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Step by Step into Pluto's Embrace

Indian atomic energy programme was begun by visionaries, who set their sights high. Nuclear energy was to be that magic talisman which would wipe the tear from every eye, make the deserts blossom and give for the country her rightful place in the community of nations. How ever much fault one may now (with hindsight) find with their judgment and with some of the elitist presumptions that underlay that judgment, it can be no denying of the fact that these people were indeed visionaries who dared to dream.

The picture, that the whole programme presents today is an altogether different one. Patriotic idealism, fervor, enthusiasm for the challenging tasks ahead are all now well and truly a thing of the past. Gone into oblivion along with the noble dream. Today, visionaries have been replaced by mercenaries; who dare not dream of anything but a money-making scheme. The whole accent is: make your pile while the going remains good.

One of the latest examples of this selfish, short-sighted and profoundly anti-people attitude is the proposal by the Atomic Energy Commission to accept spent nuclear fuel from other countries for reprocessing here. Seen from the nucleocrat's point of view this proposal has some attractive features. Presumably, it will earn some money in exchange and in our present desperate state this carrot alone will make the political leaders' mouths water and be sufficient to obtain their consent. Secondly, it will present an occasion to tom-tom their own 'great achievements' — how India is only the fifth or maybe the eighth country in the whole world able to master the

ing these wastes and areas around reprocessing plants in different parts of the world, whether in U.S.A., or U.K. are all badly polluted. (See "Back to the Land" on page 5 of this issue.)

the risk posed by nuclear transport of materials over potholed roads and under the prevailing driving conditions, about which senior nucleocrats including two former chairmen (H.N.Sethna and Raja Ramanna) spoke to just seven years ago in a paper presented at an international symposium in Vienna:

economic considerations would warrant a large-capacity fuel-reprocessing plant, centrally located, along with required radioactive waste management capability. But in a highly populated, developing country such as India, the logistical constraints, in terms of an adequate transportation network of suitable standards and infrastructural requirements need to be reckoned with. For instance, movement of irradiated fuel over roads can pose a problem as the track-widths adopted varies along the route. Similarly use of roadway is often cumbersome, as in certain areas the load bearing capacity of the existing roads is inadequate for the movement of heavily shielded consignments."

What one would like to ask these worthies and their successors is; in what way has the infrastructural conditions eased over the last seven years for them to contemplate large-scale transport of radioactive waste all over the land? Have the roads become any better today? Or have the drivers become suddenly less accident prone?

Reprocessing of spent fuel is done in Trombay and at Tarapur while another plant at Kalpakkam is almost ready. The earlier hare-brain notion of having a reprocessing plant each at all nuclear power plant sites has recently now been given a quiet burial. Since the nucleocrats are determined to provide the 'benefits' of nuclear energy in the concrete form of nuclear power stations to all parts of the country, that would have originally meant sacrificing vast areas to waste. However, the new strategy of moving radioactive waste around the country only no improvement. And to be moving not only our own waste but that of foreigners as well for little money just indicates complete intellectual as well as moral bankruptcy.

Plutonium is an aptly named material. Pluto is the king of the underworld. Over the last forty years we have slowly but inexorably marching towards his kingdom. Our goals have become ever more modest, our sights have been fixed lower and lower as befits a nether world people. One can almost predict the next proposal that the nucleocrats will come up with. A few years further down the road with the foreign exchange position even more precarious they would solve the hitherto insoluble nuclear waste problem. After all, West - the repository of the good things of life including nucleocrats' children - should not have to deal with this problem at all. What do we for! India has vast land areas and stable geological formations where all this waste could be safely stored forever, as long as that precious foreign exchange keeps trickling in.

Surendra

The Beginning in Bangalore

nuclear groups in India have been somewhat village republics of old — independent, self and isolated from each other. The three day top from April 26 to April 28, 1991 held at the s of the Indian Social Institute and organised mens for Alternatives to Nuclear Energy) group was an attempt to braid the various together. There is no doubt at all that the ers' hard work was crowned with success. All ants at the end of the three days felt closer to er, and part of a nation-wide movement. ew friendships have been forged, contacts es- d, concrete proposals of mutual help put for- ll these would be of great help in the days finally halting the nuclear steamroller from ng on.

han sixty participants came from different the country. Besides Karnataka; Goa, Kerala and West Bengal were well repre- There were also some friends from Tamilnadu, y, Orissa and Delhi. The absence of repre- es from around Rawatbhata, Jaduguda and was most keenly felt. The imminence of elections prevented groups from Andhra from attending which too was a great pity.

ly did the participants come from very dif- ackgrounds, they also had very divergent ex- ns from the meeting. These ranged the whole om, "How this meeting can help to close down and "What can be done to build a model ve;" to "Can nuclear energy be used for good s without hazards in the Indian context. How- and large, the expectations of the participants e divided into four broad categories:

strengthening contacts

exchanging information and sources of informa-

venienced. An example of the flexibility and acc- modating nature of the organisers was forthcomi even before the meet formally began; since a num of participants expressed a desire for some form of direct action to mark Chernobyl day, the organis scrapped the scheduled programme. The first aft- noon and the evening were spent in taking out a protest march from the venue of the conference to offices of the Nuclear Power Corporation. The ra- ended by presenting a short memorandum to the officials present there exhorting them to join the movement and save the world from a repetition of Chernobyl horror. Needless to say, these worthi- remained unmoved! Afterwards there was a stre- play performed by participants from Uttar Kannad

The meeting was formally inaugurated by a reti- justice of the Karnataka High Court, Justice Nitti Srinivas Rao. The first morning was spent in gett- acquainted and in to analyzing the various strateg- and actions used by different groups in trying to ra- awareness among various special interest groups su- as for example students and legislators and lawye-

The first programme on the second day was a talk- Prof D.K.Subramaniam of the Indian Institute of Science. Prof Subramaniam gave a very fascinat- description of the vast scope available in India rega- ing energy conservation and how by being more e- cient India could eliminate the need to develop n- conventional new sources be they coal, oil or nucl-

This talk was followed by an information excha- session with the participants breaking into three- groups; one on nuclear energy, the other on movem- strategies and a third on alternatives.

The afternoon session was spent by various gro- in conducting a SWOT (Strengths, Weaknesses, O- portunities and Threats) analysis of their own mo- ments and then reporting the results to the plene-

ed, it would have been more beneficial. The
ers had expected this give and take between
o take place informally during free times. This
pen a lot and yet there was dissatisfaction on
re—another indication of the extent of earlier
n amongst the various groups and their keen-
pool their strengths together.

dinner times were meant for slide-shows and
presentations. First evening, there was an ex-
animated discussion which lasted till past
ht following a slide presentation on the condi-
he people around Rawatbhata and the screen-
video film, "The Price of Power," dealing with
e subject. The second night there was a slide
y Nagesh Hegde on nuclear power followed by
a the Narmada movement, "Save Water—Save
rch," and on the Indian Rare Earths plant at
in Kerala.

st day was occupied fully in forming plans for
re. There was great interest in closer coopera-
d there were many suggestions made for
ng it.

of the proposals which elicited a great deal of
ion were:

ing antinuclear movement a strongly
men's oriented movement:

e nuclear energy is a direct threat to a woman's
t to motherhood and having healthy children,
e participants felt that the movement should
e a women's oriented focus. Not everyone (not
f them men) agreed with this emphasis. How-
, there was general agreement that special
rts were needed to raise awareness amongst
men. In this connection Dr Kusuma (Contact
ess: Snehakunja, Kasarkod, Taluka Hon-
ar, Dist: Uttara Kannada, Karnataka) agreed
e a focal point of a women's action programme.

ecting reliable data on the health effects
dian nuclear power stations:

of the major shortcomings of the antinuclear

Rawatbhata, so that they could see and exper-
for themselves the kind of havoc even 'safe'
operating nuclear power stations cause in the
immediate vicinity. There were demands th
slides and pictures of the people around
Rawatbhata, be made available to each gro
that they could be widely displayed. (In thi
nection the Anumukti group has already di-
tributed five sets of slides to different group
various parts of the country.) The need to c
local workshops in small towns near nuclear
stations was also widely expressed. There w
suggestion that dates like the Hiroshima-da
the Chernobyl-day be specifically reserved fo
local activities by activists and national lev
programmes be taken up during other times.
Another proposal which had a great deal of s
was for simultaneous cycle marches to Kai
various antinuclear groups from different p
the country. However the logistics of these m
be worked out.

- **Better intercommunications:**

How to achieve better communications bet
various groups took up a lot of time. It was d
that this task be divided into two. Coordina
between various groups would be the respo
sibility of CANE while information exchan
conducted through *Anumukti*. *Anumukti* sh
publish a proposed date of publication of th
issue and a last date for receiving communic
There should be a separate column in *Anun*
for such group communications.

- **Available Resources:**

Claude Alvares from the Goa group said th
had facilities for publishing books in English
were already bringing out small booklets o
various nuclear power plants and would lik
make that an ongoing project. They also ha
assured distribution network. The Gujarat g
said that in Sampoorana Kranti Vidyalaya a
Vedchhi, they had a very good training cen

er Plant and the Kerala groups slides on the
ch effects on people living in high-background
tation zone in Kerala.

son with other movements

point of total unanimity was the realization
nuclear power plants are just one head of a
y headed monster called 'development', and
rding the need to fight this monster on many
s. One example was provided by the group
a Goa who said that the greatest threat to the

social fabric and the environment of Goa was
the depredations caused by modern tourism
its five star hotels and luxury holiday resorts.
Groups in Goa plan to use the nearness of the
Kaiga nuclear power plant as a means to di-
courage tourists from coming to Goa.

The concluding function of the meet was a pu-
meeting in Gandhi Bhavan at which a retired c-
justice of the Karnataka High Court, Justice D
Chandrashekhar, presided.

Back to the Land:

Sea-to-Land Transfer of Radioactive Pollution

*the British nuclear lobby have ceased to deny that they have made the seas around Britain the
radioactive in the world, they continue to insist that this is having no impact on the health of
who live or work on or near the sea. But research by the nuclear industry into the effects of the
discharge of man-made radioactivity has been characterized by the use of inefficient tech-
s and mischosen sites for monitoring and analysis, and has been undertaken against a
ground of basic ignorance about the behaviour of radioactivity in the sea.*

me forty years, the British government has
ogic on its head and allowed the nuclear
y to discharge radioactivity into the sea in
te ignorance of its consequences. The little
dge that has been acquired about the dilution
persal of radioactivity in the sea has been
only by monitoring the radioactivity after it
n discharged.

ncidence of childhood leukaemia found near
stal nuclear plants at Sellafield, Dounreay and
y Point have been linked to the radioactive
ges from these sites. But the link is by no
clear cut; indeed if *conventional* dose-risk es-

sea areas. Yet the definitive *Atlas of the Seas of
the British Isles*, admits that for all British waters
main overall weakness in the study of water cir-
movement is the lack of systematic, long term
collection in almost all areas." For the Irish Sea
lack of data means that the authors can say no
than "it would appear that more often than not
is a South to North flow to the West of Isle of
For the region in the vicinity of the nuclear in-
tions at Sellafield, Chapelcross, Springfields, C
hurst and Heysham this definitive work says "
circulation shown for the region is still a matter
argument."

Knowledge of the residence time of the pollut

Reprocessing

the moment a reactor is shut down its spent fuel contains some synthetically produced isotopes, including plutonium-239. The method for chemically separating this plutonium-239 from uranium and its fission by-products is known as reprocessing. These methods were originally developed during World War II to provide highly purified plutonium for atomic bombs.

Uranium, neptunium and plutonium are members of a series known as the actinide series of elements. Their chemical properties are similar to the lanthanide series of rare-earth elements. Early studies revealed that plutonium had chemical properties that varied with its oxidation state and could thus be exploited for separation processes. These properties included the solubility of plutonium phosphates and fluorides in aqueous solutions (compared with the insolubility of the phosphates and fluorides of the fission products) and the fact that certain plutonium ions could be extracted with organic solvents.

The fission products are isotopes of elements ranging in atomic number from 30 (zinc) to 66 (dysprosium). Most of them are radioactive with half-lives that range from less than a second to thousands of years. The fission products are the chief source of heat and radiation from spent fuel. A dozen or so combine to give intense radiation and long half-life with chemical and physical properties that are troublesome in reprocessing or in the ultimate disposal of the wastes.

The first step in the treatment of spent fuel is to store it for several months in water filled pools at the nuclear power station. During this period the radioactivity and the evolution of heat decrease by a factor of about 10,000. The uranium oxide elements that fuel power reactors are encased in long, slender tubes, made of either stainless steel or of an alloy of zirconium called Zircalloy. Such rods are prepared for processing by chopping the tubes into short sections and dissolving out the oxide ("chop-leach.")

The "Purex" process, which is the most commonly used reprocessing method all over the world, employs TBP (tributyl phosphate) dissolved in a kerosene like hydrocarbon as the separating agent. When uranium and plutonium ions are highly oxidized they are more soluble in the TBP solution than they are in an aqueous solution. Under the same conditions hundreds of fission products are more soluble in a strongly acid aqueous solution than in the organic one. The process involves making the aqueous and organic solutions flow in opposite directions through a column or some other kind of a mixing chamber that disperses one of the solutions into small droplets through the other. Thus the solvent can extract uranium and plutonium in their highly oxidized forms from the aqueous feed solution which contains most of the fission products. In separating the plutonium from the uranium, the plutonium is reduced to its trivalent form making it insoluble in the solvent which then contains all the uranium.

movement of water column and its associated radioactivity. These studies showed that the radioactivity released could travel further and faster than had been previously guessed, and that

It is inevitable that sites as complex as nuclear establishments will suffer from accidental leaks. The 1983 pipeline leak was only discovered because Greenpeace protesters were working off the end of