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> *"People have to operate* nuclear power *plants no* matter *how much automation we introduce. People are forgetful, often they are* irresponsible and quite a *few of them suffer from deep-seated* irrational tendencies *towards hostility and* violence. I believe *that the confident advocates of the safety of* nuclear power plants base their *confidence too* narrowly on *the safety that is possible to achieve under the* most *favourable* circumstances, *over a limited period of time, with a corps of* highly trained and *dedicated* personnel"
>
> J.T. *Edsall*

When anything seriously untoward happens in the nuclear system anywhere in the world, the first reaction of nucleocrates elsewhere is, "IT CANT HAPPEN HERE!" After Chernobyl disaster in 1986, this litany was heard all around the world, may be even in other parts of USSR itself! It would not be an overstatement to say that at least for the Indian nuclear establishment frequent repetition of this mantra has been its only response to Chernobyl. Even almost four years after the event, Dr. M.R. Srinivasan, the then Chairman of the Atomic Energy Commission, wrote :

> *"After the* Chrenobyi affair, *the question has often* been *raised about whether or not* a similar *accident could happen in the* Indian nuclear power *plants. My* answer *is again 'no'...* The *accident at* Chernobyl *took place* mainly *because of the total disregard shown by the reactor operators for safety* rules and procedures, and'the inherent *design deficiencies."*

One of the presumptions underlying this preposterous assertion is a feeling that 'our' operators are some how better than 'their' operators. Mr. M.R. Srinivasan has often in the past said so in so many words. "Operators in India, unlike their counterparts in the West, are graduate engineers who are well trained in all aspects of reactor operation and can analyse any problems that may arise during the running of the reactors." The establishment has assiduously tried to create an impression, that unlike the drug-taking, high-school pass, order disobeying nit-wits who man reactors elsewhere, the Indian 'scientists' who control our reactors are a dependable lot, who pay meticulous attention to safety and security procedures and can be relied upon in all circumstances. May be, by and large, this does describe the true state of affairs correctly. I just don't know for sure because the secrecy which surrounds these operations does not allow any outsider to come to any sensible judgement. But the crucial point is that nuclear energy is an unforgiving technology, which does not allow any by and larges. It demands absolute reliability from all. Designs, materials and personnel must all be, without exception, flawless. Therefore, the newsreport [See Box, Page 2) of an attempt by an employee to sabotage .some pressure gauges in unit-2 of Rajasthan Atomic Power Plant (RAPP) at Rawatbhata causes special alarm. The incident shows that despite all screeings and security checks it is possible for a petty minded self-server to have access to vital parts of the reactor and place in jeopardy the life of millions.

A reactor operator deliberately blew-up a military reactor in the US in 1961. The enquiry commission which investigated the incident found him to be emotionally disturbed due to lack of promotion and marital problems. But this finding was of little use to his two colleagues who died with him or to the 720 people who were contaminated in cleaning up the mess he left behind.

The most alarming aspect of the RAPP 'unusual incident' is the flaccid way it has been handled by the authorities. Unfortunately this lackadaisical attitude to safety is far too usual.

The Chief Superintendent of the Rajasthan Atomic Power Plant, G.R. Srinivasan has admitted that an attempt was made to sabotage the turbines attached to the plant but claimed that it posed no great danger to the surrounding community. A team from the Central Bureau of Investigation has conducted an enquiry into Ine incident.
On 16th August, 1900 both the units at RAPP were under shut down for their annual maintainance. At 12.10 PM, a technical employee Mr. B.K. Jacob put a large bundle of cotton waste into the lubricating oil pipline of one of the turbines of unit-2 causing an obstruction. An engineer and another employee of the plant saw Mr. Jacob doing this and he was caught by them in a very dramatic, fashion. Soon alter senior authorities were informed of the incident
Under questioning Mr. Jacob admitted his fault and said that he had done it out of frustration at not getting promotion. He felt that due to the obstruction the unit could not have been started, and later he intended to 'discover' the obstruction and thus prove his capability for promotion!
Mr. Srinivasan said that there was no grave danger to the turbine due to this obstruction but it might have taken a few days to locate the particular pipe and that would have caused a severe production and monetary loss.
Desh Ki Dharati October 29, 1990 and Rajasthan Patrika November 2, 1990 (translated from Hindi)

Attention Koodankulam : VVER Reactors Found Unstable

According to an internal report from the Czechoslovakian Atomic Energy Agency (CSKAE), experience of the VVER 1000 reactors which are presently in operation in USSR and Bulgaria "confirms that operation is difficult to control" and the reactors are for that reason "extremely unstable." Among other things the automatic controls are "insufficient." The primary cause of the instability, said the report, is the use of two year fuel cycles which prevents use of burnable absorbers in the fuel. The resultant excess reactivity (in the core) is compensated by a higher boric acid concentration. This, however, "leads in some loading schemes to extremely undesirable positive values for the temperature reactivity coefficients."

Jargon Explanation
Each time a uranium 235 atom breaks it produces two large pieces (known as fission fragments) and sometimes two and sometimes three neutrons. These neutrons collide with other uranium 235 atoms and induce them to break. For a stable chain reaction as in a reactor one needs that one and only one of these neutrons on the average causes fission of an other atom. The key phrase here is : on the average. Since neutrons from any particular fission may of course get 'lost' — get absorbed by the fission fragments or water or tubing, reactor building, etc. Or else all the neutrons from a particular fission may cause other atoms to break. As the reaction proceeds, the conditions within the reactor core are continuously changing — the number of uranium 235 atoms are decreasing while the numbers of the fission fragments are increasing. Hence the neutron number control mechanisms need to be adjusted continually. Boron is a good absorber of neutrons. So since one wants the reaction to continue for two years without pause for reloading what is done is that at the beginning one keeps the number of uranium 235 atoms somewhat more than need be and also have a larger concentration of boron. As the reaction works itself through, the uranium 235 number will naturally decrease,and one can reduce the concentration of boron gradually thus keeping the overall neutron economy in good order. What the Czechoslovak's are saying is that in practice this procedure is not easy to control. For particular geometries of loading it may so happen that a lot of the concentrated uranium 235 may get together and as the reaction proceeds apace and accelerates and the temperature rises there may be a power surge like the one that rocked Chernobyl.

Officials at Gesellschaft fuer Reaktorsicherheit mbH, where experts from Czechoslovakia, the German Democratic Republic and the USSR are investigating VVER reactor safety, confirmed that the two year fuel cycles have been causing problems for other Eastern European and Russian reactor operators as well. According to one official, information available thus far shows that the reactor safety relevance of the WER 1000 core design problem is "not trivial" and that "axial fluctuations can occur in the core with high amplitudes and these are difficult to get under control." Local core temperatures, he said, can increases beyond allowed limits and boiling of fuel assemblies is possible. Besides the VVER 1000s presently in operation in the USSR, there are two in operation in Bulgaria and four under construction at Temelin in Czechoslovakia. The Czechoslovakian government, however, is considering cancelling the second two units and replacing them with reactors of Western design.

Source : WISE *News Communique* 337, 31 Aug., 1990

The Sterilized Zone

We hove *recently acquired a copy of Nuclear Off-Site Emergency* Response Plans *prepared* in the wake *of* the Chernobyl *disaster* in the Soviet Union in 1986. These plans have been *prepared by* the *State Level Emergency* Response Committee, *in consultation with* nuclear plant *authorities, National Level Emergency Response* Committee, *Atomic Energy* Regulatory *Board, Nuclear Power Corporation and Bhabha Atomic* Research Centre. The *plans have* been *issued in 1988, have not* been subjected to *any revision and thus represent the latest official* thinking on *this issue. Despite repeated* requests *for a copy (a* matter *of vital* concern to us, since *we live* uncomfortably close to a nuclear plant] the authorities *have not* seen *it fit to provide us with* one. *They have not denied us* our *rigjht to have it but have just gone an procrastinating for the last two years. We will be* presenting relevant portions *of the plan along with our comments under this* heading in *the next few issues. The* present article *deals with the assumptions that underlie* the whole planning process whereas the *future articles will deal with the specific protective* measures to be undertaken.

Planning Basis and Concepts

The following principlos shall form the basis of all nuclear offsite emergency planning and management :

The State through its designated agencies, has primary responsibility for the health, safety and welfare of all inhabitants of the state and the protection of property in normal basis as well as emergencies such as floods, droughts and fire and so on. Such emergencies also include nuclear offsite emergency for which this plan is made.

> If nuclear emergencies are emergencies on the same footing as are floods, droughts and fire then why does Life Insurance Corporation and other insurance agencies not insure the public against nuclear disasters as they do in the case of floods and fire. In fact there is a specific clause in insurance policies absolving the agencies of all claims arising from a nuclear emergency.

Even though nuclear power plants and other nuclear facilities are designed and operated according to stringent safety standards and those in India have an excellent safety record, emergency planning must operate on the basis that mechanical failure and/or human error can lead to accidents of a magnitude resulting in unacceptable off-site consequences.

> The 'excellent safety record' is unfortunately unknown to the public since the performance records of various nuclear facilities are classified information. It is only when an independent agency is able to analyse the records of all 'unusual incidents', forced scrams, leaks, spills, 'lost radioactive sources, etc. that one would be able to form a fair judgement as to whether Indian safety record is excellent, mediocre, poor or flunk..

The more severe a postualted accident the less likely is its occurence. An appropriate balance should be struck between risk and cost when assessing the level of emergency planning and preparedness required.

> This principle is in effect saying that prepare only for small accidents, since large accidents are extremely unlikely. The neat inverse relationship between the probability of an accident and its severity applies only to "postulated' accidents. These are those accidents which have been foreseen by the designers, and then adequate safeguards have been taken to combat them. Unfortunately in the real world, the accidents that do take place are the ones not foreseen. One reason for this is the unpredictable 'human factor.'
>
> Furthermore, the risk/benefit assessment methodology employed in this principle makes no sense. A better principle would be to have emergency planning and preparedness based on "worst case' scenario, irrespective of cost effectiveness. Certainly these high costs will be insignificant in relation to the lives and properly that could be saved in the event of a real accident.

Exposure to radiation shall be kept as low as reasonable achievable.

> The key word here is 'reasonable.' An effort to reduce radiation exposure that might seem reasonable to a nucleocrat safety ensconsed in an office in Bombay may seem totally inadequate to a person living near a nuclear plant who is being exposed to radiation. So who decides what is reasonable!

As much planning and preparation as is practical shall be done in advance to unable a rapid, effective and efficient response to a nuclear emergency.

> Again the key word here is 'practical' It seems to suggest that emergency plans should not be over emphasized since 'everyone will do what is necessary' in the event of an accident. Emergency plans ought to be more than mere 'guideposts' to effective action. They should be well known, well understood, and well practiced steps to emergency action. For example, when confronted with the criticism that the size of the emergency planning zones is too small, government officials all over the world usually respond that these zones can easily be enlarged if authorities at the time of the accident deem it necessary. Yet, this assumption fails to recognize the logistical and practical implications of such a decision since detailed planning in a non-zone areas is non-existent. The purpose of the emergency preparedness plan should not be to give the public a

false sense of security.

Preparations shall include a cost-effective programme of public education for people who might be affected, to inform them of the plans and to help them cope with a nuclear emergency.

The programme of public education has been so cost-effective that it has incurred no costs at all. The public has no choice but to get educated on its own initiative if it is interested in its survival. For example, as I mentioned in the beginning, I have been asking the Kakrapar authorities for the last two years to give me a copy of this plan and they are yet to do so.

A policy of truth and openness shall be followed in providing information to the public and media during a nuclear emergency to discourage rumours and misunderstanding.

NO COMMENTS!

Types of Accidents

An accident in a nuclear reactor cannot result in a nuclear explosion. A typical nuclear accident that could cause a nuclear emergency - its probability being one in 10,000 reactor-years - is a Loss of Coolant Accident (LOCA).

This impressive figure of one in ten thousand reactor years has come out of a hat : Dr. Rasmussen's hat. Till 1975, nucleocrats used to claim that the chances of a core-melt were one in a million reactor-years. He devised a method of assessing accident risks of a nuclear power plant and came with the one in ten thousand figure for a core-melt and a one in million reactor years figure for an accident with wide dispersal of radioactivity. There are two problems with this comforting figure. Firstly, these risk analyses are plant - specific and there has been no claim from Indian nucleocrats that they have conducted these analyses an Indian reactors. Secondly and more importantly, reactors have not been obeying the dictates of risk analysis and have been having accidents far more frequently. Thus, the core-melt at Three Mile island took place after only 1,300 reactor years of operation while the Chernobyl disaster instead of waiting a decent fraction of million reactor years took place after only 1,800 reactor years.

Nuclear reactor containment is a system of massive concrete and steel barriers with a limited number of designed openings that are closely controlled and monitored. Although simultaneous failure of the containment system and a loss of coolant accident are highly unlikely, nuclear emergency planning is carried out to cope with even such unlikely dual failures in reactor safety systems to minimize public risk.

Reactor containments for all their concrete and steel, are not built to withstand all kinds of overpressures that can build up within. In case of a failure of the emergency core cooling system, there are good chances that the containment too shall fail. In fact a study in USA on Tarapur type Boiling Water Reactors found that the chances of containment failure were nine out of ten.

The serious nuclear accident for which detailed planning and preparation shall be done is one producing an effective whole body dose of 10 rem at a distance of 1.6 km from the nuclear reactor.

Radiation Hazards

Nuclear accidents could result in two types of emissions :

(a) An airborne emission, involving the release of radioactive material into the atmosphere.

(b) A liquid emission, such as the release of radioactive liquid into a river, lake or water course.

These emissions can effect the human body or animals externally or internally in the following manner :

(a) External exposure to airborne or waterborne radioactive material, or to deposits on the body, clothing, ground, building and other objects.

(b) Internal exposure due to irradiation from inhalation of radioactive material or the ingestion or radioactive material through the consumption of contaminated food and water.

In managing a nucler emergency the radiation hazards to be considered are :

(a) Initially, the main short term danger would be external irradiation from the radioactive plume. Lesser hazards would be inhalation of radioactive material, especially radioiodine (which would accumulate in the thyroid gland), or the radioactive material deposited on the body, ground and food.

(b) After the release has ended, the long term hazard would be from consumption of contaminated foods, espcially milk and water. Lesser hazards would exist from deposited or resuspended radioactive material.

The levels of radioactivity that are expected to occur offiste in a nuclear emergency are extremely unlikely to expose people to the risk of radiation sickness or other acute effects. The main risk that emergency plans seek to avoid is an increase in the long term incidence of cancer among the population*

Also hypothyroidism, loss of fertility, genetic disorders, allergies, asthama, spontaneous abortions, lowering of the immune system .....etc.

Protective Measures

The body can be protected from external irradiation by preventing or minimising its exposure to the radiation source, by distance, by limiting the time of exposure or by shielding.

Complete protection from internal irradiation can be obtained by preventing ingestion or inhalation of radioactive material. Once radioactive material enters the body, radiation exposure diminishes with its decay, and ends when the material is completely eliminated from the body.

In other words, don't breathe or eat. If radiocative materials do get into the body, there is no way to

reduce exposure and all one can do is to wait natural bodily processes expell the substance.

A special method of protection is available for the thyroid gland which absorbs and stores iodine. If there is a risk of radioiodine entorting the body, the thyroid's capacity to a absorb it can be reduced or eliminated by taking stable iodine before or even shortly after the radio-iodine enters the body. This is known as thyroid blocking.

The specific protective measures available for dealing with the radiation hazard in a nuclear emergency are :

(a) Sheltering

(b) Thyroid Blocking

(c) Entry Control

(d) Evacuation

(e) Decontamination

(f) Use of Protective Equipment

(g) Food Chain Protection

(h) Food and Water Control

Emergency Zones and Sectors

The area around a nuclear facility for which a nuclear emergency plan is made shall be divided into the following zones :

Contigneous Zone : 1.6 km radius from the nuclear facility.

This is the zone immediately surrounding a nuclear facility. An increased level of emergency planning and preparedness may be advisable within this area compared with the rest of the Primary Zone because of its proximity to the potential hazard. This is also called Exclusion Zone as residential habitation within this area is prohibited. This area is fenced and is under the full control and responsibility of plant management. Outside this fence of 1.6 km radius, the responsibility for the nuclear offsite emergency response rests fully with public authorities.

Increased planning and preparedness for an area in the which nobody lives!

Sterilized Zone : Between 1.6 km and 5 km radius from the nuclear facility.

In this zone new growth of population development acitivity is prohibited by law {to be enacted) so as to restrict the population to easily transportable number in case of nuclear emergency. This zone is included in the Primary Zone. Area under consideration may be put under "Contonnment Board" or similar authority (proposed).

How is the prohibition on population development activity* to be enforced? By compulsory sterilisation! Parts of Mandvi (population : 25000) fall within 5 km of Kakrapar nuclear power plant, and there would be many such examples from other plant sites.

Primary Zone : Between 1.6 km. and 8 km from the nuclear facility.

In this zone it would be prudent to plan and prepare measures such as sheltering against plume exposure. Evacuation may also be required. Responsibility beyond 1.6 km is fully with state public authorities.

Secondary Zone : Between 1.6 km and 16 km radius from the nuclear facility.

This is a larger zone within which it would be produent to plan and prepare measures against exposure from ingestion of radioactivity. The Secondary Zone includes the Primary Zone. The distances will be taken from the reactor building/nuclear facility.

For the sake of comparisioa in USA the primary zone extends 16 kms and the secondary zone extends 80 kms from the reaction site. Even this is grossly inadequate as can be seen from Chernobyl. There, people within 30 km radius had to be immediately evacuated (primary zone); whereas food restrictions need to be imposed in hot spots' as far away as 400 km from the plant site.

See also the book review of Emergency Planning in Case of Nuclear Accident in this issue.

We *will discuss these special protective* measures in greater *detail in future issues.*

The mysterious Case of the Vanishing Subscriber

Yes, it is a great mystery to all of us. Has the nuclear establishment called it quits and gone to meditate in the Himalayas? Or does the coming of the new government herald a new nuclear free dawn? Or perhaps, God forbid, Anumukti has become boring, silly and full of misinformation! How come the subscribers list has shrunk almost to vanishing point!
Don't let Anumukti die a gruesome death, drowning in a pool of red ink! Send your subscription to our office (for the address, see the last page) today.

AN UNPRECEDENTED TRAGEDY

For the first time an official document — a decree of the USSR Supreme Soviet adopted on the eve of the fourth anniversary of the Chernobyle disaster — described it as the biggest calamity of the century, and a tragedy of the entire people affecting the fate of millions.

"Chernobyl was no doubt by far the worst accident that has taken place in the nuclear industry in the world. A Total of 28 deaths took place which is equivalent to two days loll of road accidents in Maharashtra only." *Dr. A.K.De* - the *then chairman of Atomic Energy Regulatory Board.*

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The crudest violations of technical procedure in operating the reactor plus its shortcomings and the unreliability of the equipment and control instruments have resulted in a hitherto unheard of tragody in the history of humanity. Deputy Yulia Drunina called it the apocalypse of our century and sharply condemned those who *"had in that* hour of *trial seated their* children into big office *limousines, while those of the non-nomenklatura* had been lined up *in the May Day holiday* columns and *led to city* squares to celebrate under *the clouds of radioactive dust."*

Blame for the inadequate measures taken at the time of the disaster and later, lies with the Ministry of Atomic Energy, the Ministry of Health and the State Committee for Hydromoterorology. These minitries concealed all information regarding the real state of affairs.

People's deputies asked many awkward questions in their speeches. Why is it that even today, information about the state of the health of the children continues to be kept secret ? Who is personally responsible for making the people stay in the contaminated zones ? On whose orders has the USSR Ministry of Health been turned into the Ministry for Opportunistic Propaganda ? And so forth .....

The position of the USSR Council of Ministers was : "Why delve into the past, when there are urgent problems of today and tomorrow facing us?"

"Thousands of people have become hostages of the disaster caused by 'Atoms for Peace'," said Deputy Igor Luchenok. Among them are those growing produce on contaminated land and those

New evidence collected by the Byelorussian Acadmy of Sciencies indicates that the medical effects of Chernobyl disaster are much greater than has been generally predicted.
The blood of pregnant women in Gomel, was found to have nine times as many severely abnormal ("dicentric") cells as that from women in a control area, Kalinin. Moreover, the frequency of multiple chromosome abnormalities is increasing. In Byelorussia as a whole the incidence of all recorded congential abnormalities since the accident has increased by 70% and that of major specified abnormalities by 50%. In Mogilyov, the development of nine year olds has been retarded on the average by about three years. In this area 20% of the children received a doze of 1,000 rads to the thyroid. Beylorussia has a population of over ten million. There has bean an increase in cancer registration of between a third and a quarter. Specifically, the number of thyroid cancers is increasing, and in Mogilyov region there has been a rise in luikaemia registrations from 22 in 1985 to 40 in 1988. There is also evidence from animal studies of a severe depression of the immune system.
The Lancet ; May 5, 1990

consuming it. And each one of us can potentially find ourselves in the latter, for contaminated fruit and vegetables, meat and milk, poultry and cereals, sunflower and flax are spreading all around to other parts of the country and the world, not without the participation of government bodies.

Some deputies with great urgency pointed out that if we repeated the mistakos of the past four years and did not take cardinal decisions, events could become unpredictable. "The psychological condition of the people has reached an irreversible turning point and the situation is fraught with social upheavals," Deputy Valeri Krishevich stressed.

Parliamentarians also said that against the background of Chernobyl tragedy's aftermath and the utter misery of tens of millions of our fellow citizens we could not afford such undertakings like countless seminars, conferences, symposiums and

other formal functions which are unnecessary and burdensome to our bankrupt treasury. Couldn't we reduce at least for the time being, the number of various "shows", and festivals so inappropriate in our present economic and social situation?

Much criticism was levelled at science in general and individual scientists in particular, on account of their concept of "normal existence" in territories with per capita radiation dose of 35 rem, and also for their tendency to strictly classifying all information on the subject (and thus leaving then nation in the dark).

Deputy Vasily Belov stated that science which had allowed the Chernobyl catastrophe to occur was immoral, and the society which developed and encouraged such science was careless. "We are being spoonfed with promises of complete reliability of nuclear power plants. Yet, we have all become hostages of this deadly, devilish force - the atomic boilers which are spread across the land in great density." He cited many hushed up cases of nuclear plant disasters in various regions during the last fifteen years.

"Recent studies by Soviet experts show that some of the earlier predictions regarding the long term health consequences of Chernobyl and the number of people affected by the accident were way of the mark. I think we should compare the 32 human deaths due to Chernobyl with the over hundred people who have died due to the recent accident on an oil platform in the North Sea."
Dr. M.R. Srinivasan in Sunday Observer of 24 th July, 1988

Yevgeni Velikhov, Vice President of the USSR Academy of Sciences, and one of the topmost nuclear experts in the country, when given the floor, held forth about the "Chernobyl " charity" TV marathon, about how scientists had frequently visited the site of the disaster, and about the need to remove nuclear fuel from the "sacrophagus". Dr. Vlikhov stated that the problems of the polluted territory inside the 30 km zone closed to people would be tackled within the next five years.

But what about the radiation danger to people outside the "death zone ?" Dr. Velikhov called for "avoiding exaggerations and unverified information." And he cited an example about himself; "The 40 or 50 roentgens which we professionals usually get are quite a normal dose, which does not pose any threat to my organism in my view."

A very typical comment! While nucleocrats dismiss claims that any particular case of cancer could have been due to radiation, they do at the same time offer absence of discernable health effects in a particular case as 'proof that radiation at that level is 'harmless' to all.

The programme adopted by the USSR Supreme Soviet envisages an improvement of medical care and the improvement of the environment in polluted territories, the registering of all who lived or worked in the danger zones, the creation of a "Children of Chernobyl" programme, and the drafting of a special law on the Chernobyl catastrophe.

Sixteen billion roubles have been year marked for the implementation of the programme, which is equal to the annual surplus of the country's national income. This was announced by the Prime Minister Nikolai Ryzkhov, though he added that this money had yet to be earned.

CHERNOBYL SARCOPHAGUS IN DANGER

Seismic activity has recently boen recorded in the vicinity of the Chernobyl nuclear power station, causing Soviet decommissioning experts to fear that the sarcophagus covering the unit could crack, allowing further releases of radioactive materials.

According to the documents obtained by *Nucleonics Week,* Soviet officials notified German Ministry of Environment and Nuclear Safety (BMU) that tremors had recently been recorded in the vicinity of the reactor and the sharply inclined roof of the reactor could shift despite remedial measures taken to keep it in place. They also said that the concrete walls of the sarcophagus and the reactor floor are unstable and could collapse.

German documents state that if the sarcophagus were to open, the volume of radionuclides released as dust from the reactor could be nearly twice the inventory by percent released during the 1986 accident. Following that accident only about 5% of the total radioactive inventory was released to the outside whoreas nearly 95% was retained within the reactor. German experts fear that is the sarcophagus collapses, the remaining radiomondes would be thrust outward by heat and air currents further contaminating the surroundings.

Because of the seismic activity, The Seviots are now backing away from their original Plan to build a second sarcophagus to cover the first. because it, too, would be vulnerable to tremous Instead, they now favour dismantling the reactor and decommissioning the site, decontaminating it to the "green-field" level. Western experts view this as impractical. According to Enno Hicken, a senior reactor safety expert at the Juelich Reserach Centre (KFA), the difficulties of dismantling smallo reactors without the additional problems associated with a severe accident, were "already considerable."' And unlike Three Mile Island Unit-2, he said, the fuel and fissile material inside Chernobyl-4 is widely distributed. The thermal and radiological conditions inside the core at present would prove too much for even state-of-the-art robotic equipment. Because of the great volume of contaminated dust inside the sarcophagus, Hicken doubts that the site could be decontaminated without the construction of a second sarcophagus to contain the dust for several decades, regardless of the threat to such a structure posed by earthquakes.

Besides the danger posed by earthquakes, there are other problems as well. One danger is that the fuel that is left in the reactor core could become critical if it was moved around or became compacted. Since the enrichment level of the fuel is only 2% U-235, the chances of recriticality are "slight." However, this analysis fails to take into consideration the chances that the sarcophagus could collapse.

Additional problems include one raised by a former senior Chernobyl engineer who was elected to the Ukrainian parliament in March. In an interview in July, he told the daily *Sueddeutsche*

Zeitung that a 1,000 square metre area of the sarcophagus had been softened up by neutron bombardment. According to experts, present emission levels measured outside the sarcophagus are 40 billion Becquerels per day which is incidentally five times the daily limit allowed for German reactors. The radiation which is escaping the sarcophagus from a number of leaking points, is carried out by strong convection currents generated by the high heat inside the reactor building. The temperature inside the sarcophagus has been measured in some places to be as high as 200*C. Western experts say that the large amounts of boron carbide and sand dumped into the reactor to extinguish the fire in 1986, may now be inhibiting decay heat dissipation now.

Sources :

Sputink : Digest of Soviet Press, September, 1990

WISE News Communique : *340, October 19*, 1990

New Clear Technology - Murky as Ever !

Nucleocrats are a hardy breed. They would like the public to think that nuclear industry is not dying at the hands of the marketplace. Hence, lately they have begun to argue that a combination of concerns about the greenhouse effect and the new "inherently safe" technology will revive the nuclear power industry. Forbes — a business magazine from USA — (which had once written an article highly critical of the nuclear industry and has never fail, d to pat itself on the back for it) now says in an article entitled "The Greenest Form of Power"

> *"Nuclear power is not dead. It is just sleeping. Solar power and wind power and the like are pie-in-the-sky, clean safe nuclear power is a reality. "*

Richard K Lester, a professor of nuclear engineering at MIT, in a similar vein :

> *"Second generation nuclear technologies would reestablish nuclear power as a major source of electricity."*

While according to the President of American Nuclear Energy Council :

> *"Nuclear energy must be revitablised in order to alleviate the greenhouse effect."*

A politician who has clearly been seduced by these new non-existent reactors is the Australian opposition spokesperson on energy, Senator Peter McGauran. In a confidential June 1989 memo he says :

> *"You would know that new generation reactors which maximum safety features are now coming into use. They are small (250-400 MW) and fully automated, and overcome the many safety problems associated with large-scale reactors of the past**[4]

Senator McGauran has jumped the gun here : not one of the advanced reactor concepts he mentions has actually boon built. Nothing more constructive than design studies have been done. In the same document he rhapsodizes that :

> *"Recent reactor designs are particularly impressive. They are easily operated, and have phenomenal safety advantages.*[44]

In a way, Peter is right : everyone would agree that non-existent nuclear reactors do have phenomenal safety advantagos.

So is new technology really the answer to nuclear industry's prayers or is it just the proverbial grasping at strws. Unitl now the dominant nuclear technology has been PWR and the BWR, with a few doddery magnox and AGR in UK, a few surprisingly good CANDU performers in Canada, South Korea and Argentina, and unspeakable RBMKs in the Soviet Union.

An editorial aside :
While the CANDUs have been good performers elsewhere, there performance in India has been uniformly awful. Also it is interesting to note that while abroad nuclear propagandists are extolling new (as yet on the drawing board) technology whereas in India the Nuclear Power Corporation has been taking out advertisements staunchly proclaiming the invincibility of the present generation of reactors.

These 'old technologies', it is argued, are too big (1000 - 1200 MW) and too costly ($2-4 billion) to fit easily into third world electricity grids or US utility budgets or planning horizons. They rely on complicated, active, 'add-on' safety systems that cannot be relied upon and cost a lot of money. They take a long time to build; partly because of their sheer scale, partly because of the regulatory problems that arise (mainly US, but also West Germany, and even in the UK), because each reactor is 'custom designed' and different; and thus has to have its entire design verified by safety authorities; and partly because engineering giants such as Betchel in the US have a way of doing things like putting in 1400 electrical circuits back-to-front, like they did at the Midland plant before it was abandoned. Finally, the PWR and BWR designs are conceded to contain real inherent safety problems — at least by engineers who are proffering alternative designs. Those who argue for 'now generation' nucler technology in this way concede much of the safety case nuclear critics have put up for years.

But, we are told, the answer is not to opt for low energy, conservation-oriented society. Technology forbid! Clearly the answer must be new technology. And so a new generation of reactor technology is on the drawing board whose characteristics are supposed to be :

Relatively small size (150-400 MW)

Modularity: Rather than say 1,000 MW units, reactors will come in, say, 600 MW 'clusters' of 4 x 150 MW, or in lines of identical units of upto 400 MW.

Standardization : No more custom built monster power plants. Instead, identical units of much smaller size are to be factory made on an assembly line.

Reliance on 'passive' safety features : new reactor designs are to rely on gravity and natural circulation to get rid of heat, not an 'active' features such as pumps.

'Automatic' shutdown : In designs such as PIUS, borated water is supposed to flood the core and shut the reactor down if anything goes wrong without the use of pumps.

'Forgiving' operating characteristics : If something does go horribly wrong, you don't have just 30 seconds like at Three Mile island, to flood the core before the fuel starts to melt, or just about 3 seconds as at Chernobyl, for an emergency forced shutdown before the reactor goes prompt citical and blows up. You are supposed to be able to walk away from designs like PIUS and MHTGR for days on end before anything actually needs doing — or atleast, that's the ideal.

Apart from the still insoluble waste problem, and besides being the most costly way of cutting the greenhouso emissions, what else could possibly be wrong with these lovely new technologies ? Let us look at them one by one.

High Temperature Gas-Cooled Reactors (HTGR)

The HTGR is or was my favourite nuclear reactor. Unlike the PWR, BWR or CANDU, the HTGR doesn't have a lot of water inside a breakable pressure vessel, trying to keep the fuel from melting. Instead, it has a much bigger graphite core cooled by circulating helium gas at a relatively low pressure, but with a much higher temperature than the present generation or reactors. Thus, it is able to heat water inside its steam generators to high (and much more efficient) temperatures typical of fozzil fuel generating stations.

Actually HTGRs are not all that now. They are the descendants of the old English Magnox and AGR plants whose performance to date has been uniformly awful. USA's 300 MW prototype HTGR at Fort St Vrain was recently shut down because of embarrassingly bad performance. The West German THTR, a unique 'pebble bed' reactor, was shut down before it had even boon properly commissioned because after relatively minor problems with fuel damage and snapped bolts in its gas duct, it was felt by its operators to be a financial meltdown in the making.

With a lineage like that, why the optimism about HTGR and MHTGR (Modular HTGR)? Well, it seems that General Atomics - the people who gave the world Fort St Vrain - have now teemed up with Siemens and HTR-GmbH of West Gormany to built a small (80 MW) MHTGR prototype inthe USSR at Dimitrovgrad. And in the meanwhile General Atomic's MHTGR concept has been selected by the US Department of Energy (DOE) for one of the two now plutonium production reactors for military uses. DOE has also increased its funding for civilian MHTGR technology.

But all is not smooth sailing for MHTGR. For one thing, the company isn't happy that DOE wants it to put a containment on the reactor. They are 'inherently safe' you see, and therefore, the company contends there is no need for a costly containment building. The company also feels that DOE's insistence on a containment would set the wrong precedence for civilian MHTGR reactors.

Yet, according to Advisory Committee on Reactor Safeguards, a fire in the HTGR's graphite moderator could happen if the reactor vessel or the core support system failed, resulting in "severe consequences".

The HTGR will need a lot of governmental help. A prototype HTGR is estimated to cost $ 1.8 - $2.1 billion for 400 MW capacity — no cheaper than the financially disasterous present generation of reactors. The claim is that if prototype costs are met through government subsidy, subsequent reactors would be cheaper. Robert Pollard of the Union of Concerned Scientists says "The nuclear industry should join the free enterprise system."

The time horizons being talked about by DOE are interesting as they indicate that the MHTGR, though the most 'advanced' amongst the now reactor concepts, is still very far from being a reality. A feasbility study for a 4 reactor, 500 MW civilian plant was nearing completion in March 1990 *[Nuclear* Engineering *International* March, '90). The study was done in part "to determine what government support would be necessary" to build a lead - plant "after the turn of the century." DOE itself is saying that MHTGR designs should be certified "early in the next century." This means that their construction won't even start till past 2000 - 2005 and that means that there won't be any MHTGR in the US till 2010.

Process Inherent Ultimate Safety (PIUS)

Meanwhile ABB-ATOM of Sweden and United Engineers of US have teamed up to market the PIUS design in the US. (Nuclear Engineering Internationa], August, 1989)

The PIUS design originated in Sweden, and envisages the entire reactor core being submerged in borated water, which normally prevents a nuclear reaction of any kind. Any minor deviation from normal operation allows the borated water to enter into the core and stops the reaction. The only problem is that the whole design concept has never been tested : no one has actually built a PIUS of any size, not even a 5 - 10 MW, so there is absolutely no guarantee that the thing would work at all.

PIUS is also in fact, not toally immune to catastrophe. It is possible for **the** vessel containing the core to rupture. Also it seems likely to he very costly.

Other Designs

Besides PIUS and MHTGR there are a bewildering multitude of 'inherently safe' designs floating around. DOE favours a liquid metal cooled reactor called PRISM, which doesn't seem to be inherently safe at all! It depends on liquid sodium for heat transfer - with all the potential for fireworks that implies. There is a chance that if the sodium coolant were lost the reactor would blow itself apart. About the only real safety advantage of PRISM seems to be that it takes a while to heat up if circulation pumps fail. PRISM like MHTGR is supposed to come in nice bit-size 135 - 150 MW x 4 bundles.

Other 'new' reactor concepts are GE's SBWR, a sort of simplified BWR. It is very similar to ABWR (Advanced BWR). GE is developing this in partnership with Toshiba and Hitachi of Japan. ABWR does seem to have a good chance of actually being built, but it is hardly a 'new' technology — rather it is the development of existing BWR design. With the continuing slowing down of Japanese reactor construction programme, it is unlikely that more than one ABWR will be built.

Another Japanese design is the 'System Integrated PWR' (SIPWR), a unique PWR with the troublesome steam generators inside the reactor vessel. Given the trouble there has been with steam generator leakage and replacement, this doesn't seem to be such a good idea: when the SIPWR has steam-generator problems they have to replace the entire reactor. Needless to say that no one has built or ordered one yet. (NEI, November, 1909)

It is interesting that at a recent IAEA forum, thee were some speakors who criticized the new technologies. Former US AEC Chief, James Schlesinger said that while the new technologies would probably be developed, there was no guarantee that they would ever be employed *{NE1* Nov. 1989) Schlesinger favoured 'evolutionary' design such as ABWR or SIPWR which he felt might be ready by the 1990s.

Others in the nuclear industry have also suggested caution over the now design. At a conference in Madrid, the chairman of the European Nuclear Society, Hans - Honning Honnies, said that what would influence the public wasn't exotic new design but a proven safety record, and in order for ' current levels' of performance (!) to be achieved, about thirty years of operating experience would be needed. But these speakers while denouncing new nuclear technology wore quick to minimize **the problems faced** by **the current generation of** nuclear reactors !

The upshot of all this is **that 'new generation'** nuclear technology is being marketed with the same unjustfiable techno-optimism and hype as was the old technology, and with even less justification.

Some of the new 'inherently safe' technologies such as PRISM seem to be as inherently unsafe as their FBR cousins, but use the excuse of claimed inherent safety to dispense with containments. Others like PIUS or MHTGR, might have been **a** good idea if they'd have had prototypes deployed some twenty years back, so we could now build a few standardized designs based on solid operating experience - if we weren't sensible enough to opt for energy efficiency instead. As it is if governments foolishly make a substantial commitment to one of these technologies now, they would have the first operating prototypes by say 2010 - 2020. The greenhouse problem by then would have become a whole lot worse, not in the least because money spent on costly nuclear power would save 7-10 times loss C02 than if it had been spent on energy efficiency. *

Inherent safety is the functional equivalent of too cheap to meter.'

Inherent safely is the functional equivalent of too cheap to meter.'

Back to **the** Real **World**

Meanwhile the nuclear power industry keeps slowoing down - the number of reactors under construction continues to drop. According to the industry publication Nuclear Engineering International there wore 109 plants under construction worldwide in December, 1988. By December, 1989, the number had dropped to just 97. Since then more plants in the USSR have been cancelled. According to latest US estimates only four reactors with definite operating dates are still under construction in the US, with nothing not subequently cancelled has been ordered since 1973.

Nuclear programmes in the two great 'successes' of nuclear power, France and Japan too are slowing down. Nuclear ordering in France is on the verge of a complete halt. UK's ambitious PWR programme has been completely scrapped, with construction proceeding only at Sizewell-B.

A recent Greenpease report estimates that
world's nuclear capacity would peak in 1995-96 and would be on the way down by the beginning of the new century.

John Hallam
Chain Reaction
Friends of the Earth,
Sydney, Australia

Testimony

Stoke the furnace, gramma used to tell my daddy-
he'd roll up his sleeves, obediently, and shovel in more lumps of coal;
i watched the fire from the basement steps; innocent, mesmerized
by the crimson flames crackling behind the window into hell;
only my young heart, thump-thumping, recognized the danger.

One day, the coal man came-menacing, dirty man; delivering clouds of dust;
quick, run upstairs into the attic, climb into gramma's trunk from the old country;
ah, just enough to hide a wee one.

i read it in the newspaper:
"hanford....forty years ago....twenty thousand boys and girls, especially babies....
higher doses of radiation than any incident since the dawn of the nuclear ago.
....secrecy maintained.…till now...."

Murky clouds choke out the sunlight; how could they do this to me?
like an abusive parent hiding behind the facade of a respectable home,
the government counts the children among their possessions;
Illusions about government's parental role vanish, but couldn't they say they're sorry?
don't you understand? i wasn't for sale!
not to anyone; not for any reason; most certainly not as a guinea pig!

Rage-shouting, kicked in the gut, "i could kill" rage! who the hell is responsible?
i feel like a blob of raw meat, vulnerable beyond my wildest nightmare;
the fire is seething, rumbling, multiplying like molecules of yeast;

Life is suddenly more precious, more precarious, too;
shall i hide? or go onward into the flames?
what is that noise? my soul, pleading; i'm afraid they'll find me wherever i go.

Remember pogo, a little voice whispers-i've seen the enemy and they is us;
yes pogo, and they is me, too.
you will take care of things, won't you?
creditors are breathing down our neck; we leave on vacation next week;
we have other plans; we're too busy; we don't feel well, maybe later.

Oh, we do some church work; toss some coins in the kettle, even helped a neighbour last week;
attention everyone, please appreciate our generosity;
how righteous we are!

We have fueled the fire with our silence; words unsaid and deeds undone reduced to ashes?
have i been a victim? yes, but so have you!
shall we-you and i-continue to feed the furnace?

Or is it time to gather up the shattered shards from dying coals? is there enough time
to forge a discerning sword? are we willing to risk living love with a thinking heart?
i must-or the flames will consume me.

Arlene Hetherington

Arlene *Hetherington grew* up in Spokone, *Washington. She was nine years* old *at the time of the* deliberate *Radioactive releases from the US* Government's *Hanford* nuclear reprocessing plant *known-as the Green* Run Experiment in 1949. When *she was in* her *thirties, she developed large tumours* on *her thyroid* gland *that* threatened to obstruct her *windpipe. This led to several* surgeries. *When physicians removed the* tumours, *they were found to* contain pre-concerous cells. She now *lives* on Bainbridge Island *and is employed as* a tourism planning *consultant.*
Source: HEAL PERSPECTIVE Vol. 1 No. 3. fall 1990.

Earth Rising

David Oats

Oregon University Press 1989

Earth Rising

David Oats

Oregon University Press 1989

The farmer in India considers listenning' the most important way of learning agriculture. For generations the advice that is handed out is "Go early in the morning to the farm. Go around the entire field and visit each and every plant. It will tell you what to do!" The field, the soil, the crop, the birds, the insects, the water and even the early morning rays of the Sun speak to the farmer. This closeness, in fact, identification with every living and non-living being is considered as the obvious way of a farmer's life.

This oneness with 'life' - an understanding though both obvious and simple is yet to dawn on the modern man'! The SCIENTIFIC man! David Oats is like an early bird announcing the coming - "EARTH RISING". Incidentally, the cover of the book is a beautiful photograph taken from the moon by the members of the original moon landing mission.

"Nowhere in the Solar system is the contrast between a dead and a living planet so conspicuous as on the Moon with Earth Rising'*

"Nowhere in the Solar system is the contrast between a dead and a living planet so conspicuous as on the Moon with Earth Rising"

The book is a manifestation of a vision. The visio highly n for sophisticated buffering devices by the totality of hom life on the planet. The whole Earth, in other words, e functions as a single organism - Gaia. Gaia was sapie the name given to the Earth Godess by the ancient ns to Greeks.

matu The author does not run down science or re 'progress' as such. The scientists are maintaining and empirical rigour and skeptical inquiry: the farmers bolo are trying to wrestle with the whole fact of ng to 'Gaja' existence, to bring coherence out of it. Real *people* - the *need both approaches.*

super *"The essential gesture of ecologism is an act* orga *of deference to the natural world: one adopts an* nism. *atitude of seeking or listening rather than* 'Gaja' *imposing ...."*

hypo Especially potent is the principle of ecological thesis balance, derived from the vision of a stable as ecosystem. Recycling cans, bottles, paper, whatever propo is a ready example, trivial though it may appear sed by Jame s Lovel ock, sugge sts that Earth' s atmo spher e and the ocea ns are maint ained as

Humans! I Mountain am speaking. You cannot ignore met I have been with you since your very beginnings and long before. For millenna your ancestors venerated my holy places, found wisdom in my heights, I gave you shelter and far vision. Now, in return, you ravage me. You dig and gouge for the jewel in the stone, tor the ore in my veins. Stripping my forests you take away my capacity to hold water and release it slowly. See the silted rivers? See the floods? Can't you see? In destroying me you destroy yourselves. For Gala's sake, wake up!

Pat Flemming and Joana Macy:
Thinking like a Mountain

on the surface Behind this practice lios the notion that our cultural habits of consumption and waste ought to be replaced by the habit of gaining the most out of raw materials by using and reusing thorn frugally to ensure enough for tomorrow and for tomorrow's tomorrow. Ecological thinking stresses that human society ought to find a balance between input and output so that nothing essential ever truly runs out.

"Skills unpreventably give pride and confidence. They won't build your character necessarily, but they will unable a breadth of experience where character might clarify. A wealth of skills docs not ensure freedom any more than any other wealth, but it surely can expand choice, which may lead out of some corners. As for wisdom, that's the name for the sustained habit of paying attention, of learning larger by learning longer."
Stewart Brand

Formula for an interesting life: Acquire skills and use them. The more skills, the more interesting the life.

From seeking this balance, understanding it, we go through Cooperation, Cybernetics, The Natural Mind and Ecological Ethics. The chapters unfolding in a manner that can be termed 'natural' - unfolding ideas like a bud; opening the leaves slowly, silently, positively and refreshingly fresh!

Hence the reader enjoys the spectacle of nature while reaching for wisdom!

Walter R. Canon in his The *Wisdom of the Body* (1932) provided an early glimpse of the deep inter-connectedness of different kinds of biological systems. The book is about the human organisms ability to regulate its internal state; keep its temperature, fluid levels and concentrations and the like within acceptable limits. Canon's term for

this process was *homeostasis* - the means employed by more highly evolved animals for preserving uniform and stable their internal economy... He applied homeostasis to other biological systems and carried this process right up the scale from single cells to human civilizationa. *"Just as in the body physiologic, so in the body* politic, *the whole and its parts* are mutually dependent; *the welfare of the large community and the welfare of the individual* members *are reciprocal*....."

David Oates discusses Bill Devall and George Session's 1985 book 'Deep Ecology - Living as if Nature Mattered'. The book follows the insights provided by the philosopher Arne Ness.

"Ecology as a science does not ask what kind of society would be the best for maintaining a particular ecosystem - that is considered a question for value theory, for politics, for ethics. As long as ecologists keep narrowly to their science they do not ask such questions. What we need today is a tremendous expansion of ecological thinking into what I would term 'ecosophy'... a shift from science to wisdom." In the author's view, 'Deep Ecology' "Is trying to exclude a large part of the ecological movement from full membership." The suthor rightly stresses the need for inclusion of all efforts also contradictions.

The author feels that the ecological world-view has found its way through the eightees with surprising vigour. His assertion that, "It seems certain that the physical realities of the earth, as well as the psychological and spiritual needs of its human inhabitants will guarantee an interesting creative future for the world view of ecology." is a view with which we cannot but agree.

"The meaning of life to Faustian man, is will and victory. The meaning of life to the ecologically wise, is *life itself,* over which "victory" is a meaningless concept. Wisdom takes satisfaction in understanding the limits of power, how to avoid hurtful exertion within a naturally balanced whole. Knowledge is very strong, and is in many places around us transforming the world for the worse. Only character can remake and control this knowledge; only the wisdom of the centered, balanced person, who knows that life and mind are part of the earth itself."

Copernican view shifted the world from the centre of the universe; the ecological view attempts to shift humans from the centre of all life on earth. For all of us who are looking for "life" this book has covered the major grounds so far. This is an important book, if not the book to gain an insight into the ecological world view.

Jyotibhai Desai
Vedchhi

EMERGENCY PLANNING

IN CASE OF NUCLEAR ACCIDENT
TECHNICAL ASPECTS
Proceedings of a Joint NEA/CEC Workshop
OECD Paris 1989

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IN CASE OF NUCLEAR ACCIDENT
TECHNICAL ASPECTS
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The Nuclear Energy Agency (NEA) was established in 1958 with the aim of furthering the development of nuclear power as a safe, environmentally acceptable and economic energy source. The agency organises workshops and seminars at which participants can exchange tochnical information and harmonise national regulatory practices.

Emergency Planning in Case *of* Nuclear Accident is a collection of papers presented at a workshop held in Brussels on 27th - 29th June, 1989. It thus represents some of the latest (post Chernobyl) thinking on the subject in the rich countries of the world. This book is an important contribution and deserves to be resd especially by public authorities who have boon entrusted the task of ensuring public safety during nuclear emergencies. It is divided into four sections besides the overview. The topics dealt include the basis for emergency planning, surveillance and monitoring, experiences from chomical emergencies and from conducted exorcises.

The major shortcoming of the book is the fact that it is written in oficiallese. Perhaps that cannot be helped since it is a collection of documents written by officials and for officials. Nonetheless it does make reading the book a chore. However, a diligent study does bring forth some useful nuggets of information. For example : there are separate considerations that need to be taken into account while doing emergency planning. In the zone immediately next to the nuclear facility the main considerations are protective measures like evacuation, sheltering, thyroid blocking that are of primary importance while in the regions some distance away one needs to plan basically with a view to control foodstuff and water. USA has the largest emergency planning zones of any country. The primary zone there extends up to a radius of 16 km from the plant site while the secondary zone extends upto 80 km. Contrast this with India where the primary zone is just 8 km. and the secondary zone just 16 km from the plant site. But contrast both with what happened at Charnobyl. There, people within a radius of 30 km had to be immediately evacuated while hot spots (regions

with abnormally high radioactive contamination whose agricultural produce is unfit for consumption) were found hundreds of kilometres away. Thus, one finds that contrary to oft stated assertions, the lessons of Charnobyl have still not been learnt anywhere in the world. Nucleocrats are yet placing unbounded faith on that totally

discredited axiom : "Nuclear disasters are extremely rare events and more severe the accident the less its likelihood of occurance."

Similarly, it is interesting to note that intrvention levels (guidelines to decide appropriate protective measures) vary from country to country. While in Germany, sheltering is advised for a dose of 5 m Sv and is mandatory above 50 mSv, in the UK it is advised at just 3 mSv and becomes mandatory at 30 mSv. For comparision, in India, sheltering won't be resorted to till an exxternal dose of 10 mSv is reached though it is mandatory at or above 50 mSv.

Priced at 220 French Francs for the paperback edition the book, is way beyond most Indian pockets. But it may be a good buy for libraries and documentation centers. Needless to add that it is extremely well produced in terms of printing binding and get-up.

EXCERPT

Now accident analyses represent substantial advancement in many areas. Perhaps the most important conclusion is that large early releases given a core melt accident still seem possible. Thus, provisions must be made for coping with such releases, so the scope of emergency preparedness cannot be reduced at this time.

A second very important conclusion is that the time and the magnitudes of releases cannot be predicted by the operators with confidence in real time. After over 20 years of study, there remains considerable uncertainty and controversy amongst experts regarding the timing and magnitude of source terms.

Source term :
Radioactive release during *an accident*

There is important positive information. First, there should be at least two hours warning before a major release, so early emergency response could prevent fatalities regardless of source term. The new analysis describes core melt accident as unmistakable by the time core damage starts. With the cooling provided by natural circulation, melt-through and a substantial radioactive release to the environment should be at least two hours away. This time can be used effectively by poople if they are provided early warning.

Secondly, early evacuations even within only two to three miles of a plant can substantially reduce the conditional risk of early fatality and injury, regardless of the source term.

This is consistent with other reports in the US that risks do reduce markedly during the first two to three miles and then slowly thereafter. Fortunately, much more time would be available for radiological monitoring teams to identify hot spots beyond this distance - where relocation from shelters might be prudent or necessary.

The overall implications of these new studies for emergency preparedness are :

Don't delay an evaluation within two to three miles if a core melt accident is indicatod.

Monitor for hot spots as soon as possible after a release.

It is important to remember that core melt accidents are not expected. Thus a protective action scheme based on initiating early precautionary evacuations for a core melt sequence but not otherwise, would accomplish as several things simultaneously :

Planned evacuations should be vrry rare, since they are warranted only by core molt accidents.

Prudent, precautionary evacuation would be initiated early, for cause.

Early evacuation within two to three miles considerably reduces risks (by a factor of ten or more).

Hot spots beyond two to three miles can be readily identified after a release and relocation from them can be accomplished in a more leisurely manner to accomplish dose saving objective.

EXPLOSION AT SOVIET FUEL FABRICATION PLANT

The official Soviet news agency Tass has reported that an explosion took place on 12 September '90 at the Soviet fuel fabrication plant in Ust-Kamenogorsk in Kezakhstan, a city with a population of a half million, located near the border of the USSR, Mongolia, and China. According to Tass, no fatalities occurred, but many people are said to be injured. Panic broke out and many left the city.

Tass stated that the explosion occurred in an underground beryllium production facility, Ulbinsky metallurgical works, causing a fire which resulted in a gas cloud that moved out over the area. The toxic gas containing beryllium hung over residential districts for most of the day before being dispersed by the wind. Days later the streets and houses were still being hosed down to keep poisoned dust from flying into the atmosphere.

The area has been declared an ecological disaster zone. Separate reports say, however, that a medical team from Moscow has determined that there is no risk of substantial health effects on the local population (where have we heard that before!), although some areas are contaminared with beryllium at 60 times the allowed level. It has also been stated that the facility will be closed though no date was given.
Source:
WISE *NEWS COMMUNIQUE 339 340.*

LETTER BOX

To sin by silence makes cowards of men. Let them who dare, speak and speak again to right the wrong of the atomic lies."

This is in reference to your editorial in Vol. 4 No. 1 regarding the unjust dismissal of Prof. R.G.V. Menon. I have closely watched the operations of Atomic Energy Commission since the days of Dr. Bhabha. Throughout, it has been a performance characterised by lies and lies only and the people have had to pay the price for nucleocrats' folly.

Prof. V.L. Talekar
C-169, Bajaj Nagar,
Jaipur 302015

I have been reading every bit of Anumukti since December 1989. In the June/July '90 issue there was a very good story under the title "Dirty Tricks of Decent Men" on renewable energy sources written probably in response to Dr. M.R. Srinivasan's published observations regarding renewable energy sources.

Till recently the Department of Non-conventional Energy Sources (DNES) was headed by Dr. M. Dayal, who used to be chief superintendent of Tarapur Atomic Power Station a long time ago. Now, after retirement from DNES he has returned to Department of Atomic Energy and is now posted in Nuclear Power Corporation's Delhi office as a Senior Technical Advisor. The overall prospects for renewable energy sources in India are just as bleak as those for atomic energy.

During the coming decade, say even by 2010 neither atomic energy nor new/renewable energy sources will contribute much to the country's requirements. Fossil fuels like coal, oil/gas and hydro will continue to dominate the energy scene.

Truly speaking scientific temper has not yet developed in the country. We only do our accounting in terms of per capita electric power consumption. We are least bothered about the proper and judicious utilisation of the abundant natural and human resourced available in the country. The politicians, bureaucrats and technocrats have developed a nexus among themselves to propagate and promote their vested interest at the cost of the poor. They have invented very treacherous and tricky terminology like "socialistic pattern of society", "poverty removal programme", "Jawahar Rojgar Yojana", and the very recent "Mandal Commission".

While energy conservation has become the foremost agenda for advanced countries, this is the least talked about item among both government as well as voluntary agencies in this Country. Electricity generation industry in India has a huge potential to improve capacity and availability factors. Just the leveling of peak demand would Yield at least 15 to 20 percent. The transmission losses in India are the highest in the world. Thus, there is ample scope for improvement. But neither the poftticians, nor the bureaucrat or the technocrat have bothered to do anything in this direction. In every sector of our economy, the picture is the same whether it be chemical industry, transport or agriculture. There is everywhere misutilisation. Either there is underutllisation or there is over-utilisation. For examples of the latter just think of suburban trains or buses in Bihar or the trams of Calcutta. We are living in poverty as well as plenty.

Dr. *G.G. Prasad*
7-C Kedarnath,
Anushakti Nagar,
Bombay 400094.

I am writing this letter on behalf of our small group NILA which is working on environmental awareness. At present we are campaigning against the proposed nuclear power plant in Kerala. On October 2nd we will be organising a protest march at Kottayam in which prominent public personalities like V.R. Krishna Iyer and Sugatha Kumari are expected to join with us.

I read "Chernobhata?" in Third World Network Features No. 486. I would like to have more information regarding issues related to nuclear energy. If you could send us some materila, that would be a great help in writing about the issue in Malayalam. We will be translating "Chernobhata" and publishing it in Kerala shortly.

Since we are here in a small village, gathering information is not easy. So please help us. Also send a note about the materials available with you, so that one of us might come to Vedchhi to refer to it.

Abey George
Ayamkudy, P.O. Muttuchiro
Kottayam, Kerala 686613

Editor's Note :

Over the years we have collected an enormous quantity of material regarding various facets of the nuclear issues. Also, since we too live in a small village, xeroxing the material is not easy and entails a long trip. We do try to send copies of material with respect to some specific requests. However, Abey George's idea of someone coming to Vedchhi to sort through these piles is most welcome. All are welcome to come anytime and research the material.

DISQUIETING ADVERTISEMENT

A recent advertisement by the Nuclear Power Corporation features glass of milk and some vegetables in an attempt to convey that a nuclear reactor is just as harmless. As irrefutable proof it gives radiation levels in terms of milllrems from different natural sources and compares it with the expected level of emission from a reactor. But the trouble with the radiation estimate is that it represents the ideal, even wishful figures as if already achieved nay as if they wore the basic characteristic of the plant. This way, what is inherently unsafe is made acceptable.

The true story of nuclear programme everywhere is heavily stained with accidents and leaks

and an aggresive cover-up of it by the state run agencies. While the mighty explosion at CIOrnobyl was sufficient to seal the fate of nuclear power in most countries, we in India are still planning a ten-fold increase.

The very beginning of the nuclear cycle, the process of mining and refining radioactive materials, is one of indifference to health of workers and the local population. A few years back, V.T. Padmanabhan published his findings of the hazards created by the Indian Rare Earths Plant at Alwaye, Kerala which established beyond doubt that the people working in the plant had a far higher incidence of radiation related diseases than those working in other industries in the region. The Times *of India* in its main editorial had called this "Disquieting News".

Even in industrially advanced countries independent research on the health of workers in nuclear plants and on people living in its vicinity has confirmed that the claims being made by nucleocrats are an eyewash. At Sollafield nuclear reprocessing plant in the UK, it was found that the levels of leukemia and non-Hodgkin's lymphoma were ten times as higher than expected for local children.

An advertisement that equates the harmful effects of a nuclear plant with a glass of milk and vegetables sounds a gruesome joke.

Kersi *Sabavala*
Mohite BIdg. near *Amardeep Apt. Baroda 390001*

Editor's Note :

No, the trick Is not in presenting ideal figures as actuals though there is that of course. The real trick lies in averaging. Consider any nuclear plant however badly run, say Chernobyl for example. The average dose to the people of the world from Chernobyl has been less than the natural background since most people in the world do not live near Chernobyl. Even the number of fatal cancers produced by the Chernobyl disaster, though it may eventually be well over a million, is negligible in comparison to the 'natural' occurence of cancer in the world. Thus, by averaging over a large enough area any polution can be shown to be much less than the 'natural'. The trouble is that there are a large number of people who receive a dose which is much larger than the average.

NUCLEAR NOTES

SOVIET N-PLANT SINKING? The Kalinin nuclear power station, 100 km north of Moscow, could sink into the ground at any time, resulting in another Chernobyl. According to Nikolai Gladkov, chief hydro-geologist with the Kalinin Geological Survey, the station is built on karst limestone which is full of hollows and crevices. To make matters worse, the two new units now being built will need subterranean waters for cooling. Gladkov warns that pumping water could cause a "sudden catastrophic" subsidence.
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Anumukti staff regrets the late publication of this issue. All sorts of causes, from Diwali to riots to computer viruses conspired to bring about this unwelcome outcome. We hope to bring out the next issue by the 15th of December.

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