



ANUMUKTI

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The Long Death

*Radiation is like oppression
The average daily kind of subliminal toothache
you get almost used to, the stench
of chlorine in water, of smog in the wind*

*We comprehend the disaster of the moment,
the nursing home fire, the river in flood
pouring over the sandbag levee, the airplane
crash with fragments of burnt bodies
scattered amongst the hunks of twisted metal,
the grenade in the marketplace, the sinking ship.*

*But how to grasp a thing that does not
kill you today or tomorrow
but slowly firm the inside in twenty years.
How to feel that a corporate or governmental
choice means we bear twisted genes and our
grandchildren will be stillborn if our
children are very lucky.*

*Slow death cannot be photographed for the six
o'clock news. Its cdl statistical,
the gross national product or the prime
lending rate. Yet if our eyes saw*

*in the right spectrum, how it would shine,
lurid as magenta neon.*

*If we could smell radiation like seeping
gas, if we could sense it as heat, if we
could hear it as a low ominous roar
of the earth shifting, then we would not sit
and be poisoned while industry spokesmen
talk of acceptable millirems and .02
cancer per population thousand*

*We acquiesce at murder so long as it is slow,
murder from asbestos dust, from tobacco,
from lead in water, from sulphur in the air,
and fourteen years later statistics are printed
on the rise in leukaemia among children,
We never see their faces. They never stand,
those poisoned children together in a courtyard
and are gunned down by men in three-piece suits.*

*The shipyard workers who built nuclear
submarines, the soldiers who were marched
into Nevada desert to be tested by the
H-bomb, the people who work in power plants,*

they die quietly yearn after in hospital ward and not on the evening news.

The soft spring rain floats down and the air

is perfumed with pine and earth.

Seedlings

drink it in, robins sop it in puddles, you run in it and feel clean and strong, the spring rain blowing from the irradiated

cloud over the power plant.

Radiation is oppression, the daily average

kind, the kind you're almost used to and live with as the years abrade you, high blood pressure, ulcers, cramps, migraine,

a hacking cough;

you take it inside

and it becomes pain and you say, not

They are killing me,

but I am sick now.

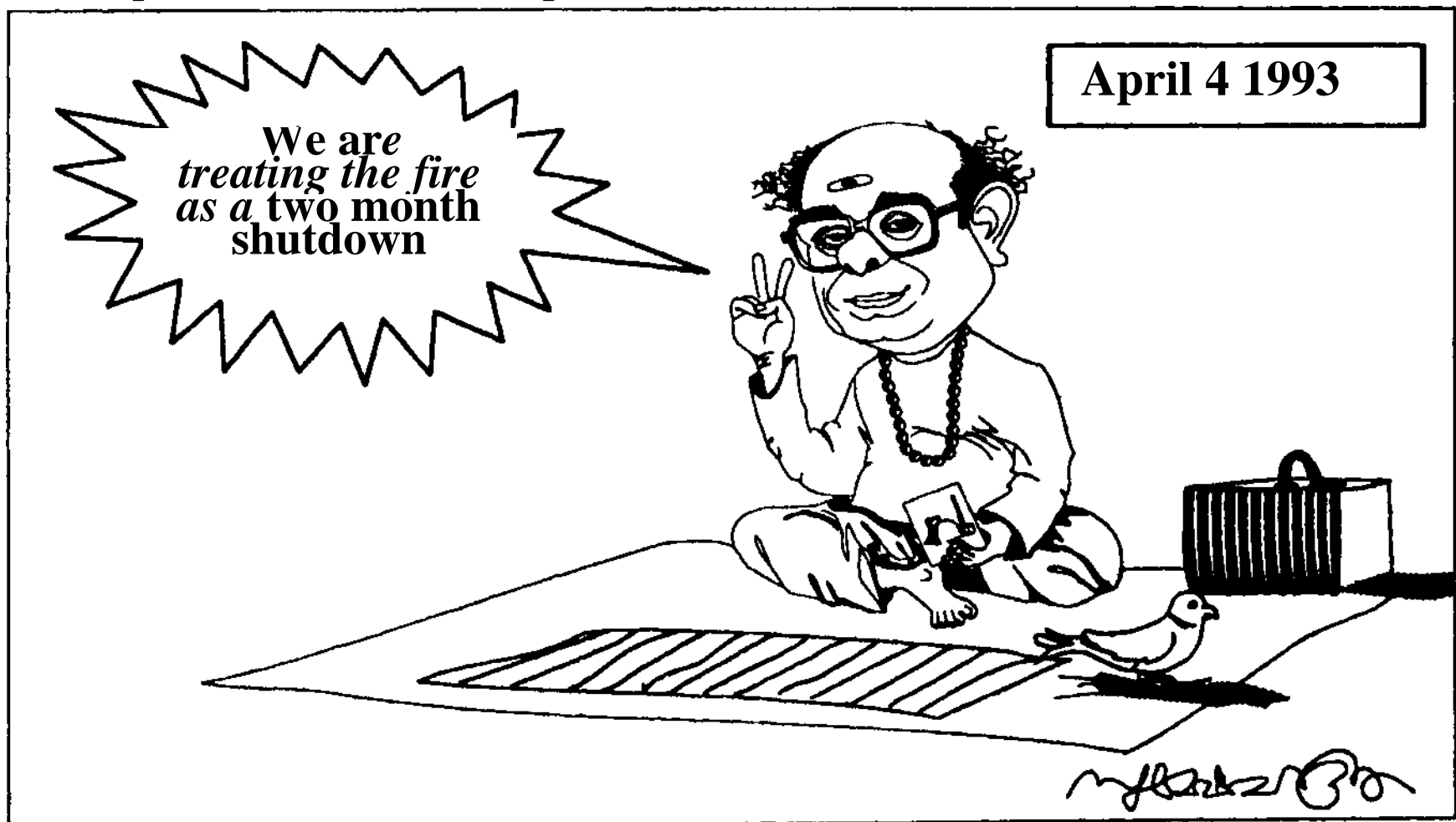
From *Circles on the Water*
by Marge Piercy

From The Editor's Desk

Scientists as Soothsayers

Supposedly scientists and engineers are people who speak precisely, at least regarding matters of their chosen speciality. If this is true, then one wonders how come nucleocrats are so often wrong in their predictions. One can understand blunders in long term prediction like the one Dr. Bhabha—the father of the Indian nuclear effort—made in 1962 when he said that in 26 years India would have 20,000 MW of nuclear electricity. (We just about reached 1,000 MW) There are various factors which can influence the final outcome and no one even the great Dr. Bhabha could have foreseen everything. But to make such large errors of judgement in short-term forecasts, such as weeks or even days like Dr. Chidambaram about Narora (See Cartoon Below) or the station superintendent of Kakrapar, Mr. Kalaiya, about Kakrapar-1 re-start (On July 3rd, he felt that the unit would start by end of July, whereas it actually started end of October,) makes one wonder whether these blunders are actually errors or are they deliberate attempts to mislead the public and the government. Dr. Gopalakrishnan, the chair of the Atomic Energy Regulatory Board, suggests (see page 10) that these "optimistic assessments" may be the age-old approach to get initial financial approvals. But then, is this the scientific way or is it the way of frauds and cheats. The question the public needs to ponder is: Can we entrust our security and well-being to such error prone enthusiasts.

Despite Dr. Chidambaram's prediction Narora-1 takes 21 months to restart



Paying the Price for Honesty and Courage

Mr. Manoj Mishra's ordeal

No regular reader of Anumukti would be unaware of the havoc created by floodwaters that entered Kakrapar Atomic Power Station on the night of 15th of June, 1994. As has been already described in previous two issues of Anumukti, floods caused large damage to the turbine room where more than two hundred pumps and motors were drowned. The waters also breached the waste containment and some bags containing radioactive waste were carried away and deposited far away from their original disposal site. Had the reactor been in operation at the time, the situation could have resulted in a serious disaster. But although mercifully no great disaster took place the event did highlight the lax attitude towards safety of the nuclear power plant authorities. Some of the glaring irregularities:

No scheduled flood plan exercises had ever been carried out at Kakrapar. The gates which controlled the water level in the reservoir adjacent to the plant had not been opened for years with the result that huge amount of grass had grown around them. Thus, when the water level started rising these gates could not be opened.

I The hydrology of the plant and its surroundings have yet not been done though two nuclear reactors have already commenced operation.

The drainage points were not situated above the maximum flood level

The much touted "defence in depth" was found in practice to be full of holes. Major pumps which run the secondary cooling system of the reactor like the Boiler Feed Pump, the High Pressure and Low Pressure pumps were located below ground level and were drowned under the flood waters. But under the defence in depth concept, each of these had auxiliary pumps which should have taken over and continued uninterrupted operation. However, these auxiliary pumps were also located below ground level and were also drowned and hence having them made not the slightest addition to the safety of the plant. In fact had the water risen a little more, even the diesel pumps which provide emergency power to control the reactor would have been drowned and the reactor would have been left with no power at all.

The station authorities did not feel it incumbent upon them to inform the Atomic Energy Regulatory Board (AERB) promptly of the situation. This illustrates the contempt in which the board is held by officials of Nuclear Power Corporation. The fact that AERB is unable to pull up these officials and take any strong action where these people are personally held responsible and have to pay a price that bites for

their lapse, adds to the contempt.

All this shows a criminal negligence on part of designers, operators and regulators of nuclear power in the country. And yet nobody is likely to suffer any adverse consequences at all. Nobody except Shri Manoj Mishra—the man who blew the whistle.

Shri Manoj Mishra is a plant operator and has been active in the employees' union. He is the secretary of the INTUC lead union. When the plant was flooded on the 15th of June, the authorities were inclined to keep quiet about the whole incident. Even the Atomic Energy Regulatory Board was not informed by the plant authorities. However, Mishra talked to newspaper reporters and apprised them of the possible serious consequences. It was only after the news was published in Gujarat Samachar on the 23rd of June, that people outside and even the nuclear establishment in Bombay, took cognisance of the event. The station superintendent made a dash to Surat and issued a statement along with the district collector of Surat assuring all and sundry that all was well under control.

Mishra was immediately suspended from work for the crime of talking to the press and his suspension continues even today, five months after the event. While all those who displayed singular dereliction of duty continue merrily along, the one man who put the interest of the country above his own selfish interests has been made to suffer as an example to others that in the nuclear establishment the only leaks that matter are leaks of authentic information.

The Going Rate



On August 6th, 1994, Shri Narayan Desai had written a letter to all the legislators of Gujarat assembly asking them to form an all party committee and investigate the damage caused by floods to the Kakrapar Atomic Power Station. Busy as all these worthies are with the welfare of the people only five of them found time to reply to his letter. However, the MLA from Kadi in Mehsana district of North Gujarat, Shri Nitin Kumar Ratilal Patel sent our letter to Kakrapar authorities for their comments. Five months later, on January 16th, 1995, we received a copy of the reply from the station superintendent of Kakrapar Atomic Power Project. We have reproduced parts of this letter elsewhere in this issue. While ending, the letter states, "The welfare of the public is fully taken care of. Kakrapar Atomic Power Station has taken innumerable measures for the welfare of the people around the area as per Annexure." We are reproducing the annexure in full for two reasons. One, it is fine example of what nucleocrats believe to be 'development', And secondly, we do not want people around other nuclear installations to be unaware of the going rate for disease, deformity and death.

Nuclear Power Corporation Kakrapar Atomic Power Project

Details of assistance rendered by Nuclear Power Corporation of India Ltd. to surrounding villages and areas of the Kakrapar Atomic Power Project.

L Land compensation

a) Original disbursement as per the award of Land Acquisition Officer Rs. 73,58,803.66

b) Additional compensation disbursed as per the Court's verdict is Rs. 99,54,049.50

c) Further additional compensation likely to be awarded as per compromise formula being arrived at is Rs. 2,50,00,000 /-

2 In addition to land compensation, 85 families were compensated for cost of houses.

3 Additional 40 families occupying houses in government land were also compensated as special case for houses.

4 Additionally building materials of houses were allowed to be taken away by the house owners and free transportation for shifting materials provided.

5 Rs. 12,57,000 /- deposited with State Government for rehabilitation of displaced families.

6 116 persons of land affected families directly recruited by KAPP

7 Land affected persons in large numbers were also employed in establishments of contractors.

8 Training imparted to land affected persons for getting selected to ministerial / clerical posts in KAPP.

9 Training and nourishment programme conducted for land affected persons to facilitate induction by Central Industrial Security Force.

10 Students belonging to land affected person's families and others in surrounding villages imparted English familiarisation classes.

11 Candidates belonging to land affected person's families are given preference for recruitment Only if suitable candidates from land affected families are not available, other means of recruitment Like through employment exchanges is resorted to.

12 Total number of locals directly recruited by KAPP are 657 and the number of land affected persons are 116.

13 Land affected persons are given preference in allotment of shops etc. in the residential township.

14 Efforts are on to help the villagers in forming Worker's Co-operative Society to undertake petty works and contracts connected with the Project.

15 Medical camps have been organised every year in association with voluntary organisations of the township. Large number of villagers availed the facility including the facility of eye-operation conducted during the medical camp. Free transportation and medicines are provided to the patients and also follow up facilities given.

16 Continuous measures are taken for creating awareness of the general public with regard to the project. As part of this, regular visits of villagers, children from schools, colleges, and other educational institutions are organised to the plant site. The visitors are provided with free transport and other facilities.

17 Rs. 2,68,000 /- was sanctioned by NPCIL to the Vyara Municipality for construction of roads in Vyara.

- 18 An amount of Rs. 2000/- is given to three village schools nearby every year towards the cost of study tours for the benefit of the students. The village school in Unchamala has been given infrastructure facilities, educational aids etc. and action is also on hand for giving financial assistance for construction of school extension building.
- 19 NPCIL has sanctioned financial assistance to the tune of Rs. 5,00,000 /- for the Mandvi Education Society.
20. Approval has already been obtained for financial assistance to the tune of Rs. 20,00,000/- for improving the existing roads between Moticher, Tarsada, Nanicher and Raj wad villages. Approval has also been obtained for extending financial assistance for construction of roads from two village hamlets located near the plant site boundary and linking them to the Vyara Mandvi road.
- 21 A Cricket pitch has been laid by NPCIL at Vyara for the promotion of the sport of Cricket.
- 22 Action is in hand for the supply of saplings to nearby village schools.
- 23 For public relations, public awareness and assistance to villages, over and above the facilities given above, an amount of Rs. 60,000/- is regularly spent every year.

Raising Public Awareness—Nuclear Style

As mentioned in the previous article, Shri Narayan Desai had written a letter in Gujarati to all the members of the Gujarat Legislative Assembly. This letter had clearly stated what had happened on June 15th and had asked the legislators for:

Constituting an all-party enquiry committee which would investigate and report to the public in a reasonable time. The committee should look into the following:

What were the reasons for the delay of at least 12 hours between the flooding of the turbine room and the declaration of site emergency?

What were the reasons for declaring the site emergency?

Why were the people living in the vicinity (within 30 kms) of the plant, not informed of the situation?

What was the extent of the damage to the waste management area? How many waste filled drums are kept at different locations within the KAPS premises?

What are the contents of these drums?

What amount and kinds of radionuclides were released to the environment? What are their long term Implications for public health?

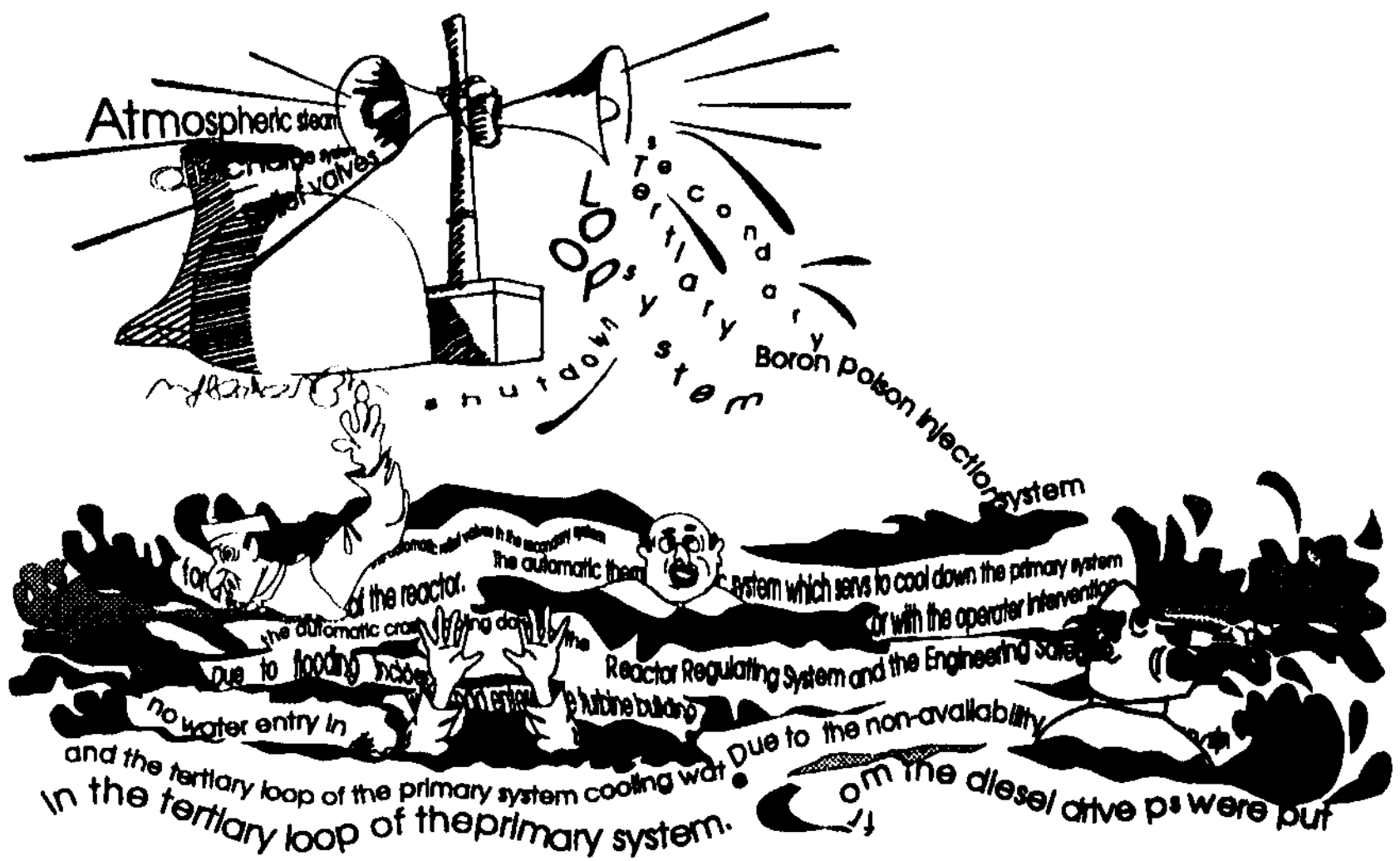
B How do the authorities propose to evacuate the public in case of emergency during monsoons when the condition of the roads makes the task Impossible?

Most members of the Gujarat assembly were too busy to bother about the letter in any way leave alone constitute a committee. This was especially true of our local MLAs whose constituencies would be directly and immediately affected in case of any accident at Kakrapar. Mr. Nitin Kumar Patel, the member for Kadi in Mehaana district of North Gujarat, sent the letter to the Kakrapar authorities. Below we are reproducing some operative portions from the reply.

"Before we furnish our specific comments on the letter of Shri Narayanbhai Desai, we would like to reiterate that Kakrapar Atomic Power

Station is a nationally important venture of the Government of India employing a frontier technology. The Nuclear Power Corporation of India Limited who is entrusted with the responsibility of designing, constructing, commissioning and operating of the Kakrapar Atomic Power Station has four decades of technical expertise in the nuclear field. This power station has all the required safety provisions to foreclose eventuality of any accidents. The Station is designed and operated in accordance with the codes and guides of the International Atomic Energy Agency and the Atomic Energy Regulatory Board. The guidelines set by the International Committee on Radiation Protection are also followed scrupulously. In addition, NPC in association with the Government of Gujarat has drawn out detailed emergency preparedness programme for handling any plant/site emergency. There need be, therefore, no apprehension whatsoever about the safety and security of the Kakrapar Atomic Power Station."

"With reference to the letter of Shri Narayanbhai Desai, we herebelow give our comments:



The Real Flood

The flood water entered the Turbine Building and submerged the equipment on the secondary system and the tertiary loop of the Reactor systems. The condensate pumps, the Boiler feed pumps etc. serve the secondary loop of the main Reactor systems. The active high pressure and low pressure process water serve the tertiary loop of the main systems. Due to the non-availability of the above systems there are different other systems like the shutdown cooling in the Reactor Building, atmospheric steam discharge system in the secondary systems, the automatic relief valves in the secondary system, the automatic crash cooling down of the reactor, the automatic thermosyphonic system which serve to cool down the primary system without or with operator intervention. If the reactor is in operation stage then the reactor protection system, reactor regulating system and the engineering safeguard features are designed for a safe shut-

down of the reactor. Due to the flooding incident, water had entered the turbine building and there was no water entry in the reactor building which remained in the normal condition. Due to the non-availability of the secondary systems and the tertiary loop of the primary system cooling water from the diesel driven pumps were put into service in the tertiary loop of the primary system i.e. the cooling water portion of the shutdown heat exchangers and the same thing could have been done if the reactor had been in operation. This is the provision of the systems and the design provision had been utilised. Due to the flooding incident the secondary systems in the form boiler feed pump, condensate pumps became non-available. If the reactor was in operation the heat removal of the secondary systems would have been done by the atmospheric steam discharge valves and the relief valves. These are given in the design provision so it is being emphasised

that the flooding incident has not jeopardised safety of Kakrapar Atomic Power Station and the systems provided in the design had been utilised to meet the situation."

The letter goes in the same vein for five full pages. I will not test the patience of *Anumukti* readers by reproducing it in full. This is just an example of the kind of junk served by these worthies in answer to honest queries regarding their performance. Can any one, even they themselves in their sober moments, make sense of what they have written? All they want to really say is that they managed to cool the reactor by using diesel pumps which luckily did work in time and in case the reactor had been functioning the same process might have sufficed. Obscured in all this verbose jargon is:

the fact that despite four decades of experience in the field they had no clue regarding

ways to prevent the calamity from taking place such as ensuring proper drainage.

It was pure luck that the diesel pumps were also not drowned in the floods. The authorities had not taken any concrete steps to prevent the water rising in the turbine room except to curse the irrigation authorities for their inefficiency and incompetence in being unable to open the gates of the reservoir. Had the water level risen a little more, the diesel pumps would have also drowned and even this fig-leaf of an excuse would have disappeared. The fact is that drowning of the reactor in floods was an "inconceivable" accident to them and the people of the state and the country could have paid a crushing heavy price for lack of foresight and imagination on part of these guardians of public trust.

Regarding the detailed questions on the radioactive waste the letter has this to say:

Solid wastes generated from the different areas are stored in drums and then the drums are kept in earth trenches. This is as per the design, the

same thing being done for very low active wastes. The high active wastes are stored in RCC trenches and high integrity tiled holes. Due to excessive rains, the earthen trenches became full with water. Only one drum lid opened and two bags came to the surface. The bags, which contain low active cotton wastes, are already contained in plastic containers so the spread of radioactivity was not there. The floating bags of 2 Nos. were already within the fence only so the spread of contamination is out of question. Any spread of radioactivity in the area will be located by the bore holes (32 Nos.) which are located around the solid waste burial ground. All the borehole samples are analysed and found to be below detectable level.

Nice to know that we have the Mate of the art technology: fences and plastic bags to save us.

But what takes the cake and leaves me speechless is the following:

"There is no effort by the Station authorities to keep anything in the dark. Shri A. K. Asrani, Director (DR&I), AERB and his representatives. Director (Projects), the Chairman of Safety Analysis Review Committee for Operating Plants (SARCOP) and Advisory Committee for Projects Safety Review (ACPSR) have visited the site and the matter has been very much open to the pub-

Surendra Gadekar



After a long period of blissful dormancy, nuclear plants have suddenly started going on-line

Nuclear Should Get Its Act Together

*Dr. A. Gopalakrishnan, Chairman,
Atomic Energy Regulatory Board*

There was a time that I would present arguments from nucleocrats in all their gory and boring detail just for the pleasure of chopping them to bits. These childhood pleasures are hopefully a thing of the past and now-a-days I am loath to give them any space in Anumukti at all. I believe that the nuclear establishment, however strapped for cash it might be, has no dearth of money for advertising its views and no lack of 'friends' in the media. But sometimes one does come across an article, which, considering its source, is so Anumuktish, that one has to make an exception. However, in the present case, it must be stated that the article has been edited in the interest of brevity and provided with heading and sub-titles. Needless to add that Nuclear can never get its act together.—Editor

Current Status

The two 220 MWe units each at Narora and Kakrapar are on line, and this 880 MWe will be poised in the near future for operation at its full rating.

In the case of Rajasthan Units-1 & 2, AERB is still awaiting the final decision of the Nuclear Power Corporation. From what we know, it would appear that RAPS-2 is ready for en-masse coolant channel replacement and would be under shutdown for at least three and half years from the time the retubing effort is initiated. Therefore, the earlier that NPC embarks on this task, the better it would be, since a great deal of careful planning, review and preparation will be needed in this first-of-a-kind effort. As for RAPS unit-1, it is doubtful whether we can authorise its re-start without a complete in-service inspection of all its pressure tubes. Whether or not NPC intends to continue the operation of RAPS unit-1 under the present circumstances is also a matter in which we are awaiting NPC's decision.

Overall, what DAE needs to do in Rajasthan is to cut its losses as much as possible and expedite the rehabilitation of unit-2. It would help if NPC is given a totally free hand in this endeavour, without imposing unnecessary policy constraints on

how and from where they should manage to get the required assis-

*'What DAE needs
to do in Rajasthan
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much as possible.'*

ta nee to meet this objective. The primary concern should be to minimise the overall loss of time and money.

Safety Should Not Be Ignored

In the case of Tarapur 1 & 2, we appear to have come out of the uncertainties in fuel availability. Over the last two and half decades, it is creditable that the Tarapur units have contributed a notable percentage of the nuclear electricity supplied in India. However, we have to be conscious that these are the oldest of our power reactors, having seen almost 25 years of operation since their commissioning. No boiling water reactor of the same vintage is currently being operated anywhere else in the world. Wherever such older units elsewhere are stated to have been decommissioned because of "economic reasons", a closer look reveals a different picture. The only

alternative to decommissioning these reactors would have been to make all the mandatory and costly additions and improvements to their safety related sub-systems. Considering the fact that these alterations were decided after extensive consultations between the General Electric Co., who is also the designer of the Tarapur Units, and the US utilities and their regulatory agency which manage a total of over 35 BWR units, it is not prudent for us to ignore them totally. The situation is further complicated by the recently observed core-shroud cracks in 11 out of 19 BWRs so far examined, which indicate an urgent need for core-shroud inspection also at Tarapur. Added to this, the extensive leaks in the secondary steam generator tubes in both units of Tarapur have resulted in the steam generator shells now serving as part of the primary system boundary — a situation not envisaged during design.

Overall, therefore, fuel being available for TAPS is only the alleviation of part of the concern. We need to settle also the uncomfortable questions related to safety, including the ones which I mentioned. This can be done if we give the right priority and emphasis to these issues. AERB will be soon seeking for an action plan from NPC in this regard and we hope the schedule for inspections and corrective steps to be evolved will match

the relative urgency of the issues, consistent with their safety significance.

Unrealistic Forecasts

The Kaiga project is partially held up due to the unfortunate delamination of its inner containment dome. The actual work on the dismantling and removal of the failed dome, NPC's own investigation of the failure and the re-engineering of the dome are all lagging behind their original schedules. We need to avoid

that the inner containment dome failure at Kaiga makes it imperative that similar domes planned for the 500 MWe project will have to be subjected to a thorough scrutiny by a competent independent agency before they are approved for construction.

No Money

Today, the most serious concern that troubles the NPC is the lack of financial support. As I understand, neither NPC is able to raise much

funds from the public nor are they getting adequate financial sources from the government. With the impending long shutdowns of the RAPS-1 & 2 units and the potential delay in commission

We need to avoid giving unrealistic initial schedules and ending up in unusually large slippage subsequently. This was done in the case of Narora rehabilitation work and the same practice occurs even in the delivery of documentation and data NPC has been promising to AERB and its committees.

giving unrealistic initial schedules and ending up in unusually large slippage subsequently. This was done in the case of Narora rehabilitation work and the same practice occurs even in the delivery of documentation and data NPC has been promising to AERB and its committees. As it stands, the AERB Investigation Committee on Kaiga Dome Failure is also unable to complete its work due to non-availability of certain material test data and crucial reports from NPC. NPC management must expedite these inputs so that NPC can proceed on with finalising the re-engineering of the dome. Unfortunately, the delay in the finalising the Kaiga dome will affect also the time schedule for Kaiga-2 and RAPS 3 & 4, where also identical inner containment structures are to come up. In passing, let me state

ing of the Kaiga units - 1 and 2, the income to the Corporation will decline, even though Narora-1 and Kakrapar-2 coming on-line will partially offset these losses. There is also the unavoidable expenditure of en-masse retubing of RAPS-2 as well as the cost of inspections and retrofits which may be necessary at TAPS. Down the road, NPC will have to face similar en-masse pressure tube replacements in Madras and Narora units in the not too distant future. Added to these is the question of finances required for the Kudamkulam project and the two 500 MWe units to be constructed at Tarapur. In the light of all this, it is obvious, that unless the viewpoints of the Planning Commission and Finance Ministry change considerably in their favour, the Nuclear Power Corporation will find it hard to com-

fortably survive through in the near future and come out as a viable business enterprise in the long run.

I am not aware of the discussions which have taken place between the DAE and the other Government agencies in this regard. However, from all available indications, it would appear that the Government and especially the Planning Commission, are not convinced enough that increased budgetary allocations for nuclear power in the current setting are bound to bring tangible returns. Performance of our stations and the high cost of nuclear power generation also appear to be under serious questioning.

In short, nuclear power is at crossroads and it is necessary that the DAE and the NPC urgently formulate a strategy and action plan to enhance governmental and public confidence in nuclear power. This will require an impartial introspection of the current situation and an openness to listen to diverse opinions, including constructive and not-so-constructive criticism both from inside and especially, from outside the DAE family. To my knowledge, I am not aware of such serious dialogue on the subject of nuclear power, involving also the power sector experts, administrators and planners in the country.

Steps Needed For a Resurgence in Public Confidence?

NPC could set a reasonably high target on a two-year capacity factor to be demonstrated in the 880 MW comprising the Kakrapar and Narora units. They could plan and estimate the realistically highest targets feasible in this regard, commit the same to the government beforehand, and deliver what is promised. This would indeed serve as a demonstration of an improved managerial performance on part of

NPC and the Department of Atomic Energy (DAE).

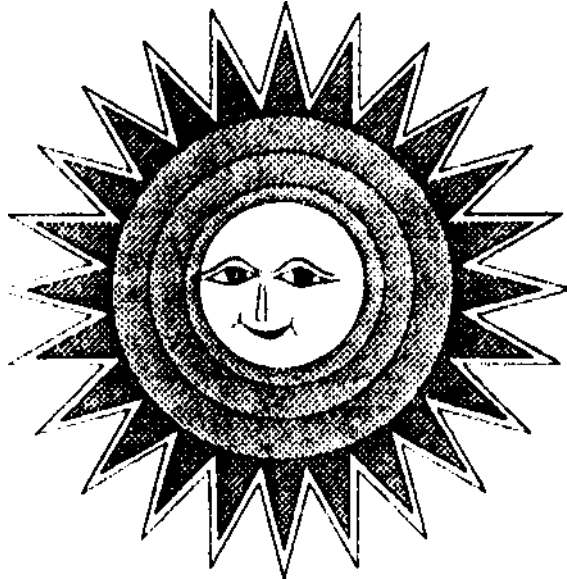
The Madras Atomic Power Station is a site where, in my view, NPC should speed up its efforts to safely increase the operating power level. After a long delay, only couple of weeks ago, AERB has received a proposal from NPC on this matter. There had been some differences of technical opinion within the DAE family on the acceptability of the NPC proposal and it may be necessary that a larger group, involving non-DAE experts, will have to evaluate and settle the issues. I cannot see why MAPS power level cannot be raised within the next six months, and a high capacity utilisation factor maintained thereafter, if such an evaluation identifies no problems.

Constraints

NPC and DAE should start doing realistic project planning and present their plans and defend them even if the schedules are not so attractive. What is happening today is the presentation of a highly optimistic plan at the outset, known to contain unattainable milestones, followed by subsequent presentation of excuses for lapses. This may be the age-old approach to get initial financial approvals, but it leaves certainly a wrong impression of our ability to plan. Furthermore, this practice motivates the internal staff to have no commitment to such a plan since they know that it has been framed without much seriousness.

A crucial necessity for the success of NPC is the availability of adequate technological assistance in a timely manner. Unfortunately, NPC is not self-sufficient in all the required engineering and technological areas, since the intention has been NPC should be provided prompt assistance by institutions like BARC, IGCAR etc. However, to-day the interaction between the R &

D institutions of DAE and the NPC leaves a lot to be desired. I feel NPC should be given freedom to seek and obtain assistance from other sources both inside and outside the country. We cannot expect a power corporation to function efficiently and grow in today's competitive world, if their destiny is solely and closely controlled by the R&D establishment who, in turn, are not able to deliver usable end-results on schedule. Since, in



Sum: The Only Safe Source of Nuclear Energy

the overall interest, the highest priority of all DAE technological groups should be to provide the necessary support to the nuclear power sector, NPC becomes the focal point for utilising their services. Thus, it is only logical that the performance of these auxiliary institutions should be judged by how well they provide useful and timely assistance to NPC. It is time that the role of various DAE institutions in supporting the Nuclear Power Corporation is subjected to an urgent down to earth review.

Good Money After Bad?

Extensive studies on viable scenarios for environmentally acceptable electricity generation have been carried out by some institutions in the country. Given the high ash content of Indian coal and the projected re-

source position for various fuels, almost all these studies have come to the imperative conclusion that nuclear power has to become a strong component of the total electricity production in India by the early part of the next century. Having created extensive and expensive infrastructure in India for supporting nuclear power, neither the public nor the government can afford to let it wither away, due to our inability to manage the interfaces appropriately. I hope the NPC and the DAE will take the present decline in government and public confidence in nuclear power as a forewarning, and initiate corrective steps. Otherwise, it is not unlikely that alternate organisations and control structures may come up in due course to get things done which we may fail to do.

(Invited talk: "Nuclear Power: Statue and Prospects" delivered on 9.1.'96 at BARC, Bombay)

Editor's Note:

Incurable Optimists

It would be indeed funny if it were not so sad, that researchers in prestigious institutions who conduct studies of future energy scenarios have such a blinkered (Coal, hydro, nuclear) vision. How come they cannot make out after nearly forty years experience world-wide and more than twenty-five years in India, that nuclear does not deliver the goods, only the bads, To make studies without taking into account long years of actual field performance shows a stuck-in-the-rut mentality. The performance of old nuclear plants in India was no great shakes to begin with, but the performance of new nuclear plants in India is much worse than that of old ones in the corresponding periods of their lives. What is urgently needed is letting in some Sun.

The Golden Goose Stops Laying

Tarapur Reactors Stalled for Want of Funds

The much awaited (by masochists—editor) execution of two additional upgraded nuclear power projects of 500 MW each, at Tarapur, has virtually been stalled for the past two years, for lack of central funds.

Sophisticated equipment, including calandrias, reactor headers, pressurised and primary heat transport pumps worth crores of rupees have been laying idle at the project site, with the Nuclear Power Corporation (NPC) spending scarce funds just to preserve them.

Officials of the corporation say that

An Example of Nuclear Foresight

"Sophisticated equipment, including calandrias, reactor headers, pressurised and primary heat transport pumps worth crores of rupees have been laying idle at the prefect site."

It is purely coincidental that when large orders are made, private corporations do not forget to show their appreciation of the trust placed in their abilities to serve the nation.—Editor

the infrastructure involving an expenditure of Rs 25 crore had already been developed at the site. The proposed two reactors will be Pressurised Heavy Water Reactors of 500 MW each. They were supposed to be first in a series of large sized plants.

The Central Government had accorded financial sanction for the project in January 1991 and the authorisation for construction was later approved by the Atomic Energy Regulatory Board (AERB) on Sep-

tember 1, 1993. The AERB had already given safety clearance of the site in December 1989.

Explaining the situation, the Executive Director (Operations) of NPC, Y S R Prasad, said that the main obstacle to the execution of the project was funding. He said there were numerous difficulties, the main being resource crunch, since funds have to be cleared by the Cabinet Committee on Economic Affairs of the Central government.

Secondly, the NPC was facing massive problems in obtaining parts and the necessary technology.

"There are restrictions on procurement of equipment. Technology is not accessible to us and work at the site has been hampered for want of funds, new technology and spare parts," he elaborated.

Prasad said that while India could fabricate all the essential equipment indigenously, there were certain restriction in the global market, as a result of which the project had

been delayed. He however assured that though work on the nuclear power projects may take some time, work will never be stopped indefinitely.

The proposed two unit PHWR station is located on the western sea coast, adjacent to the existing 2 x 160 MWe Boiling Water Reactor BWR of TAPS, which is celebrating its silver jubilee this year. The proposed PHWR station is based on indigenous technology which has been proven with the successful imple-

mentation of the Kalpakkam Atomic Power Station at Madras, Narora Atomic Power Station in Uttar Pradesh and Kakrapar Atomic Power Station in Gujarat. Its operation will be supported by supply of heavy water from the country's heavy water plants and fuel from the nuclear fuel complex, both under the Department of Atomic Energy.

In present ideology of 'economic liberalisation', Prasad was quick to assert that private participation should not be allowed for the construction of the two additional units.

*Financial Express
October 5, 1994*

Is he a Fool? Or Does He Think You To Be One?

"Mr A.N. Prasad, Director of the Bhabha Atomic Research Centre, said in an interview to UNI that escalating prices of components and the long gestation periods had grossly affected the future of nuclear power in the country though returns were much higher than in thermal power projects. He said the programme had to solely depend on internal generation by the Nuclear Power Corporation and Government funding as no institution, international or national, was willing to finance nuclear power projects."

The Hindu 6 September, 1994

If the returns are so high, then why are national institutions and the markets so reluctant to finance nuclear power projects?

The English Are No Better

Trevor Brown spent more than a dozen years warning as many people as he could that safety measures at the Atomic Weapons Research Establishment at Aldermaston were inadequate. His battle cost him his job.

Now, 13 years after he was forced to retire seven years early, he has been vindicated. A report following a comprehensive review by the Health and Safety Executive has said that, had it not been for its immunity from prosecution, the Ministry of Defence could have faced criminal charges over safety at Aldermaston.

Mr Brown was sent to Aldermaston in 1961 to manage a civilian plutonium fast reactor fuel project. It took very little time for him to see that there was inadequate training for line management in safety. The measuring of radiological materials in air was inadequate and there was not access to independent experts to discuss safety measures.

"The management said it was a top secret site and they did not want independent experts," Mr Brown said. "I had to accept the situation." The authorities in fact claimed that safety standards at Aldermaston were so high that they were thinking of making economies by reducing the number of safety staff.

However in 1977 Mr Brown won an agreement from the management

that there should be some personal air sampler trials to see how much plutonium was floating around. Until then, measurements had been taken 8 feet above ground in the workplace.

For a week Ken Cummins, a chargehand, wore a sampler around his

Whistle-blowers'

*When they hear the whistle blow,
security will know,
that it's time for them all to listen in
—to monitor your phone,
redecorate your home;
yes, it's time for them all to listen in.*

*When you have got a complaint,
and the boss man says it ain't,
then its time for them all to listen in
—park their van down the block,
all your visitors to clock;
yes, it's time for them all to listen in.*

neck. In that week he breathed in three quarters of a year's dose of plutonium. Mr. Cummins died two years later from bowel and liver cancer. His family believes that Aldermaston was to blame for his death.

The results of the sampling caused a sensation and Mr Brown was now allowed to speak to an outside expert at the Nuclear Protection Board at Harwell. There he was shown the International Committee for Radiological Protection regulations which stated that it was not enough to sam-

ple just one point of a room. Sampling must also be done in the breathing zone of the worker. Neither Mr. Brown nor, as far as he knew, other workers at Aldermaston had seen these regulations before.

In 1978 all plants at Aldermaston were closed down and Sir Edward Pochin conducted an inquiry into radiological safety. He found significant worker contamination and that air samplers in the chimney stack were upside down.

Yet still not much happened, and in 1980 when Mr. Brown was asked to appear on a television programme, he sought the Ministry of Defence's permission. He was told that to do so would be in contempt of court, a reason neither he nor Berkshire council's solicitor understood.

A further request for permission received no response, so he appeared on the programme. "I made a very mild comment that perhaps excessive secrecy had interfered with safety," he said. "All hell broke loose."

He was severely reprimanded and in 1981 was forced to retire. Today, aged 71, he wonders why it took so long for this latest review. There was so much secrecy, an unnecessary amount," he said. "Whether there was a real danger, we do not know. But that is in itself a danger.

Victoria Macdonald

The Worst Nuclear Practice Ever

Russian scientists have disclosed that for more than three decades the Soviet Union secretly pumped billions of gallons of atomic waste directly into the earth. They say the practice continues in Russia today.

The Russians told a small group of Western experts that Moscow had injected about half of all the nuclear waste the Soviets produced into the ground at three widely dispersed sites, all thoroughly saturated. The three sites are Dimitrovgrad near the Volga River, Tomsk near the Ob River and Krasnoyarsk on the Yenisei River. The Volga flows into the Caspian Sea while the Ob and Yenisei flow into the Arctic Ocean.

The amount of radioactivity injected is more than three billion Curies. For comparison, the Chernobyl accident released about 50 million curies of mostly short-lived radionuclides. The accident at Three Mile Island released about 50 curies. The Russian discharges are mostly long lived radionuclides like caesium-137 and strontium-90 which have half-lives of nearly 30 years which means that the threat from these discharges would remain potent for more than a few hundred years.

Russian scientists claim the practice is safe because the wastes have been injected under layers of shale and clay which in theory cut them off from the earth's surface. But already, the wastes at one site have

leaked beyond the expected range and "spread a great distance." The Russians have not elaborated on what is meant by great distance—metres, kilometres or has it already reached the surface? The disclosure has set off a debate among experts over the likely consequences of these injections. It would be centuries before we know whether the injections are actually harmless. A catastrophe could occur much sooner.

Upon learning of the injections, Dr Henry W Kendall, a Nobel laureate in physics at the Massachusetts Institute of Technology said that "Far and away this is the largest and most careless nuclear practice that the human race has ever suffered."

TVA Throws in the Towel

Work Halted on Last Reactors Under Construction in the US

On 12 December the Tennessee Valley Authority, one of the largest American power producers, said it would halt work on the last three nuclear power plants under construction in the United States. Two of the unfinished units are at the Bellefonte Nuclear Plant near Hollywood, Alabama. The third, Watts Bar Unit 2, was being built near Spring City, Tennessee.

According to *International Herald Tribune*, the decision "is the symbolic death notice for the current generation of reactors in the US.

TVA once had the most ambitious nuclear programme in the country, with 17 reactors on order. Only five units were actually built and only three of those are still operating. The

reasons for this failure are the same which dog nuclear power all over the world: High costs. Besides there was the uncertainty regarding whether the plants once constructed would actually be brought on line.

TVA has already spent US \$ 6.3 billion on the units (they were 67%—88% complete), and the authorities estimated that another \$ 8.8 billion would be needed to finish them. This was too much even for the already debt ridden TVA. 44% of TVA's debt is due to its nuclear programme.

The decision to halt further construction is a major shift in policy for TVA. No new nuclear plant has been ordered in the US since 1978. Many utilities had abandoned the nuclear dream long ago. But TVA, which is

owned by the federal government, and protected from some of the competitive pressures, had obstinately continued to press ahead on the nuclear path. A government spokesman said, TVA had to recognise that policies conceived decades ago are no longer viable."

US is led with a substantial but ageing base of nuclear reactors—109 reactors producing 21% of the country's electricity. Although the end of the first generation of nuclear reactors is welcome news, it needs to be kept in mind that nuclear industry is already seeking federal certification for the next generation.

WISE News Communiqué 424

Public Protest Force Closure off Canadian Nuclear Plant



Widespread public concern about health has forced Canadian authorities not to renew the license of the Pickering nuclear power station where an accident took place on December 10, 1994. The accident was caused by the bursting of a copper pipe and resulted in a spill of 130 tons of radioactive water onto the floor of the reactor containment room.

Around 1.5 million live within 30 kilometres radius of the Pickering Station. They are concerned about their health following the release of the radioactive water from the ageing nuclear power plant. It is at their urging the the Atomic Energy Control Board (AECB), a federal government licensing and regulatory agency has decided not to renew the license of the nuclear station pending detailed investigations.

According to Nuclear Awareness Group, once the water started to spill, a turbine went out of control and had to be shut down manually. The group said that the clean-up of the radioactive water would cost the tax-payers millions of dollars in clean-up. The group suggested AECB should order a full investigation into the plant's safety. The director general of AECB, Mr. Ziggy Domarsky said that "the heavy water spill does not indicate that the Pickering reactors are in trouble. Our plants are designed to be able to handle this type of accident."

He also claimed that the Pickering plant is built to withstand an earthquake measuring 6.9 on the Richter scale even if it occurs directly under the reactors. But Mr. J. J. Wallach, a scientist with AECB, disagreed with Mr. Domarsky's assertion. In a scientific paper published in January

1990, he concluded that the ingredients for a major earthquake exist near the Pickering and Darlington nuclear power stations. He conducted aerial surveys that showed the presence of two anomalies on the floor of lake Ontario. The anomaly is "practically beneath the Pickering nuclear power station," he claimed. This 100-page paper is supported by several geophysical maps that detailing various features. The evidence accumulated to date indicates the need to conduct as soon as possible, a full scale, fully integrated seismotectonic programme relevant to reevaluating the nuclear generating stations," Mr. Wallach said. But no such detailed investigation has been conducted so far, according to informed sources.

Indian Express December 22, 1994.

Interview with Dr. Rosalie Bertell

It is a great pity that illness prevented the proposed Indian visit of Dr. Rosalie Bertell. Below we are reproducing an interview she gave some years ago to Safe Food News—a US journal devoted to the cause of educating the public about the hazards of food additives and food irradiation.

Dr. Rosalie Bertell is an epidemiologist and Catholic nun who has been involved in environmental health for more than 25 years. She is the President of the International Institute of Concern for Public Health in Toronto, Canada. In 1986, she received the prestigious Right Livelihood Award for her work in "protecting human life and livelihood from ravages of industrialism." She is also the author of the critically acclaimed *No Immediate Danger*.

Question: How did you get started in what has turned into a life-long

commitment to health and environmental justice?

Bertell: I started working on environmental health issues primarily because I was looking at the environmental and hereditary factors associated with an increase in leukaemia. In doing so I really discovered the whole world of medical x-rays and the problems they were creating. From there, I became involved in the **nuclear** industry, where I found out to my surprise and horror that **they** were allowed to routinely **release** radiation in to the environment,

which, to quote the industry, "gave the people a radiation dose similar to x-rays," which were OK. because your doctor gave them to you. Then I started looking back and wondering who ever told them that it was OK. to give x-rays to people when they were not obtaining a benefit for it like they do with a medical x-ray. I then found out that the regulations for permissible levels were set by the military. So the whole thing kept becoming more and more involved and horrendous.

Question: It seems like many of our environmental problems have their roots in the military. It's hard to comprehend, however, that the military systems supposedly designed to protect us are also threatening our health and well-being.

Bertell: You're right. Many of the environmental problems we're experiencing have their roots in the military. Even the food irradiation programme. We have this addiction to militarism and military ways of thinking. I call it an addiction because it has all the classic signs of an addiction — it's secretive and exaggerated, it sacrifices health and social goods, and it takes the best and the finest young brains in the country and drains them off into producing weapons of mass-destruction. This addiction to militarism is widely destructive and we are not confronting it.

When we talk about an environmental problem, we say that it is everyone's refrigerator, their underarm deodorant, or it's because they don't recycle paper. We don't say anything about the major things the military is doing to damage the life support system. It's something that we, as a society which is undermining our survival because of a distorted national security syndrome. In the past, it could be somewhat justified as a strategy, but it has now become a self-destructive addiction which needs to be unmasked.

Question: You've been a critic of the so-called "acceptable levels" of radiation exposure. In fact, you've called the acceptable radiation-exposure levels set by the nuclear industry a self-delusion. How did we get to a point where our regulators view certain cases of suffering, even death, as "acceptable?"

Bertell: I think what we're dealing with here is a rather bizarre defi-

nition of safety and it comes out of a mentality of risk-benefit trade-offs. Those people who bring us regulations have decided that the setting of regulations is not a public health function. So, regulations are not set in order to protect the public health or the welfare of future generations. That's the trade-off underlying the regulation. The regulation is meant to be a political statement that people accept the cost in life, health, and damage to future generations in exchange for the benefit of the activity. The benefits are economic and social. You have here a pseudo-science. While it is possible to come up with estimates of risks and also estimates of socio-economic benefits, it isn't logical for a society to allow the same persons who are obtaining the social and economic benefits to do the calculation of the risks. It's obviously a biased system. What we've done is said that the people who promote food irradiation, for example, and this applies in many other areas, are the experts. Therefore they can tell us the risks and they can tell us the benefits, and that is certainly an illogical system. What we really need are disinterested parties who speak for public health, the integrity of the gene pool and inter-generational equity. These are the people who should calculate the risks of the proposed activity while the producers of the proposed industry calculate the social and economic benefits, if there are any. Then we must have a public-political process which decides the trade-offs. It is the structure that is wrong. It is not a scientific method and it is not even an acceptable political method.

Question: In other words, our government and various responsible bureaucracies have failed to protect the public from environmental pollutants.

Bertell: Yes. I think environmental pollutants are falling in the cracks between departments of environment and the departments of health. The departments of environment are oriented towards chemistry or engineering. They have technical personnel who go out and measure the pollutant and then they look for some legal limit. The only things they are able to say in terms of health is that you might have a potential health hazard. They do not have the expertise to deal with it on any farther level. On the other hand, if you look at the health departments, they are trained in either one-on-one medical care or they know how to deal with distributing the flu vaccine or dealing with infectious disease. They are not, however, good at all with environmentally-mediated diseases, with diseases related to pollution of air, water or food. Also, they are not trained in environmental health or the kinds of community impacts to be expected when you release multiple toxins into a community's water supply, landfill or local fishery, for example. So you see you've got these types of situations without any bureaucratic body dealing with it. You also have the industry trying to avoid responsibility.

Question: In regard to the combined health and environmental problems facing us, you've said that the gene pool is being damaged at the same time that we're damaging the environment, so inhabitants of the planet are given a double burden. Could you expand on that?

Bertell: Part of the public health orientation is how far into the future do you care? You'll find that many members of the public and many people who deal with hazardous materials have a *very* short timeline of concern. If, for example, you go for an

x-ray and you're not sick within 24 hours of the x-ray, it is judged as harmless. The time-span there is extremely short. If you take medicine like chemotherapy, then the timeline might be as long as a week or a month to see whether or not there are any harmful side-effects of the medicine. That's a little longer timeline.

People are now becoming conscious of the fact that an exposure could cause cancer in the next 20-25 years. That's an even longer timeline. What I'm asking for is the understanding that every person who will ever live on this planet is present right now in the sperm and ovum in the people that are living. So these are not nebulous beings who come from outer space, they are people connected to the people who are now living. If you expose yourself to toxic agents that damage the sperm or the ovum, it might take two or three generations or 70-100 years to show up, but it becomes inevitable once sperm or ovum are damaged that this will resurface as serious illnesses in the future.

So I'm looking at the fact that we are doing this kind of damage. We are recklessly releasing mutagens into the environment and musing this kind of genetic damage. It has not taken its total toll yet, either. In fact, the first two generations are only 25% of the expected damage. So at equilibrium, that will be four times as much damage coming.

I'm only trying to point out the fact that we have already done this real damage to the gene pool. At the same time we're making the environment more hazardous to live in because we're reducing the quality of air, food and water, and this is the life support system. You can't do both of these things at the same time without introducing species death syndrome. You cannot damage the ability to cope and then give the individual more to cope with and expect to in-

crease life expectancy and the quality of life. It is going to decrease.

Question: It seems like so many of the bureaucrats and corporate executives of polluting companies have forgotten how precious life is and how their decisions impact upon life.

Bertell: They often consider people easily replaceable. They seem to say, "Oh, well, have another baby if this one is damaged." It is a very callous approach to the uniqueness of each human being. And I do not mean just human life, I also mean animal life.

Question: You once called food irradiation "scientifically outrageous and humanly exploitative." Would you elaborate on that?

Bertell: The purpose of food irradiation is to make money for the food producers and the nuclear industry. I think that it's a pseudo-scientific solution, especially in that the radiation-sensitive bacteria or microbes in the food are also the same things that tell you the food is stale. So, food irradiation kills the organisms that produce the odour or change the colour to give you the clue that the food is stale. You never wipe out all the bacteria or microbial life with irradiation because, if you do, you make it limp, colourless and tasteless and it wouldn't be saleable. Therefore, you're only killing a part of that ecosystem and the part that you leave alive is apt to be even more damaging to health than the kinds of things that give you a clue that

the food is stale. For example, the micro-organism that causes botulism is among the most radiation resistant. As you destroy part of an ecosystem, the surviving microbes that are left fill up the system — they grow without competition.

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