efforts as a result of the experience gained with the use of the currently supplied Soviet reactors. Thus India has, In effect, agreed to perpetuity and to pursuit clauses not only in respect of the Soviet supplied reactors but also in respect of ail reactors of the same design that might be built in India.

For comparison, if a similar clause had been part of the safeguards agreement In respect of the Rajasthan atomic power station, we would have had to put under safeguards not only RAPS but, in addition, the Madras atomic power station, the Narora atomic power station and all the CANDU-type atomic power plants that are being constructed or planned in India. Few would deny that such an agreement would have been a setback to Indian efforts towards self-reliance In the nuclear field. Yet in response to a question whether the latest safeguards agreement Is a setback to our goals of self-reliance, the minister replied in the negative.

There can be no doubt that the current safeguards agreement is a far more restrictive one than any India has agreed to so far. In fact, If a similar agreement had been entered Into by India In respect of the other power reactors, TAPS and MAPS, then for all practical purpose India would have been under fullscope safeguards. It Is true that the reprocessing plants and the heavy water plants would not be under safeguards. But since by virtue of the safeguards agreement all power reactors would have been covered by the perpetuity and pursuit clauses, all the nuclear material used, produced, processed in these reactors Including subsequent generations of special fissionable material would have been under safeguard and we would have had to put the future generations of breeder reactors under safeguards as well.

In fact, the implication of the minister's statement that the Tarapur and Rajasthan atomic power station safeguards agreements were broadly similar is Itself a misleading one. The RAPS agreement was a far more restrictive one than in the case of TAPS. As a matter of fact, there has been a steady deterioration, from the Indian point of view, in the terms the safeguards agreements, four in all including the latest one, that India had concluded with the IAEA.

Special Agreement

The first safeguards agreement was signed in January 1971 and was in respect of the Tarapur atomic power station. The agreement with USA regarding TAPS was a special one, since the nuclear fuel for TAPS was supposed to be supplied exclusively by the U.S. The safeguards were applied on the reactors at TAPS; any nuclear material, equipment or device transferred to India by the US; Any special material produced in India in, or by use of, materials or equipment or devices transferred to India; and any facility while it is containing, using, fabricating, or processing, any special nuclear material transferred to the government of india for, or special material produced at the Tarapur atomic power station.

In practice this meant that in addition to TAPS, fuel elements and the spent fuel, the nuclear fuel complex and the Tarapur reprocessing facility were under safeguards while they contained material to be used or used in TAPS. The

agreement did not cover the second and successive generations ol nuclear material obtained by the use of the spent material. In any case, It was expected that the spent fuel would be returned to the USA The safeguards agreement thus Included the perpetuity clauses but not the pursuit clause.

In agreeing to even such a limited safeguards agreements the Indian government stated explicitly that,' the government of India emphasises, in contrast to the position of the United States, that its agreement to the provisions of this article In relation to equipment or devices transferred pursuant to the agreement has been accorded in consideration of the fact that, as provided In this agreement, the Tarapur atomic power station will be operated on no other special nuclear material than that furnished by the government of United States and special nuclear material produced therefrom in consequence of which the provislons of this article In relation to equipment or devices in any case ensue from the safeguards on fuel.

In spite of such explicitly stated provisions, India found It difficult to break away from the agreement when the USA refused to supply fuel to TAPS. Eventually, of course, the agreement was transferred in favour of France which continues to supply fuel to TAPS and the safeguards agreement remains In place.

Similar Agreement

Soon after the first agreement, India signed a second safeguards agreements with the IAEA September 1971, which was in connection with the Rajasthan atomic power station. This agreement was somewhat similar to the TAPS agreement. The safeguards were to be applied on all nuclear material used or produced In RAPS. In addition to the nuclear material, the heavy water supplied by Canada was also under safeguards for a period of five years only, since upon the completion of the five year period, such heavy water was supposed to be removed from the scope of the agreement by retransfer from India to Canada or by substitution in accordance with established procedures.

In addition to this, the safeguards agreement stipulated that, 'nuclear material produced by the use during the aforesaid five-year period of such heavy water, and all subsequent generations of nuclear material produced in or by the use of such material, shall be subject to the implementation by the agency of the safeguards provisions.' Here we have the first application of the pursuit clause. However, In this instance it was limited to only a five year period during which the heavy water supplied by Canada was to be used In RAPS.

After that period, if India had used domestically produced heavy water in RAPS, the safeguards were to be applicable on only the spent fuel produced in RAPS but not on the subsequent generations of special fissionable material pro duced by the use of this spent fuel. More specifically, If India had used the plutonlum extracted from the spent fuel to fuel Its breeder. So In the second agreement there was a perpetuity clause and a limited period pursuit clause. A slight retreat from the first agreement but still acceptable.

THE Pokhran explosion altered the situation dramatically. With the withdrawal: of Canada from the project and with the domestic production of heavy water far behind schedule, India had to look for other sources of heavy water. Finally a third safeguards agreement, second with respect to RAPS, was signed with IAEA when the Soviet Union agreed to supply India with required heavy water. This agreement went far beyond the first two. The safeguards were to be applied to : heavy water supplied by the Soviet Union to India; any nuclear material, including subsequent generations of special fissionable material, produced, processed or used In the Rajasthan Atomic Power Station or in or by the use of any other facility while containing, using or processing any of the heavy water or any nuclear material under safeguards.

Thus perpetuity and pursuit clauses were applied to RAPS reactors, the heavy water supplied by the Soviet Union and all nuclear material used, produced or processed In or by the use of any item under safeguards. The scope of this agreement was far beyond anything even considered in the first two. Fortunately, the agreement was restricted specifically to RAPS and the heavy water supplied by the Soviet Union. Thus when India built and commissioned with indigenous efforts the Madras atomic power station, it was not covered under any safeguards agreement. The significance of this achievement should not be underestimated.

Unsafeguarded Facilities

There are currently five non-nuclear weapons states that have unsafeguarded (facilities of significance for safeguards, (Brazil, India, Israel, Pakistan and South Africa). Of these only India has so far managed to build and operate nuclear power stations without outside help and thus outside safeguards. In the remaining countries all their nuclear power station, either operating or under construction, are under safeguards and the Indian nuclear power programme did not envisage any further safeguards on any future nuclear power stations. At least till now. With the latest agreement, India has committed itself to subjecting, not one nuclear power station, but a whole class of nuclear power stations to safeguards. No amount of indigenous efforts can help us In breaking this stranglehold of safeguards. Now it is true that the wording of the agreement leaves some scope for manoeuvre in future, but that can sill lead to disputes and arbitration, a course of action full of uncertainty and pitfalls. The costs involved In the current course of action far outweighs any benefits that we can get. The benefit is 2000 MWe. The costs are politically far more. The current agreement falls just one step short of fullscope safeguards, something which we have been opposing consistently sofar.

In the international arena this question of full-scope safeguards has been a bone of contention between the nuclear weapon countries, alongwlth a number of developed countries and few developing countries especially Brazil and India. Some 137 countries have signed the NPT which, In effect, calls for fullscope safeguards. Among the non-nuclear states that have not signed the NPT. eight have significant, operational or planned, nuclear activities in their countries. These are : Argentina, Brazil, Chile. Cuba. India, Israel, Pakistan and South Africa. In five of these states unsafeguarded facilities of significance for safeguards are either In operation or under construction. Among these five, only India has serious civilian nuclear programme calling for substantial investment In nuclear power generation.

Internationally the efforts of the IAEA have been directed towards either bringing these unsafeguarded facilities in these non-nuclear states under safeguards or restricting the growth of such unsafeguarded facilities. Towards the latter end, the IAEA has been continuously strengthening its safeguards conditions. In the earlier years Its efforts were directed towards applying safeguards on specific installations or nuclear supplies. Later they began to apply the safeguards on installation and nuclear aterial.

The Tarapur and the first Rajasthan agreements belong to these types of safeguards. The safeguards scope was then expanded to Include pursuit clauses In Its totality. The second Rajasthan agreement is an example of this kind. Still the efforts were directed towards specific Installation. In the early eighties It began to adopt a different strategy. With the example of India, which had begun to build series of nuclear power stations on Its own but based on an Imported design In mind the IAEA began to insist on safeguards being applied on a whole series of, built, under construction or under possible construction, nuclear facilities.

Vandellos Plant

When in April 1981. Spain signed an agreement with IAEA in respect of the Vandellos nuclear power plant, the safeguards agreement called for safeguards on only the Vandellos facility along with safeguards on all nuclear material used or produced by the use of Vandellos facility Including subsequent generation of such material. However, when a couple of months later. In July 1981. Argentina approached IAEA for a safeguards agreement in respect of the Atucha II nuclear power plant, IAEA Insisted on applying safeguards not only on Atucha II but on "any nuclear facility designed, constructed or operated In Argentina on the basis of or by the use of the technological Information transferred from the Federal Republic of Germany to Argentina contained in design drawings, technical specifications, technical manuals for the operation and maintenance of the Atucha II Plant.

With this stipulation, the IAEA prevented Argentina from following India's example of building of similar reactors on its own and keeping them free from safeguards. The strategy was clearly to prevent the country from expanding its Inventory of unsafeguarded facilities, the underlying idea being that If you cannot get a country to either sign the NPT or accept full-scope safeguards, expand the safeguards conditions so that with a single agreement a large number of facilities can be brought under safeguards. In case of Atucha II the terminology was specific. In the present agreement that india has signed, the IAEA has used more general terms, it is Interesting to speculate whether this would result in a wider coverage than the Atucha 11 or a narrower one. In any case what Is Important Is the fact that there Is a fundamental conflict between the alms and objectives of the IAEA and India. The IAEA's aim is to get as many Indian nuclear facilities as possible under its safeguards coverage, thereby circumventing India's objections to either signing the NPT or accepting fullscope safeguards. India's aim Is to develop its indigenous nuclear capabilities with as little international safeguards, as exemplified by the NPT, as possible The present agreement is a clear victory for the IAEA. What Is not clear Is why the Indian govern ment and nuclear establishment agreed to con cede such vital principles to the IAF.A.

CHERNOBYL, CHELIYABINSK AND KOODAMKULAM

Glasnost and the Evasive Soviet Nuclear Industry

The civil and military nuclear establishment of USSR has even today remained as an island untouched by the social audit being Initiated under Glasnost. The civilian nuclear reactors produce 10% of the nations electricity. The military wing would become redundant if the peace talks succeed.

The Common Interest of the Nuclear Energy Lobby.

It has been argued that the USSR fully cooperated with the International Atomic Energy Agency (IAEA) and the governments of other nations in sharing the Chernobyl data. Such sharing with IAEA and nuclear establishments of other countries who all share a common bond of secrecy is of little relevance to the people. IAEA and the nuclear establishments of its member countries are promoters of N energy and as such any Information which questions the safety or economic aspect is anathema to them. Critical data like the probable health costs of an accident are neither sought nor given In IAEA gatherings.

Secrecy over nuclear matters is not a Soviet syndrome. Writes Stephanie Cooke, formerly managing editor of *Nucleonics Week and Nuclear Fuel :*

> It is an International masonic order of its own, with roots that lie in industry's birth place : the top security labs that produced the world's first atom bombs. (1)

None of the existing medical literature on radiation caused health hazards has originated from the scientists on the payroll of N energy establishments anywhere. The studies on environmental contamination and health effects In the western nuclear nations by independent scientists show that even under normal functioning, nuclear power is harmful for the entire life support system for many a generations. (2)

In the USSR, because of the support from the party and the state, the nuclear establishment retained monopoly over data and research. There was no visible anti-nuclear movement and counter-information base till Chernobyl.

The glut in Internal market ?

Opposition to nuclear power is gaining momentum In the USSR after Chernobyl. Construction work on six nuclear plants has been stopped. Other East European nations also are less enthusiastic now.

The Soviets first proposed to sell reactors to India during the early eighties. This has been frozen because of the full scope safeguards which would mean that the supplier would have control over the plutonium produced In indegenous reactors as well. This clause Is being reportedly diluted and the terms and price now offered are better than the earlier offer.

Did the USSR decide to do so because of a glut in reactor market in USSR and the Eastern Europe ? Before the transaction takes place, there should be a popular debate in both the countries centering the following issues :-

Is it safe from a public health point of view, even under conditions of no Chernobyl type accident ?

Is the reactor under negotiation relatively safer than the models involved in Three Mile Island and Chernobyl ?

Has proper environmental Impact assessment been made before selecting the site for the proposed plant ?

This debate could begin with the limited and extremely fragmentary data on N Power in the USSR published in Soviet and international media. Here we will examine two cases : 1. the status and efficiency of N power industry in USSR which addresses Itself to the question of relative safety of the reactor under negotiation. 2. The response of the Soviet and International N establishments to two serious accidents In 1957 and 1986.

The Soviet Nuclear Industry

A UK Green Peace report quotes from Soviet newspapers about the bottlenecks in the nuclear construction programme:

Chronic shortages of manpower, housing and materials have dogged most of the nation's nuclear sites and reactor manufacturing sites for more than a decade. The three large nuclear construction sites in the Soviet Union - Smolensk, Chernobyl and Leningrad-suffer from serious shortage of key materials .....

it is reported that only 10% of the 1430 tons of steel required to meet 1980 construction goals was delivered to the Chernobyl site. In the first quarter of the

 year, the plant was undersupplied with

6,500 cubic meters of reinforced concrete structures, hundreds of Kms of electrical cables and 12,000 ancillary equipments. No welding cable was sent In two years. (3)

Sovietsakaya Rosslya In a 1982 report quoted Nicholal Derkovitch, the then construction chief of the Balkavo nuclear reactor : "we ask for 12 millimeter sheet and they give us 20 mm. which is heavier and more expensive. When they give us 12 mm Instead of 20, of course we cannot work. Instead of giving us steel, they're giving us the finger, if you will pardon the expression. And as a result, we are violating every normal rule of construction technology." (4)

Eight years before the Chernobyl, Nikolai Dollezhal had complained about the low quality of materials supplied:

"the equipment delivered by plants must be nuclear class, as it has now become the custom to say. It is not possible to say that all is well in this respect. Although legalised standards and rules for the design and manufacture of equipment for nuclear power plants have already been In existence for several years, observance of a high technological level in production is not always satisfactory." (5)

Atommash

The Atommash, planned with an annual production capacity of 8 VVER 1000 reactors was supposed to be the show-piece of Soviet reactor technology. A new city was created at Volgadonsk, the meeting place of the Volga and the Don. Construction work started in 1972 under Italian collaboration. The reactors manufactured at the 10 Km long assembly line would be towed by barges up the Volga to Central Russia or down the Don to markets through out the Southern and Eastern Europe. The Green Peace Report says:

Atommash has been dogged by difficulties for many years. Originally It was scheduled to be In operation by 1980. It missed this deadline badly. In the 11th 5year plan (1981-86), Atommash was projected to supply a modest seven 1000 MW WER reactor to Soviet sites. But by late 1981, officials said a maximum of four might be provided. (6)

The mess at Atommash did invite the attention of politburo. In 1983, Vladimir I Dolglkh, CPSU secretary for heavy industries rebuked the Atommash management for "having for a number of years failed to observe approved technological procedures, for gross violation of state discipline, for gross deviation from design standards and for failing to insure the accident free operations of engineering communications." Deputy Prime Minister Ignatl Novlkov and Gennadi Fomln, Chairman of the State Committee on CMI constructions lost their jobs. (7)

Atommash is reportedly In more serious troubles. According to a New Scientist report by Zhores Medvedev, Its heavy foundations began to give way In 1983. ..walls collapsed and serious accidents stopped the plants operation. Reason : the three giant structures - Atommash, Energomash (heavy Industrial complex supplying steel for Atommash) and the city of Volgadonsk were built well below the level of the artificial 1080 Sq. Mile Tsimlyanskoye Sea. Since the exploratory bore holes were drilled too vide apart, the large underground cavities beneath the plant went unnoticed. These cavities we e filling up with water from the sea. The water table in the entire area has risen sharply in recent years, undermining all the three units.

The soviet scientists were toying with the idea of protecting the structure by freezing into permafrost the groundwater ladden soil of this temperate region. According to Medvedev, this is highly impracticable "the only real answer Is to transfer the plant, lock stock and barrel to a new firmer location." (8)

Safety Consciousness in **India and the** USSR

Several safety lapses on the part of Indian atomic establishment have come to light. Narora, where two 235 MY/ reactors are coming up is a seismic zone and IAEC claims that an earth quake will have no effect on the reactor. Chairman IAEC quotes the example of Soviet Union, which has six reactors In seismic zones.

According to a news report in Janayugom, the organ of the Communist Party of India, the work at the reactor being built at Kransnodar, a seismic zone has been stalled In response to the peoples protest. Does this shelving, Inspite of the huge Investment made so far, indicates that the Soviet authorities are not all that sure, while Indian counterparts still quote the Soviet experience.

At Koodamkulam, the proposed site of WER 1000s, no environmental impact assessment and a study of the feasibility of rescue work in the event of a major accident has been done.

The atonic energy establishment in India will have to tell the people as to how the WER reactor, built at Atommash will be safe. The Soviet authorities should also reconuider the Justifiability of exporting a potentially dangerous technology to **a** nation which does not even bother to observe the preliminary safety measures ?

Chernobyl

Information regarding the accident was relayed to the neighbouring governments on the third day, only after Sweden sought an explanation for the radioactive anomaly observed by their monitoring agencies. Dr. Rosalie Bertell wonders as to how the US spy satellite (which has resolution power to read a license plate number on earth and locate lost persons In wilderness area) missed the explosion, graphite fire and evacuation of 25,000 people in the vicinity of the reactor. (9) More serious lapses have been reported In the official version regarding the dose to the people and the health effects.

Dose from Chernobyl

As per the data provided by the Soviet scientists to IAEA experts, the total dose to USSR people was 2 million man selverts (1 Seivert (sv) - 100 Rems). The IAEA sources point out that it is 20 million man Sv. (10) Roger H Clark of NRPB UK says that this difference is due to the underestimation of long lived isotopes like cesium 137 (Half life-Tl/2 33 yrs), strontium 90 (T 1/2 27.7 yrs) and plutonlum 239 (T 1/2 25.000 yrs) (11)

Valery N Soyfer, the geneticist who founded the first molecular biology and Genetics laboratory in USSR questions the correctness of dose assessment:

> Immediately after the accident, the Soviet mass media talked about the radioactive Isotope of Iodine 131. Its half life is relatively small, about 8 days. It **was** reported that 50 to 80% of all radiation that fell to the ground was made up of this isotope.
>
> In reality, iodine 131 formed no more than 10% to 15% in most of the tests. The longlived Isotopes often formed more than one-third of the total of radioactive substances. Yet the estimate of the future increase in cancer deaths was based on the presence of iodine 131 in the radioactive dust that fell on that part of the Soviet Union where 7E million people live. (12)

While Information on dose from cesium was denied to the Soviet people, their scientists told the IAEA experts that 1 million curies of cesium 137 has been deposited in the European region of USSR (13)

Caucer consequences

The Soviet scientists estimated 4150 additional cancers over the next 70 years, which is 'less than 0.05% from the level of death rates caused by spontaneous cancer'. Dr. Robert Gale, the American who did bone marrow transplantation of Chernobyl victims predicted 6000 additional cases. (14)

According to John B Goffman, the disaster would cause an additional 951,000 cancers (half of them fatal) and 19,500 leukemias. Of this, 424,300 would be in Russia and 526,700 in other countries. (15)

Alongwith this gross underestimation there was total denial of any probability of genetic/congenital anomalies or abortion. In an IAEA meeting at Kiev, the Soviet scientists advised the people to shed what they termed as radiophobia, which was spreading in USSR. (16) Says Zoyefer:

> The amazing peculiarity of the Soviet report is that there were no reference to future Increase in herldltary disorders. Specialists In genetics know that the frequency of herldltary diseases is greater than the frequency of cancerous degeneration under the influence of the same doses. This correlation applies to the consequences of Chernobyl as well. (17)

The governments in the West did tell their people all what they knew about the possible consequences of the fall out. While in the US data on increase in radioactivity was available for the public, France even refused to provide the same inspite of a request by the NATO allies. (20) Ail governments however consoled the people that the future health effects would be negligible.

Cheliyabinsk

The USSR set up its first plutonlum processing plant at Cheyabinsk in the Ural mountains in

1947. The military establishment had, In the next two years amassed enough plutonium to detonate a bomb in Sept. 1949, on the 70th birthday of Joseph Stalin.

In 1957 an accident took place at Cheliyabinsk due to the explosion of the ammonium nitrate in the waste. Some 10 million curies of strontium 90 and other highly active elements like plutonium spewed into the surrounding country side. About 60,000 **people had** to be evacuated, 30 towns eliminated. Eye witnesses testified of vast territory laid waste and the road blocks and warnings to travellers. There were huge piles of contaminated top soil, the contaminated houses were pulled down to prevent their owners from retrieving the poisoned possessions. Thousands of people were hospitalised, the local people referred to the Urals as "the graveyard of the earth." (19)

The first report of this accident, more serious than Chernobyl, appeared in New Scientist after 20 years.

Cheliyabinsk also housed a Secret Science Centre, where majority of the scientists were prisoners. Immediately after the accident, another research lab was set up here under Al Burnazlan, a Leutenant general and also a Deputy Minister of health. The dissident geneticist Zhores Medvedev says that he turned down, the invitation to work at the Radiation Research laboratory, since it entailed curtailment of professional freedom to publish papers and also a strict surveillance by the secret police. (20)

The results of 30 year long observation of plant, animal and human life In the Urals have not been published so far. Dr. Nikolai P. Dubinin, a geneticist mentions of a 1970 report of the President of Soviet Academj of Sciences in which results of 11 years of experiments and observation at the Urals were quoted. In the contaminated area.

Some species died out, some continued to suffer for a long time their population reduced In size and some evolved towards a higher resistance. Ail the fine trees in the area died out and about 80% of the bush trees were severely damaged. Higher plants and trees were replaced by radiore-
sistant grass. (21)

In the International Conference on Genetics heid in the USSR In 1977 Dr. Dubinin spoke to 2000 geneticists from all over the world that "any further advancing along the path of uncontrolled damage to the biological basis of mankind's existence could bring about great losses in the biological quality of human population. The percentage of children in Industrialised countries born with congenital anomalies more than doubled between 1956 and 1977. (22)

According to Rosalie Bertell, CIA has 16 secret reports on Cheliyabinsk, which they would not release. (23) The USA is the biggest producer of nuclear electricity and spent fuel waste containing Plutonium 239, an excellent bomb material and breeder fuel. Yet, they do not have a spent fuel reprocessing plant. Did the USAEC shelved their plans after seeing the horror at Cheliyabinsk ?

The Medical Data Which Needs to be Reanalysed and Published

Soviet Union and the Comecon nations have a third of the nuclear facilities in the world. Naturally, a third of the victims of radiation exposure also. Their proportion could be higher In Soviet people, since they have to keep and reprocess spent fuel from the plants exported by them.

The nuclear science establishment of USSR has been observing the ecological effects of Cheliyabinsk accident for the past three decades. Similarly, the health status of workers and population exposed to "lower" levels of radiation from the "normally" functioning reactors might also have been monitored. Findings of these studies are not available to the International community. The health statistics like birth anomalles, sex ratio at birth, cause of death etc. have to be reanalysed with specific reference to radiation and other carcinogens. A collaborative efforts by the international scientific collective with no bias against the Soviet Union or toward nuclear energy would definitely Increase our chances of survival. Soviet Union can well afford to spend a minimum of five years in sorting out the unresolved safety problems of nuclear power with the support and goodwill of global anti-nuclear, environmental groups. Construction or sale of nuclear reactors to other countries can also wait.

Kremlin has allowed the hawks from Pentagon to inspect the nuclee- Installtions in **Soviet Union. Now, a few doves doing medical**

research must be allowed to see the voluminous health data of workers and people exposed to radiation from the civil and military nuclear programme.

From the statements of Dubinin and Soyfer, It seems that the damage inflicted on the national gene pool by the emissions and leaks from the nuclear fuel cycle Is likely to be massive and Irreversible. This invisible violence persisting even today in our soli, air and water might turn out to be more virulent, evasive and sustaining than the bulltets and barbed wires of the dark era. Glasnost demands that the killer be made visible.

References:

1. **Stephanie Cooke, (1988). Western Government* Downplayed Consequences of Chernobyl Accident. Third World Network Features No. 140.**
2. **John Gofman. (1981) Radiation and Health. Selrra Club Press.**
3. **UK Green Peace (1984) Status Report on Global N Power, p 77.**
4. **Nucleonics Week. 11 2 82.**
5. **Dollezhal N, quoted in Gloria Duffy. (1979) Soviet Nuclear Energy Domestic and International Policies. Rand Corporation for the US DOE.**
5. **Green Peace (Ibid) p79.**
7. **New York Times. 26.7.83. Moscow Polit Buro Censures Big Reactor Plants' Builders.**
8. **Zhores Medvedev. New Scientist 26.1.84. Reservoir Eats Foundation of Russian Industrial Complex**
9. Rosalie Bertetl, (1986), No Immediate Danager • Prognosis lor a Radioactive Earth, Women's Press, p xl
10. FA Fry et.al., (1986). Nature, 321, pp 193-5.
11. Roger H Clarke (1987), Dose Distribution In Western Europe following Chernobyl.
12. Valery N Soyfer, (1988), Effects of Chernobyl much more than Indicated, 111 World Network Feature No. 141.
13. State Committee for Using the Atomic Energy of the USSR. The Accident at Chernobyl and Its consequence, Data prepared for the IAEA Conference at Vienna. August 1986.
14. Valery Soyfer (Ibld)
15. Goffman John W. (1986), Assessing Chernobyl's Cancer Consequences : Application of Four Laws of Radiation Carcinogenesis.
16. Psychological Scars of Chernobyl, Times of india. 13.5.88.
17. Valery Soyfer (Ibid)
18. Stephanie Cooke, (Ibid)
19. Rosalie Bertell. (Ibld). pp 175-85.
20. Rosalie Bertell (Ibid)
21. N P Dubinin, (1973). Eternal Motion (Autobiography) Moscow, p 330.
22. Birth Defects Up - Russian Reports, Milwaukee Journal. 23.8.78
23. Rosalie Bertell, (Ibid) p 184.

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Can we afford Narora ?

As the countdown begins for the commissioning of the country's first post-Chernobyl reactor, the Narora Nuclear Power Plant, the campaign "Stop Narora" has barely a few weeks left to persuade the government to defer, if not altogether scuttle, a project on which It has already spent Rs. 532 crore.

In Narora, a Sanghursh Samiti Is mobilising people for a major protest. Early in September, 14 ruling party MPs from Uttar Pradesh submitted a memorandum to the prime minister to stay the commissioning of the Narora Reactor. Rajiv Gandhi Is expected to be receptive to a proposal for a dialogue on Narora with eminent citizens, as an image-building exercise.

Despite Chernobyl, for Rajiv Gandhi and the Indian atomic energy establishment, the promise of the nuclear dream remains Intact. If India is to meet the ever-growing demand for an assured source of power supply, atomic energy is alone the answer, Is the establishment view. Considerations of safety are brushed aside as the hobgoblin of technologically ignorant minds. "More people die from accidents than radiation hazards. The adverse impact of nuclear power on human life is far less than that of cigarette smoking. Nuclear power is as safe as any other source of power supply." These statements have been made by successive chairman of the Atomic Energy Commission.

What about the near disaster at the American Three Mile Island station in 1979 ? Former Commission chairman Raja Ramanna saw it as a demonstration of how well the "fall safe" principle of nuclear power reactors works. And Chernobyl ? WorldWatch Institute "State Of the World 1987" report points out, "Potentially health threatening levels of radioactive material was deposited more than 2000 kms from the plant in at least 20 countries." But here, undeterred by the Chernobyl cloud, faith in nuclear energy is nurtured by Doordarshan ad capsule on the goodness of energy derived from the atom.

If safety considerations evoke so little concern, what about the economics of nuclear energy ? In the 60s, the architect of India's nuclear establishment, Horn! Bhabha, used to speak of nuclear energy as being too cheap to meter. But today staggering cost overruns continue to plague nuclear power projects. In the case of the Narora Reactor estimated to cost Rs. 200 crore, cost overruns are likely to be more than Rs. 323 crore. This does not, of course, include costs for waste management. The chairman of the AEC, Mr. Srinivasan may glibly claim that the technical problems associated with the production of heavy water have been solved, but the facts are chastening. Till 1986, India produced not more than 24 tonnes of heavy water against an installed capacity of 301 tonnes and a requirement of 558 tonnes. About 131 tonnes of heavy water were Imported from the Soviet Union at a cost of Rs. 30.80 crore from 1980-82.

Financial problems, technical difficulties and safety concerns have elsewhere In the world resulted In a drastic reduction of the nuclear energy profile. But in India till recently critics of the country's nuclear policy were denounced as CIA agents. The department of Atomic Energy functioned virtually as a secretive sub government beyond accountability to Parliament.

The Comptroller & Auditor General's reports on MAPP and the heavy water plant in Tuticorin have came as a shock and changed the sacred cow status of atomic energy. It is now quite common for AEC chairman Srlnivasan to talk to the press or with anti-nuclear activists. Even the bete noir of the atomic energy establishment Dr. Dhirendra Sharma has been invited to address officials at the Bhabha Atomic Research Centre ! Only last month a press party was taken to the Narora plant where they were reassured by managing director about the special safety provisions of the plant. Interestingly, the party did not appear to include any of the correspondents who normally cover the subject.

Empty exercises in PR ? Perhaps. They are nonetheless Indicative of the pressure the anti-nuclear lobby In the country has successfully built up.

Narora has been the most controversial of the planned atomic power stations because of its situation : on the banks of the Ganga only 56 miles from the Marodabad belt of the 1956 earthquake. Going contrary to the conventional wisdom of never setting up such plants on alluvial grounds and fractured rocks, Narora was chosen for political considerations. This was despite the strong criticism of the site by the 1972 interim report of the Vegurlekar Site selection Committee for future power plants.

NAPP managing director now assures us that adequate care has been taken to ensure the stability of the plant in high seismic zone, never mind that the cost of redesigning the foundation structure at Narora has consequently qudrupled. But even if we were to accept that the country has been able to acquire the expertise to construct an earthquake proof building, what about the claim of Dhirendra Sharma. that several engineers involved with the project have expressed concern about the use of substandard material ?

On September 22, 1982 there was major breakdown in RAPP-11 due to a "manufacturing defect" in the "moderator heat exchanger (ME)", according to a report In *Sunday* magazine. Subsequently, Dhirendra Sharma was able to confirm from engineers or. the site that their counterparts who had pointed out the defect at the time of delivery of the MHE from Larsen & Tuobro had been overruled by DAE and transferred, Sharma in his book *India's Nuclear Estate* claims that L & T officially admitted that they received a concession from DAF. on the original quotations as they were unable to meet the standards stipulated.

The CAG report on MAPP also emphasises the existence of faulty material and equipment supplied by the contractor. For storage of helium and heavy water, 62 stainless steel tanks were erected between 1975 and 1979 after due clearance by the Quality Surveillance Wing of the DAE. However 22 were found defective and had to be replaced with carbon steel tanks. DAE explained that the 22 tanks had developed leaks because they were not used immediately, as MAPP was delayed by more than eight years.

Sharma is also sceptical about the confidence displayed In the "failsafe" systems all of which are electronically controlled and require a constant source of outside power.

Narora, he claims, suffers from the two very flaws singled out by Soviet physicist Valery Legasov : accident-prone construction and lack of reliable emergency systems. Even routine spillages of radioactivity into the Ganga will contaminate the remaining 1000 kms to the Bay of Bengal.

These fears may well be exaggerated, but we have a right to know about the risks Involved. Nuclear power requires an extraordinary faith by the ordinary citizen in the technical elite - a faith that has been badly shattered.

Demonstrations

About 60 young girls from Delhi squatted on October 6th, 1988 outside the gates of Narora shouting slogans like Parmanu Bijli bandh karo (stop nuclear power). The girls, from Delhi's prestigious Lady Shrl Ram College and Jawaharlal Nehru University, sat all morning effecting a partial rasta roko.

The students had come a distance of 125 km to this tiny town on the banks of the Ganga to |oin the first anti-nuclear demonstration at the site. The Students Action for Environment and the Women's Development Cell of the College had enthusiastically responded to the call from the Committee for a Save Nuclear Policy (CONSUP). Amidst gaily-coloured banners saying "Rs. 800 crore, that is cheap nuclear power", they sat in the blazing sun listening to Dhirendra Sharma's impassioned warning that while the Bhopal disaster had affected thousands, a mishap here would be much worse. "For 10 to 30 years of electric power you are endangering generations to come", he said.

Initially, a Delhi-Narora march had been planned, but few turned up on October 2 for the march and it was decided Instead that volunteers would travel to the villages neighbouring Narora and warn the people of the dangers of an accident in the Narora plant, which is located in an earthquake zone.

The volunteers had very mixed experience. At Ghaziabad when they put on a slide show in a temple, the audience which was expecting a feature film, turned hostile and flung mud at the screen, said a volunteer from the Network to Oust Nuclear Energy (NONE).

But at Dlbal, a few km from Narora, despite opposition from the local Congress-1 MLA, they were not only able to win the support of about 40 students at the Digambar degree college, but the principal even gave them money to get to Narora to join the demonstration Kuldeep Kumar, a young motorcycle mechanic, also came with them. For 12 years he had indifferently watched the shadow of the Narora plant steadily lengthen across the Ganga. It was only this week that he learnt what radioactivity could mean for them and the thousands of others in the neighbouring village.

He had read about Chernobyl accident but failed to make any connection between the gleaming with domes of the power plant coming up here and the explosion of the Chernobyl reactor. His friends at the college had no idea what radioactivity was. May be the science students knew, but certainly not the others.

Did the people feel that the nuclear power plant would be advantageous to them ? Would it bring employment, development of industries and electricity ? this correspondent asked. "What benefit, they are even taking our farm land away from us", Kuldeep said, referring presumably to the 15 km radius that the government Is obliged to maintain as a safety zone as per International Atomic Energy Association regulations. For most of the villagers, the danger of radioactivity is a cold abstraction, and the question of more adequate compensation for land taken over is far more emotive issue.

What about the 470 MW of power that the two nuclear power plants would generate ? That power is not for the locals. Kuldeep said, Engineers from the plant who frequented his shop had told him that the electricity was for industrial units in Kanpur.

Meanwhile, Dhirendra Sharma was elaborating on the differences between rural and metropolitan India. High technology as represented by the nuclear plants was for the cities, while those in the villages and small towns who bore the most risk benefited the least, Sharma stressed. "Reach out your voice to the hell-copters of Raj Bhavan, wherever he is", exhorted Sharma, referring to the prime minister.

But even were the voices of the demonstrators to reach the prime minister, It is too late for dialogue. The Narora Atomic Power Plant (NAPPS) Is scheduled to become critical' by the end of the year. According to project director Krishna Chopra, the process of commissioning the reactor Is well advanced. An application for heavy water has been made. The plant needs 235 tonnes of heavy water per reactor initially as coolant and moderator. Some 9-15 tonnes are required per annum as replacement for process losses in this natural uranium reactor.

However, In view of the disturbing reports about the indigenous heavy water production, the commissioning may well be delayed. The Madras atomic power plant suffered a 16 month delay in commissioning because of the non-availability of heavy water. Atomic Energy Chairman M. R. Srinivasan however maintains that the problems with the heavy water projects have been ironed out.

Project director Chopra easily brushed aside fears about the safety risks involved, "SAfety Is looked after in an absolute updated post-Chernobyl."

Sources: Rita Manchanda in The Indian Post, Sept. 23rd, 1988 and October 8th. 1988.

Editor's Note : The commissioning of the Narora reactor which was first stated for October '88 and then December '88 has now been postponed to March '89 May be al! ts not as well as the nuclear authorities would have us believe

NEW DIMENSIONS TO SELF-RELIANCE

A high-level cabinet working group was set up in December by West German Chancellor Helmut Kohl to Investigate accusations by West German federal prosecutors in Hanau that top officials from two firms had exported a variety of nuclear components and materials from West Germany to Pakistan, India and South Africa. The exports, which took place between 1982 and 1988, were in violation of West Germany's Foreign Trade Act. Key suspects in the case Include a past technical director of NTG-Neue Technologlen Gmbh (NTG), and the present director of the nuclear consulting firm Physikallsch Technlsche Beratung (PTB). Prosecutors say a third firm, Gutekunst, may have also been Involved by procuring tritium gas and nuclear technology for PTB and NTG, possibly in another country. The illegal exports reportedly Include both unspecified quantities of the tritium gas as well as tritium processing equipment. Tritium can be used as a neutron generator for a fission bomb.

In addition to transactions that are blatantly Illegal, exporters In Germany have taken advantage of loopholes In West German laws on nuclear materials (among the most lenient In Europe) to trade in what is being called a "gray market" In nuclear materials.

Alfred Hempel, a nuclear broker and former Nazi officer, whose West German company Rohstoff Einfuhr GmbH Is also being investigated, is said to be a pioneer In this flourishing "gray market". An article appearing in early January in The Wall Street journal describes some of Hempel's shadowy deals involving the sale of heavy water. The Journal also notes that Western sources estimate there are now 25,000 tons of heavy water in the world. About half of It Is In Canada, whose CANDU nuclear power plants require it to operate. However, Canada, says the article, imposes heavy controls on its heavy water business. Much of the world's other heavy water Is believed to be in plutonium production reactors operated by the "nuclear powers" to make atomic and hydrogen warheads. What portion of the remainder has spilled over into the "gray market" is unknown.

in one deal described by the journal, a chartered West African Airlines Boeing 707 left Basel, Switzerland on December 1, 1983, carrying 122 barrels of heavy water. Heavy water is supposed to be one of the world's most closely guarded materials because it is used in production of high-quality plutonium for nuclear weapons. But apparently nobody was on guard that particular afternoon. According to the paperwork accompanying the shipment, the flight was from Oslo carrying 15 metric tons of heavy water to Frankfurt, West Germany. In actual fact, the flight had gone from Oslo to Basel, where the cargo was sold by Hemple's Rohstoff Einfuhr company to a Swiss company, Orda AG. Then 6.6 tons of Soviet heavy water were added to the Jet's cargo. After it was

loaded, the Jet took off for Its ultimate destination: Bombay. Hempel, who as it happened, also controls the Swiss Company involved, made at least US$15 million on that deal.

According to Dieter von Wuerzen of the West German ministry of economics, even though these shipments were Initiated with a West German government Import certificate authorizing a shipment to Frankfurt, they were not covered by West German law - because, says the ministry, the flight never entered West German territory.

Hempel similarly manipulated IAEA regulations two years later In another sale to India. Under IAEA regulations there is a loophole that waives controls over heavy water shipments of less than a ton, so, In 1985, according to Swiss records eight shipments totalling 6.8 tons of heavy water from the Soviet Union arrived at the Zurich airport. All the shipments were, according to paper-work, destined for different customers all In Western Europe. However, at the airport the papers were changed, making It all one package. It was then rerouted to India. When Moscow was informed of the true destination of their sale, they checked the papers from the Soviet trade agency that dealt with Hempel. "They were In perfect order," said Moscow's man in charge. Some of the papers even had notations that the heavy water had actually been received by customers In Western Europe...

Criminal investigators in Norway and US officials are also Investigating Hempel, studying evidence that he has supplied nuclear materials to India, Israel, Pakistan, South Africa and Argentina, all of which are assumed to be (and some of which are known to be - why Is It the press still Ignores such obvious evidence, especially in the case of Israel?) involved In making nuclear weapons. What they are finding Is that Hempel uses a network of more than a dozen German, Swiss and South African companies to, as one US official put It, "dance on the edges" of international controls meant to limit nuclear proliferation. Hempel has also, beginning In the early 1980s, involved China In his many deals. China hasn't signed the Nuclear Non-Proliferation Treaty - not that it seems to matter whether a country has signed or hasn't, but a big deal is being made in this case of the fact that China hasn't. Anyway, to try to make a long story short, acording to The Wall Street Journal, US officials, who asked not to be named, say the Chinese deals were huge They apparently involved more than a hundred metric tons of heavy water to India alone. At the same time, US officials say, Hempel's companies sold "substantial quantities" of Chinese heavy water and enriched uranium nuclear fuel to the military junta ruling Argentina.

The Chlna-Hempel connection came at a time when the *US,* France and other Western suppliers were boycotting South Africa, trying to force it to open up all of its secret nuclear facilities to International International inspection In exchange for nuclear fuel. South Africa has never agreed to do that. It hasn't had to. With a little help from Hempel, at least 60 tons of Chinese enriched ura nium found its way there when South Africa needed it to start two nuclear power reactors.

Some of the questions Investigators are ask-Ing about this man's deals are rather Interesting. Information that has come out so far makes clear that successive Bonn Governments have protected West Germany companies exporting nuclear materials and technology to Pakistan, India, Argentina and South Africa. So questions like, how have West German government officials secretly helped Hempel sell nuclear materials are to be expected. But they are also asking questions like, how has a man, who several years ago flaunted his Nazi past by sending Christmas cards showing himself in his medal-covered Wehrmacht uniform, been able to deal so easily with officials in Israel, Norway and the Soviet Union.

Meanwhile... the federal prosecutors in Hanau are continuing with their investigation of the original scandal that led to the current allegations. That's the scandal involving Transnuklear, a company that transported and processed lowlevel waste from nuclear reactors until the West German government took away Its license. Well, It sems that over the last decade or so executives of this company had, among other things, been spending millions of Deutschmarks In unexplained payments and outright bribes. And when that came out, early last year, rumors about West German companies shipping plutonlum to Pakistan and Libya also surfaced (Anumukti voll. no. 4, Feb '88). Those rumours have not been substantiated...not yet. anyway.

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'KAIGA CHALO' AGITATION BEGINS

There was a big meet at Karwar in Karnataka on 2nd October, 1988 Gandhi Jayanti Day to protest against the Installation of nuclear energy plant at Kalga. About 2500 activities from different parts of the state participated in the meet. Of these, about 500 were women. The majority of the demonstrators belonged to North Kanara district. The rest were from Shimoga, Mysore, South Kanara, Dharwad and Bangalore.

A procession was taken around the town with placards and banners. The processionists sang songs and shouted slogans. Despite poor weather the enthusiasm of the protesters was unbounded. They urged the government to scrap the project and save the people from radiation disaster and proliferation of radioactivity After the procession, a public meeting was held in the evening. Speakers requested the protesters to bring to a halt all work on the Kainga plant within six months and to ensure that funds from Kaiga were diverted to ecologically sound projects which would guarantee equity and employment for the residents of North Kanara. The meeting was held under the presidentship of Dr. N. Shanta Bhatt. Among the prominent speakers were freedom fighter H. S. Doreswamy, Journalist Nagesh Hegde. National Award winning film director Suresh Heblikar, Food scientist Dr. A. N. Nagraj and former MP B. P. Kadam all of whom reiterated their support for this popular people's movement.

The next day there was march led by Sri Vlsveswara Theetharu the senior swami of the Udipl Pejawar Mutt to the Kalga plant office. The marchers demanded the Immediate closing down of the office and stoppage of all work at the Kalga plant. 375 people braVed the hot sun and stood by the swamljl when he requested Dr. P. T. Tiwari, the director to the office to close down the office permanently. But he expressed his Inability to do so though he did close the office for the day. All the protesters were arrested when they tried to forcibly enter the office.

Before the satyagrahis dispersed, It was announced that a two district action committee would be formed at a meeting of taluka representatives. It was also decided that number of senior activists would tour the districts to mobilize the people for the next phase of the struggle.

The success of the Kaiga Chalo march was due to the untiring efforts of many activists from all over the North Kanara district and Karwar town. Special mention must be made of Dr. Kusuma Sorab and her volunteers of Sneha kunja. Shri An ant Hegde of the Seva Sagar trust and the volunteers of Parisar Samrakshana Vedike, Sirsi.

Based on a report by Kaiga Roko Action Front and an article by Shri H S Doreswamy in Vigil of 15/11/88

Debate On Nuclear Power

To the credit of the Karnataka government, it has honoured the word of the erstwhile chief minister, Mr Ramakrishna Hegde, who had promised to hold a national debate on nuclear power, following the controversy over the Kalga atomic power plant in Uttara Kannda district. This Is the first time that the votaries of nuclear power - led by Dr. M. R. Srinivasan, Chairman of the Atomic Energy Commission (AEC) - have met face-to-face with the "opposition".

Indeed, those who have been objecting to the use of nuclear power in India in general and to a location in the sensitive ecosystem of Karnataka's western ghats in particular can hardly be blamed for believing that the nuclear establishment has not only chosen to turn a deaf ear to criticism but also refused to part with Informa tlon on this vital issue. Only too often, the AEC more readily releases documents to the International Atomic Energy Authority than to critics at home.

Since both sides are too deeply entrenched in their own well-known positions on this contentious issue, it was too much to expect any consensus to emerge from the Bangalore meet. At best, as this writer observed, there should have been a dialogue, Instead of a duologue, so that the two could have heard out each other calmly. Acrimony, of which there was unfortunately too much, could have been avoided.

Nevertheless, the very fact that the debate was held was an important departure. The estab

lishment has agreed to appoint a retired scientist who will liaise between the two sides and provide Information. What is more, there will be repositories of official documents relating to nuclear power in major cities. Perhaps the imminent entry of Soviet nuclear know-how also heralds a new spirit of glasnost in the atomic energy 'state" here.

Cardinal Factor

Inevitably, the Bangalore discussions revolved round the cardinal factor, safety. As Dr Srinivasan remarked, "We must take risks because societies that have, have progressed. Nothing ventured, nothing gained." This was countered by the anti-nuclear lobby which pointed out that India's safety record at Tarapur and other plants was dubious. Medical experts drew attention to the incidence of mongolism among newborns In certain coastal areas of Kerala, where sands are radioactive, as well as to complications caused to workers at the Kalpakkam power plant.

While these "costs" of harnessing nuclear power can be argued ad nauseam, with both sides providing conflicting data, perhaps the more illuminating point of contention is the necessity of producing such power In the first place. Only too often, protagonists of nuclear and other forms of centralised systems of providing electricity equate "power" with "energy", as though the two were the same. As a matter of fact, even the catch-all "energy" they refer to is actually only commercial energy, while the bulk consumed in this country - particularly by the poor, both in villages and towns - Is fuel for cooking, and almost all of it in rural areas in non-commercial or collected "free" (with the labour of women and children).

As Dr Amulya Reddy, the wellknown alternative energy expert from the Indian institute of Science (HS), where the debate was held, argued, "Energy Is treated as an end in itself and the focus is on Increasing energy consumption." His case is amply illustrated by the experience of Karnataka. When environmentalists halted work on the Bedthi hydel project in the same district as Kalga earlier this decade, they calculated that the per capita rural expenditure on all forms of energy in the state had declined (at constant prices) from Rs.1.66 per month in 1951 to Rs.1.23 in 1976, even though the generation of electricity had increased ten-fold in the same period.

Crying Need

The pro-nuclear lobby asserted, persuasively, that this form is not only cheaper than hydroelectric of thermal power - not to mention renewables like solar and blogas - but also that it has no adverse environmental effects. Unlike hydel, It does not flood vast tracts of forest; unlike thermal, It does not pollute the atmosphere. Mr S.K Kattl, who heads the Nuclear Power Corporation, stated: 'There Is a crying need for power from any source".

However, the old claim that nuclear power would become "too cheap to meter" appears farfetched today. Despite what Dr Srinivasan maintained about more countries going nuclear, the industry has suffered a setback, especially after the Chernobyl accident. What is more, even on its more attractive advantage - its low cost per unit of power - it can be faulted. Dr Reddy has shown that if three elements are included in costs: the AECs actual performance in completing power plants (15 years instead of eight), proper waste disposal practices and the comptroller and auditor general's estimates for heavy water, the cost per kilowatt-hour can rise to 122 paise from the AECs 99 palse, while thermal power costs only 101 palse.

Because the nuclear industry, worldwide, faces an ever-increasing cost escalation as public awareness about its hazards continues to grow (particularly after Chernobyl), attention must be drawn - when planning a new station like Kalga - to alternatives. The first is to save a kilowatt, instead of producing one more. In Karnataka, as throughout the country, as much as 22 per cent of the electricity produced through centralised power systems is lost on transmission and distribution. if various conservation measures are taken at the point of consumption, every kilowatt thus saved is equal to 2.03 KW generated, as pointed out by an expert group's perspective plan for Karnataka.

Some of these conservation measures include modernising the state's power-intensive industries (like the private sector aluminium plant in Belgaum), making irrigation pump sets energy-efficient , replacing conventional bulbs with fluorescent ones and electric domestic water heaters with solar appliances, and using LPG instead of electricity for cooking. The plan showed that with these five measures alone, Karnataka's power deficit for 1986-87 would become a surplus of 458 MW the equivalent of two Kaiga-type 235 MW reactors**.**

The need to conserve pOnver, before producing more of It from centralised systems, should be apparent from the fact that big Industrial units account for no less than 70 per cent of the electricity consumed In Karnataka. Whatever the other benefits of these Industries, their employment potential Is extremely small, which prompts a re-examination of the social benefits of concentrating such a large chunk of financial and physical resources in this one all-important sector. Nationally, power received nothing less than a fifth of the total investment In the Seventh plan.

If one reverts to the earlier observation that It Is the total energy that Karnataka should be worried about, and not Just the generation of power. It Is clear that renewable forms ought to be given much more emphasis. (The country-wide picture is no different, with these receiving 0.3 per cent of the Investment in the last plan.) With some 13 million cattle, the state is as well equipped as almost any other to meet the energy needs of Its population from gobar gas.

According to Prof K.S. Jagdish of the IIS, with a low output of 4 kg of dung per head of cattle a day, It should be possible to produce sufficient blogas, with which an electricity capacity if gen erated for eight hours every day of 250 MW can be created. In other words, each village can reap the benefits of a 10 KW power station. He also advocated the conversion of wastelands Into firewood and foddar plantations, as well as the replacement of bullock power with biogas.

Energy Scenario

For such a transformation of the energy see nario to take place, of course, the essential pre requisite is the proper management of the "commons". The task could be undertaken, rather like the mandate given to the National Wastelands Development Board by Mr Rajiv Gandhi, over a five-year period. As Prof Jagdish argued, "This approach solves at one stroke the problem of soil erosion, high rainfall run-off due to deforestation and the shortage of rural energy". Such a holistic and reinforcing solution would also attend to the dilemma of mass unemployment, unlike the path carved out by centralised energy provision.

The location of the Kaiga atomic power plant does precisely the opposite. Quite apart from the safety hazards and ever-escalating costs, the very site on the western ghats, from which sever al rivers flow, militates against that new "buz zword": sustainable development. Very simply put. It amounts to a choice between generating power from two 235 MW atomic plants at Kaiga (four more have recently been sanctioned there) or meeting the energy and employment needs of the entire state, with all the spinoffs of environ mental enhancement.

Courtsey DARRYL D MONTE Times of India 23 12 88

LETTER BOX

By reading the articles, of the August issue I felt very upset. I thought that Anumukti would guide the antl nuclear movement In India. For this, It is necessary to collect and publish Information on anti-nuclear movement as well as expose the activities of our Atomic establishment. On 6th August, there were processions in Kakrapar, Bombay & Calcutta against Nuclear Power. Comments of V. Legasov published in Moscow News (July 17, 1988) could be reproduced In Anumukti.

We are trying to organise movement against the proposed Nuclear plants in West Bengal. But Anumukti won't provide any guide for our would be activists.

Niranjan Haldar
79, R. K. Ghoshal Rd.,
Calcutta-700 042.

Editor's reply :

What males nuclear industry so Irresistibly attractive to leaders' of third world elites is the possibility of producing a nuclear arsenal from Its waste products. The August Issue was devoted bringing out this connection In detail. Regrettably the publication of the August issue was delayed. I had given the complete 'matter' to the printers on 3rd of August hoping to post the Issue by the 15th. Unfortunately due to a death at the printers and the resulting disorganization I received the printed copy only on the 26th of September. Consequently there was no possibility of including reports of protest demonstrations which took place on 6th and 9th of August. The present Issue does contain reports about protests in different parts of the country. I still cannot Include a report of the Calcutta demon stration since I have no information about it and

your letters was the first 1 heard about it.

Anumukti cannot fulfill its function of being a link between groups of activist in different parts of the country unless activists themselves feel the need and send reports regarding their activities to it-

Received your Journal Anumukti of August 1988. This type of Journal working for non-nuclear India is essential at this stage because now our country has got a number of nuclear plants In different states and Intends to open more. Anumukti must create awareness in the people. Articles, especially like 'Daughter of the A - Bomb' must be published, which highlight the III effects of Nuclear Bombs. Congratulations.

ASIAN YOUTH CENTRE
H. Q. 37, Melpadi Muthu Street,
Nungambakkam, Madras - 600 034.

Mr. M. R. Srinivasan, Chairman of the Atomic Energy Commission recently announced a programme for 12 new nuclear power reactors with a total capacity of 6000 MW to be set up as a part of the 10000 MW nuclear power programme by the year 2000. In view of the secrecy surrounding the AEC working, It would be too much expect more Information than whatever has been announced till the plants are set up.

This programme will not come up for public debate. There may not be any avenue for submitting objections like the enquires that Department of Environment organises for other projects. Should we take the AEC 6000 MW programme low lying or shouldn't we put up a concerted stand on a national basis ? The-AEC announcement should not go unchallenged or unopposed.

KISAN MEHTA
Save Bombay Committee
C/o. KAYJAY ENGINEERS
123, Mahatma Gandhi Road,
Bombay - 400 023.

The August Issue of ANUMUKTI contained some Interesting and moving articles. Sri Lanka is a country without nuclear energy plants and without atom bombs. Nevertheless, the problem Is one of concern for the whole of humanity. We recognised this fact when It was made the topic of the daily meeting in our pirivena (monastic school) on Hiroshima Day and also in the meeting of the Mahila Samiti based at the temple, the next day.

It has to be mentioned that the rural population here doesn't have a perspective which reaches much beyond the southern areas of Sri Lanka. On that day, however, for the first time the ladles of the surrounding villages started to think for the whole humanity. They understood that the nuclear question Is also their problem and decided to build up a strong women's organisation to conduct a public programme with a silent procession of mothers and children, prayers and meditation on next Hiroshima Day. Issues like this one and other environmental problems which threaten human life on the whole earth, we hope, can be made a permanent part of the traditional programmes in our temple.

Dr. Ven O. Sobhita
Sri Bodhiraja Bhikku Training Centre,
Embilipitiya, SRI LANKA.

I brought a confidential report from Sweden, IAEA' Board of governor's Safeguards implementation Report for 1986, date 4 May, 1987. It is a 68 page document. If any one is interested in getting a copy against payment, he may write to me. SIPRI-1988 report describes Nuclear weapons situation in China, India and Pakistan. Copies are available with

Mr. R Dasgupta,
49/4. Hindustan Park,
Calcutta-700 029.

N. Haldar
79, R. K. Ghosai Rd.,
Calcutta - 700 042.

Going through your number of August 1988, found some spelling mistakes. "Hypocrisy: spelled as "hypocracy". The latter spelling Is wrong. Similarly "Occurences" Is spelt as "Occurances". I did not read the magazine thoroughly, I Just went through the sub-titles and found these two glaring mistakes.

D. N. Mittal;
Guru Nanak Pura,
BASSI -140412.

Editor's reply : I am solely to blame for these errors. My spellings have remained a constant source of exasperation to all. Since I am also Anumukti's only proof reader, a solution is not easy to find. Deeply regret, and promise to Improve in the future.

THE BANGALORE WORKSHOP

The National Workshop on Nuclear Power Projects with Specific Reference to Kaiga, organised by the government of Karnataka was held in Bangalore on December 10th and 11th, 1988. It was a unique event which brought together both antlnuclear activists and the nuclear establishment to share the same platform and almost equal time.

The scene of the confronation was the auditorium of the Indian Institute of Science. The debate at times grew rather acrimonlus. Elsewhere in this Issue we have published other accounts of the proceedings.

First it is important to understand what the workshop was not. It was not an exercise in creating an informed public opinion - an attempt at educating the public about the pros and cons of nuclear power. Therefore, It was a close-door, by Invitation only affair. A gathering of the experts' and a gathering for the experts. Neither was the workshop an expression of the open mindedness of the Karnataka government regarding the nuclear alternative. Despite assurances by ministers during the opening session it was clear from the very beginning that the decision on siting the nuclear power plant at Kalga did not depend on the outcome of the deliberations at Bangalore.

However, in a limited context, the workshop was a very useful meeting. The nuclear establisment was represented in full measure. All the big shots were present along with most of the second line. Glasnost' was a much abused word. The workshop did serve many useful functions however, and can be thought of as a milestone on the road to a non-nuclear India.

Firstly it showed unambiguously to everyone, (including some sceptical activists themselves) that the antlnuclear movement has gained a certain maturity. The arguments are no longer exclusively emotional - based entirely on a sense of moral outrage. The moral passion still underlies the foundation but it is reinforced by a technical understanding . The bland reassurances of the nuclear establishment - "leave the nitty-gritty to us" - no longer suffice.

A very large number among the scientific community share a feeling of vague unease regarding the nuclear enterprise. Normally these feelings remain amorphous. The forceful articulation of antinuclear views at the workshop helped many 'neutrals' to make up their minds. This side-effect of the workshop would greatly help the movement in the future.

Thirdly, the workshop was a place where one could learn new things. Two facts gleaned there deserve special mention.

1. Indian nuclear programme is based on reprocessing of spent fuel. Contrary to the practice in other countries the earlier policy of the Department of Atomic Energy was to locate reprocessing plants at reactor sites. This raised (by a large amount) the radiological burden at the site but it did avoid the dangers involved in transporting of highly radioactive spent fuel, (see Anumukti vol 1. No.3, Dec.'88) However now, unannounced, there has been subtle shift of policy. Thus, though there Is a reprocessing plant at Tarapur and another is under construction at Kalpakkam, the department Is ambiguous about whether there would be plants at Kalga and at other reactors sites. Meanwhile without as much as a by-your-leave of the residents enroute. It has started transporting spent fuel in trucks over thousands of kilometers. Spent fuel is extremely hazardous, and an accident Involving It could be a major calamity. The right of informed consent is a cornerstone of any system based on natural Justice and ought to be respected by all - even by sacred cows like the D.A.E.

2. The breathtaking announcement by the chairman of the Atomic Energy Regulatory Board (AERB) who said that site selection was political decision and the AERB was in no way connected with it. This, while the atomic energy establishments all over the world spare no effort at assuring the public about the great care that goes Into all aspects of safety of nuclear plants starting from site selection, (see the note following this article)

The most useful outcome of the workshop was the reluctant admission by the establishment of its duty to provide factual Information to the public. Specific reports like the Sriram report on Tarapur and the Ramarao report on Rawatbhata would be made available in some public libraries.

Dr. Ramanlah, the president of the Indian Nuclear Society was designated by the chairman Dr. M.R. Srinivasan to co-ordinate this. Any activist desirous of any specific report or Information should directly contact him. His address is:

Dr.M.V. Ramaniah
Indian Nuclear Society
Engineering Hall No. 7
BARC TROMBAY
BOMBAY 400 085

SURENDRA GADEKAR.

NO COMMENTS!

The Search for an Ideal Location

Where a nuclear power plant is located can affect its safety and ultimately the public health and ecological balance In the surrounding area. Before a site is selected, many factors are carefully assessed to determine, as far as possible, whether the Interaction of a plant and Its site would be harmonious or would pose unacceptable risks to safety. How susceptible Is the area to earthquakes and other extreme environmental phenomena ? Although plant design can counter many potential safety hazards, others many present difficulties so formidable that they are best avoided altogether through the selection of an alternative site.

A proposed site is also viewed from the perspective of how population density, patterns of water and land use and other features would influence any radiological effects of the plant under normal operating and accident conditions. As a corollary, the feasibility of emergency plans are studied, such as the availability of transport and communication network.

Source : Basic Safety Principles for Nuclear Power Plants : Highlights of a Report of the International Nuclear Safety Advisory Group (IAEA Topics June'88)

The selection of the site of a nuclear power plant is a political decision. The Atomic Energy Regulatory Board is net involved in the site selection process.

Source : Dr. A.K. De, Chairman, Atomic Energy Regulatory Board at Bangalore, December 11th, 1988.

ANUMUKTI

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