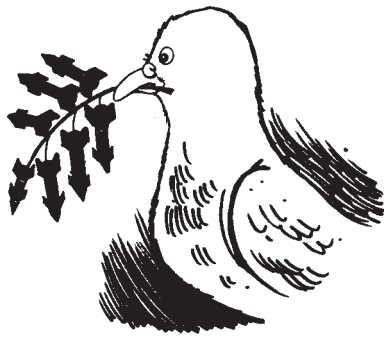
Irfan Hussain



India's Nuclear Prowess

False Claims and Tragic Truths

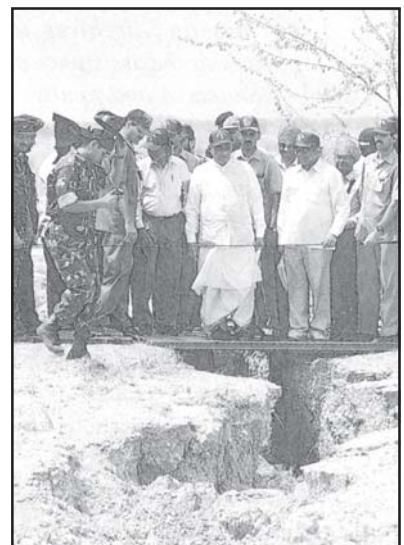
❍ **Buddhi Kota Subbarao**

While the people of most other countries have a good deal of information on their civilian nuclear power programmes, Indians have no such access. There is no well-defined boundary line between India's civilian programme to produce nuclear power and its military programme to make nuclear weapons. A veil of secrecy covers both, which comes in handy to hide from public scrutiny the vast sums that are being wastefully spent to produce a tiny amount of our power requirements. Our mismanaged nuclear power stations are an enormous financial burden on our people.

Even more importantly, Indian politicians and bureaucrats have managed to cover up the innumerable violations of minimal safety standards that have begun to take their toll in terms of public health and environment. They inflate the accomplishments of our nuclear scientists without fear of being exposed. The poor scientific work is hailed as spectacular progress and thus the pretence of competency of the Indian nuclear power establishment remains unexposed.

For the past 50 years, civilian nuclear energy projects have been a monopoly of the Department of Atomic Energy (DAE). Enormously powerful and influential within the government, the DAE has time and again stymied attempts by academic institutions to open nuclear engineering departments. This has led to a vacuum of nuclear expertise outside the DAE. Careers in this field are now controlled to a large extent by the serving and retired personnel of the DAE, which makes any expert and independent criticism of its functioning rare. Though in private, many knowledgeable scientists within the DAE are quite critical of the DAE, in public, there are few who do not sing its praises.

The Comptroller and Auditor General (CAG) of India, the constitutionally designated auditor of all public funds in the country, does not currently audit the DAE. It functions more or less as the personal fiefdom of those at its top. They use the issue of national security as one among other unjustifiable excuses to perpetuate their lack of accountability to constitutionally mandated authority.



Prime Minister Vajpayee at Pokhran

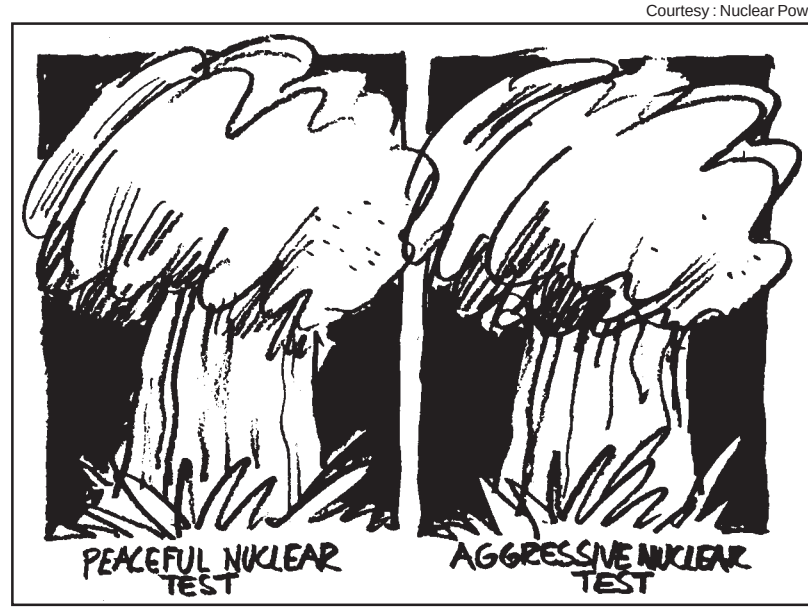
The Atomic Energy Regulatory Board (AERB), established to monitor nuclear safety, is so structured as to make it possible for the person who is at the helm of DAE to overrule the AERB if it ever attempts to expose DAE. The manpower and financial resources of the AERB are controlled by the DAE. The AERB has no autonomy as it depends, to a major extent, on DAE for funds, manpower, technical expertise and material resources.

In fact, the chairman of the AERB reports to the overall head of various departments under DAE which are supposed to be regulated by the AERB. The apex policy-making body in nuclear matters in India is the Atomic Energy Commission (AEC). The chairman of AEC is also DAE secretary. He is also the chairman of the Nuclear Power Corporation of India Limited (NPCIL), which builds and operates nuclear power plants. The AERB chairman reports to the AEC chairman, who can overrule anybody in the AEC except the finance member.

Another major anomaly in the composition of AEC is that the officials whose actions are scrutinised by the AERB, like the managing director of NPCIL and the director of the Bhabha Atomic Research Centre (BARC), are members of AEC, but the chairman of AERB is not a member of AEC. Such facts appear to have provided the former AERB chairman Dr A. Gopalakrishnan the basis to say in an interview to *The Times of India*, Mumbai (June 18, 1996) : "During my

six-year-old association with the AERB (three years as a member and the remaining period as chairman), I was able to study the nuclear regulatory process thoroughly. I discovered that it was a total farce. I was of the opinion that the government and the public should know this because ultimately they finance the nuclear establishment. My straightforward attitude was not liked by the top bosses of the establishment. The DAE wants the government and the people to believe that all is well with our nuclear installations. I have documentary evidence to prove that this is not so. A national debate is needed. My only concern was to ensure the safety of the employees and the people at large." It is clear that present and future generations in India face grave risks to their lives and environment from the nonchalant approach of DAE to nuclear safety."

Courtesy : Nuclear Power



Aged Nuclear Power Plants

Many of India's aged nuclear power plants are capable of continuing operation only by totally ignoring the internationally established safe radiation limits. In any other country, the nuclear regulatory authority would have denied permission for these aged plants to operate. In India, they continue to be flogged much like old bulls in the countryside who are forced to pull bullock-carts despite lacking sufficient strength.

Most Indian nuclear plants have been plagued by design or mechanical defects that have severely curtailed their output. A discussion on how fit India's nuclear power plants are may be useful.

TAPS : Radiation Leaks

The Tarapur Atomic Power Station (TAPS), located about a 100 miles north of Mumbai, was commissioned in 1969 as a turnkey project by General Electric (USA). It uses ordinary water as a coolant and moderator. It is called a Boiling Water Reactor (BWR) because water boils in the reactor to form steam. The steam thus formed is used to run a turbine which is coupled with an electric generator to produce electricity. The installed capacity of TAPS is 420 MW (two units of 210 MW each). However, due to ageing and excessive radiation levels, TAPS has now been downgraded to 320 MW (two units of 160 MW each).

While the DAE and NPCIL continue to churn out glossy magazines and newsletters about TAPS in which problems never find a mention, many crucial questions regarding its functioning remain unanswered, which may also serve as indicators of the problems other plants may be facing. These are as follows :

- What are the radiation levels in various sub-systems, machinery, pipes, pumps and engineering components of the BWR at TAPS? Are these radiation levels within the limits of the internationally accepted safety standards?

The intergranular corrosion of primary piping in the BWR is well known. For example, due to a leaky emergency condenser tube in loop A of TAPS Unit 2, on May 13, 1992 about 11.94 curies of radioactivity was released into the environment. On many occasions, such leaks of radioactivity have been hushed up. The tube failure is attributed to corrosion-assisted thermal fatigue.

The amount of iodine-129 and other radioactive substances discharged from the Tarapur complex remains unknown. The half-life of iodine-129 is approximately 16 million years. If radioactive iodine makes its way into the body in excessive quantities, it accumulates mainly in the thyroid gland and can cause a variety of illnesses including cancer.

- What has the NPCIL done to examine the integrity of the core shroud in TAPS, in the light of the recent observations of cracks in many foreign BWR shrouds? Why has the NPCIL not made public its findings from the examination of the core shrouds in TAPS?
- How safe is the sea at Tarapur from excessive radiation levels? Are the fish and other marine life in the sea affected by the radiation brought in by effluents from the nuclear power plant and the nuclear reprocessing plant at Tarapur?

In September 1989, it was reported that highly radioactive iodine had been detected in seaweed gathered around Tarapur plant. Scientists of BARC paid a price for publishing in a marine science journal that the amount of iodine-129 found at Tarapur was 740 times the normal level. The scientists had concluded that the main cause of this unnatural amount of iodine was the nearby fuel reprocessing plant. This revelation made a splash in the newspapers and was also subsequently referred to at several fora.

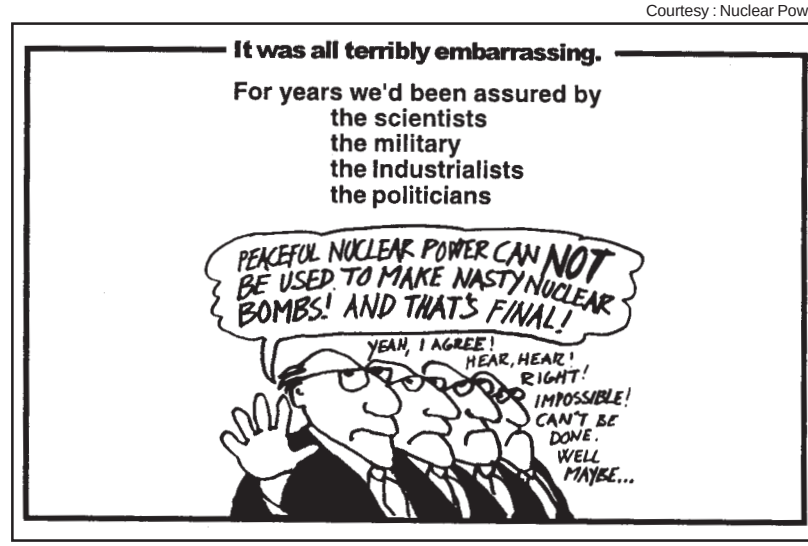
➢ Why is the NPCIL reluctant to make public the radiation dose levels reported in the medical records of people working permanently and temporarily at TAPS? Hundreds of workers have reportedly been exposed to excessive doses of radiation at Tarapur.

For example, labourers brought from outside are sent home after they receive excess doses of radiation. They are not informed of the dangers of radiation. Many a time, there is not even a record of their having worked at Tarapur. According to knowledgeable sources, at least 300 workers at Tarapur have been exposed to levels of radiation far higher than the permissible 5 rems per annum. On March 14, 1980, cooling water leaked from the No.1 reactor, and 26 workers engaged in repairs had to be rushed to a hospital in Mumbai.

The Tarapur plant has been operating since 1969. Its counterpart, built in the USA, the Dresden-I, underwent many modifications, all of which did not extend to Tarapur. The Dresden-I plant, in its original form, no longer exists anywhere else in the world, but it remains in operation in India.

Is NPCIL willing to allow an independent body of experts to inquire into these questions concerning Tarapur?

Courtesy : Nuclear Power



RAPS : Root of Genetic Disorders

Rajasthan Atomic Power Station (RAPS) at Rawatbhata in Rajasthan has Pressurised Heavy Water Reactors (PHWR) of Canadian design. It has two units, each of 220 MW installed capacity. Unit-I went critical in 1972, Unit-II in 1980. But due to various technical problems, neither of the units ever worked at its installed capacity. In fact in Unit-I, a crack in the endshield of the reactor core forced the plant to shut down for several years in the 1980s. Some patchy repair work was done, but it is now running at only a third of its rated capacity. Unit-II had tube leakage and other technical problems and it could never operate continuously at its rated capacity. Unit-II was shut down in August, 1994 for about three and a half years. Recently, 306 coolant tubes in Unit-II were replaced at a cost of Rs 170 crore.

Canada was the original designer of the PHW reactors adopted for our Rajasthan, Madras, Narora Uttar Pradesh, Kakrapara (Gujarat) and Kaiga (under construction in Karnataka) power plants. What has been Canada's own experience with this type of nuclear reactor? In August 1997, it became known that North America's largest electric utility and a major investor in nuclear power, Canada's Ontario Hydro, had to shut down seven of its 19 reactors and spend $1.2 billion in neglected repairs, and more on increased fuel costs. A critical study revealed that operators of the province's 19 nuclear reactors routinely ignored maintenance schedules and pushed the operating capacity of the plants to their limits ignoring the leaky tubes and valves and other deteriorating conditions. The release of water contaminated with radioactive heavy metals into lake Ontario was discovered as early as 1980, but the public came to know it only in 1997 after considerable irreparable damage to the bed of Ontario lake and the surrounding environment. Moreover, it is now admitted that the seven aged nuclear plants in Canada can be repaired and reconditioned only if any reasonable cost-benefit analysis is totally ignored.

The nuclear power plant in Rajasthan has reached a much worse state of deterioration than the seven nuclear plants in Canada which are slated to be shut down shortly. Instead of shutting down our aged nuclear power plants, hundreds of crore of rupees are wasted in costly

and futile repairs like the ones on Unit-II of RAPS. There are instances of nuclear radiation taking its toll in Rajasthan with cancer and leukaemia in workers having been reported.

Dr Surendra Ghadekar and Dr Sanghamitra Ghadekar carried out a detailed study and reported various radiation injuries, including genetic disorders among inhabitants of five villages. These reports have never been refuted by DAE. Their study demonstrates that radioactive emissions from RAPS nuclear power reactors are responsible for the radiation-induced disabilities among villagers in the vicinity of the plant.

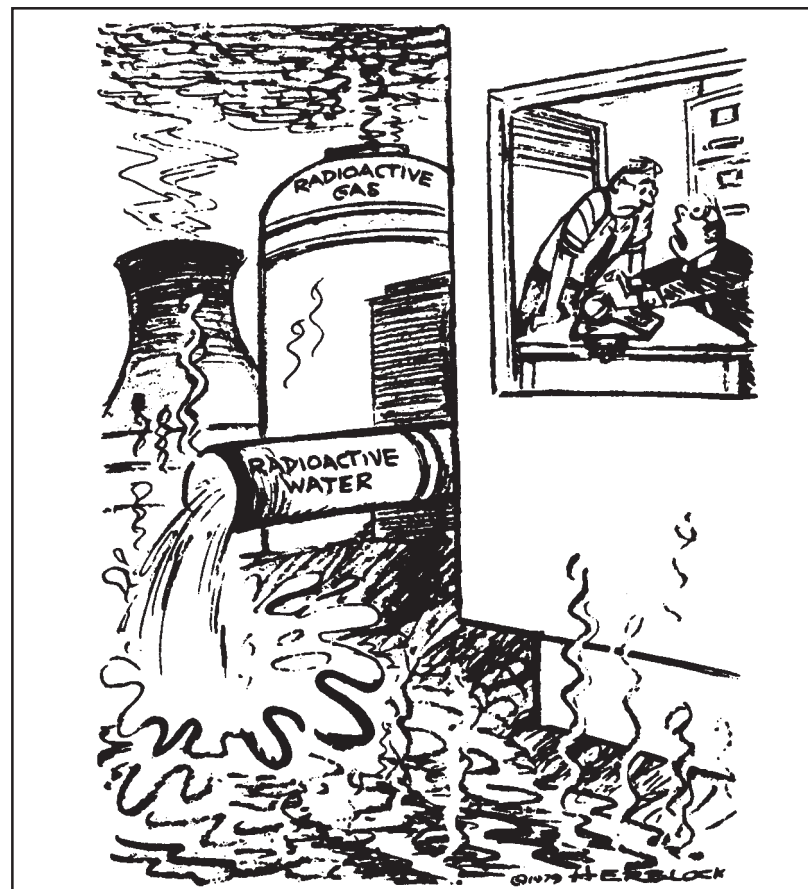
MAPS : Marine Life in Chaos

Madras Atomic Power Station (MAPS) at Kalpakkam near Chennai also has PHW reactors of Canadian design. It has two units, each of 220 MW installed capacity, the first went critical in 1983 and the second in 1985. However, due to technical and safety problems both the units have been downgraded to 170 MW each.

Both units ran into major problems soon after they were commissioned in the mid-1980s. The moderator distribution systems collapsed inside the reactor and advanced robotics had to be developed to remove the debris. The NPCIL was able to only partially solve the problem and as a result both the units are forced to run at about 75 per cent of their rated capacity of 220 MW each. Unit-I of MAPS also faced a major problem in 1990—a broken turbine blade. The problems triggered by that breakdown required the use of industrial robots to repair them.

The fishermen near Kalpakkam know that when both the units of MAPS are in operation, the temperature of the sea around it rises excessively. They say that when they go out to sea during those times in their small boats they are unable to catch fish because if they get hit by a wave while they are out fishing, they start to itch and the lower half of their body breaks out in blisters.

There was a time when crab, shrimp, shellfish, and a variety of multi-coloured fish could be found in abundance near Sadres, a quiet fishing village at the southern end of the Kalpakkam nuclear complex. The havoc caused to local life due to the plant is described by Japanese journalist Tashiro Akira and others who visited several nuclear sites in the world including India. Their findings were published in a book titled *Resume*. The fishermen tell them... "The reason why our catches have declined so drastically is that plant. The warm waste water that comes out of these keeps the fish away, particularly in the area within a few miles' radius of the outlet." The villagers added, "Lots of dead fish are floating out there. We gather them up and make *karuvadu*." The Japanese journalists mention that *karuvadu* is a dish made by salting and drying fish for two or three days. The journalists heard from the villagers of Sadres: "It all goes to market. People here won't touch the stuff because they know where it's come from. The villagers take their catch of *karuvadu* to Madras and sell it there, where it provides a cheap source of protein for the poor people in the city." When the journalists asked whether it was actually safe for people to eat this fish, the reply was, "Well, they're probably contaminated, but we can't catch anything else, and there is hardly



'This is an emergency—we've got to prevent any leaks of information!'

Herblock, The Washington Post

any money coming in at the moment. We don't have any choice."

NAPS: Environment Ministry Caught Napping

Under normal conditions, the temperature of the sea around Kalpakkam is about 85 degrees F. When both the units are in operation, the temperature at the outlet shoots up to 140 degrees F, a dangerous level. If these are the temperature and radiation levels near a nuclear power plant with a capacity of less than 340 MW of the present rated capacity, what will be the situation at Kudankulam when the 2000 MW power plant goes into operation further south on the Tamil Nadu coast? Has the Ministry of Environment examined this aspect before giving environmental clearance to the two Russian VVER 1000 reactors of 1000 MW each slated to be installed at Kudankulam?

NAPS : Saved from Chernobyl

The Narora Atomic Power Station (NAPS) in Uttar Pradesh also has PHW reactors of Canadian design. It has two units each of 220 MW installed capacity. The first went critical in 1989 and the second in 1991.

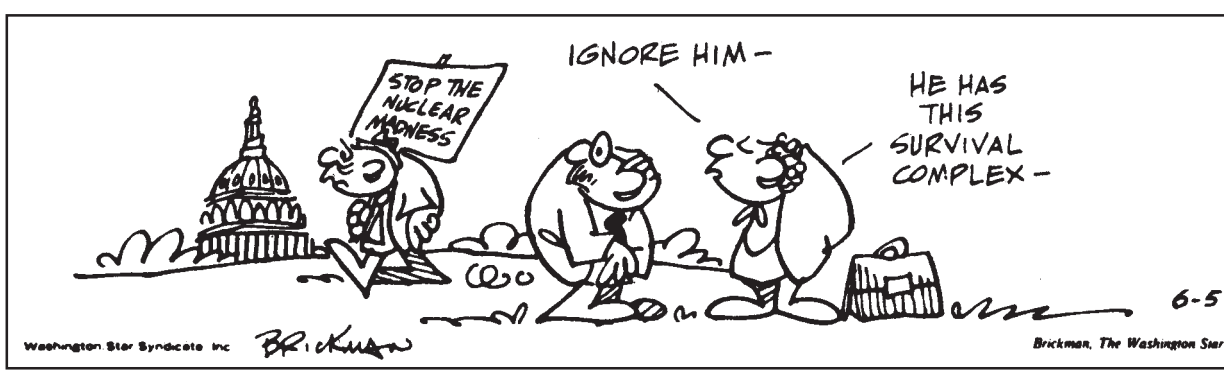
On March 31, 1993 there was a serious accident at NAPS. India was close to repeating Chernobyl, in a nuclear disaster that could have changed the very face of this subcontinent. That night, a fire broke out at NAPS and for several agonising hours the country's nuclear establishment feared the worst. But, as soon as they managed to avoid a catastrophe, the accident was, as usual, played down as a minor incident and within weeks of its occurrence, it was allowed to be forgotten. But the truth partially surfaced, and whatever has already come to light is unnerving, to say the least.

The finding of an expert committee set up by the AERB to look into the causes of the Narora fire shows just how close the incident came to becoming a disaster because of the major chaos in the system. The fire broke out at 3:31 a.m. that day after two blades in the turbine generator of Unit-I at NAPS snapped under accumulated stress. The broken blades then sliced through 16 other blades, destabilising the turbine rotor system and causing it to vibrate excessively. Within seconds, pipes carrying hydrogen gas that cools the generator burst and caught fire. It rapidly spread to the oil used as a lubricant and engulfed the entire transmission complex. The cables of four power supply systems that act as back-ups in case of an emergency were also burnt, causing a total blackout within just six minutes of the fire.

Before operators in the control room were forced out, choking on the smoke brought in by poorly located ducts, the computers confirmed that the reactors in Unit-I and Unit-II had automatically tripped. The men then initiated the crash cooling command to rapidly dissipate heat in the core. After the complete power failure, using torches, some of them climbed to the top of the reactor building to open valves that would release boron in liquid form, which prevents the nuclear core from turning critical again. Full power was restored 17 hours after the fire broke out.

There were major flaws in the design and installation of the Narora plant, both procedural and structural, as detected by the AERB committee. Moreover, there were two immediate reasons for the occurrence and the consequent complications of the Narora accident in March 1993.

The first reason was that they ignored a warning from the UK-based General Electric Company (GEC) which had transferred the turbine blade technology to Bharat Heavy Electricals Limited (BHEL). GEC had informed them as far back as 1989 of the possibility of such turbine blade failures as it had already observed 41 cracks in 5,304 similar turbine blades used elsewhere in the world. They had recommended design modifications for blades that had finished more than 10,000 running cycles. Unit-I of Narora had in fact completed 16,251 cycles and therefore there was an obvious failure on the part of the scientists at Narora to carry out the modification as per the warning from GEC. Even now, no one is being



Brickman, The Washington Star

held responsible for this failure which was so dangerous and which resulted in a loss of several hundred crores of rupees to the exchequer.

The second reason was that the power cables for each of the four back-up power supply systems were laid in the same duct without any fire-resistant material dividing the layers. As a result, the fire from one set of cables spread to the others and made the emergency remote control systems unavailable. Fortunately, the fire at the Narora plant did not spread to two giant oil tanks on a lower floor in the same building, or to 14 spare hydrogen tanks stored nearby, or else much more damage would have resulted.

But for the heroism of the person who climbed atop the reactor in darkness to open manually the boron flow valve, there would have been more serious complications. Strangely, the country does not know the identity of this person. In any other country, such a brave act and devotion to duty would have been appreciated and amply rewarded.

Even stranger is the fact that two enquiry reports—one by the AERB Committee and the other by the Committee set up by the NPCIL, have not been made public. In a similar fire accident on March 22, 1975, at the Brown's Ferry Nuclear Plant near Decatur, Alabama, the US Nuclear Regulatory Commission published a detailed report on February 1976, marked it NUREG-0050, and made it available to the public at $5 from the National Technical Information Service, Springfield, Virginia.

The AERB committee found that the total loss of power had led to other major failures. The most serious was the loss of containment integrity. NAPS was the first of the reactors to be built with a double containment feature. The primary containment chamber was backed by another thinner dome. Nitrogen was used to create a difference in pressure between the two zones as a further prevention against leakage. But during the total failure of power and the consequent black-out, the nitrogen back-up system failed to function. As a result, the door seals of the airlocks were deflated. If a core meltdown had occurred, the radioactivity would have leaked out.

Everything is under control

The expert Committee's findings were not disclosed even to the Parliament. Having been misguided and misinformed by DAE, the Standing Committee on Energy of the Lok Sabha got a distorted view that reduced the Narora accident to a minor fire and gave a clean chit to DAE and NPCIL without any critical references.

However, despite protests from NPCIL, the AERB classified the Narora fire as a serious incident meriting a level-3 rating under the international nuclear event scale. It meant that if any further failure of safety systems had occurred it could have resulted in a nuclear accident in which even radioactive substances might have been released. From all accounts, the Narora fire in March 1993 in Uttar Pradesh was India's worst nuclear accident since its first nuclear power plant was commissioned at Tarapur, Maharashtra, in 1969.

The DAE admitted before the Standing Committee On Energy (1996-97) of the 11th Lok Sabha that the Narora fire had triggered a chain of events resulting in long shutdowns required for rehabilitation and modifications, not only at Narora but also at Madras and Kakrapara atomic power plants. Our position in nuclear power would not have been as bad as it is now if there had been greater accountability and effective regulation. It is a practice with our nuclear establishment to keep everything a secret. As a result, the public in India is in total darkness regarding the mishaps in our nuclear plants which the NAPS incident amply illustrates.

KAPS : Faulty Systems, Outmoded Procedures

Kakrapara Atomic Power Station (KAPS) in Gujarat also uses PHW reactors of Canadian design. It has two units each of 220 MW installed capacity. Unit-I went critical in 1992 and Unit-II in 1993.

There was a near-disastrous fire accident in 1991 at the KAPS plant. Extensive damage was also caused to the plant by floods in 1994, which is considered a curse by the nearby villagers. Deterioration in the health of the people and in the purity of environment around the plant is

quite visible. Amongst the safety issues in technology adopted for KAPS, the following remain unresolved by the DAE:

- The coolant tubes in KAPS Unit 1, very much like the coolant tubes in RAPS and MAPS, are made of zircaloy, which has been discarded internationally as a coolant tube material. As of now, all these coolant tubes are in different states of hydriding and embrittlement. Hence, they are very much prone to catastrophic failure which, when it occurs, is bound to release massive doses of dangerous radioactive material from the core. Moreover, certain operational procedures in these power plants are outmoded and of such hazardous type that even if the coolant tubes were made of acceptable material, they would be prone to multiple fractures.
- The Emergency Core Cooling System (ECCS) designed for modern practices and installed in KAPS and NAPS, which should have been tested for its proper functioning at the initial stage of the project, was not tested functionally even once. After a furore in the print media, the ECCS was finally tested in KAPS Unit-II, but the system failed the test. Some design and procedural changes were required to make the system perform satisfactorily. Those changes are yet to be carried out in NAPS and KAPS Unit-I We do not know why they are not being carried out at these other nuclear plants.

KAIGA: Unprecedented Collapse of Containment Dome

Kaiga Atomic Power Station, now coming up in Karnataka, will have six units of 220 MW each. They are of Canadian PHWR design. Two units are already under construction. The containment dome of Unit-I collapsed in August 1994 and so the construction schedule of Unit-I slipped. It is now expected to be commissioned at the turn of the year 2000. Unit-II is expected to be commissioned by April 1999. So far the DAE has spent Rs 2,200 crore on the project.

The collapse of the containment dome of Unit-I of the Kaiga plant in 1994 was unprecedented. In the more than half century of worldwide nuclear power history, such a thing has never happened anywhere else. If such a collapse had taken place during operation of the nuclear plant, about 130 tonnes of concrete falling from a height of nearly 30 metres would have damaged the automatic control rod drives that lie below the crown of the dome, disabling them and making the safe shutdown of the reactor difficult. The massive weight of concrete might have led to damage to the nuclear coolant pumps and pipes, resulting in severe loss of coolant. This could have led to nuclear core meltdown and the escape of large amounts of radioactive substances to the environment.

To investigate the collapse of the containment dome, which the DAE and NPCIL prefer to term delamination, two investigating teams were commissioned, one by the AERB and the other by NPCIL. The AERB team consisted of experts from outside DAE, whereas the NPCIL made it an internal investigation with no outside expert participation. However, the findings of both Committees have been kept secret.

Our country is the only one in the world where even though public funds are utilised in a faulty civil engineering design that resulted in the consequent collapse of the structure of an atomic power plant meant for civilian use, the entire matter can be kept away from the public gaze, all in the name of official secrecy and national security. In contrast, the openly available public documents on the Three Mile Island (TMI) accident in USA and the Chernobyl Unit-IV accident in USSR have occupied considerable shelf space in public libraries the world over.

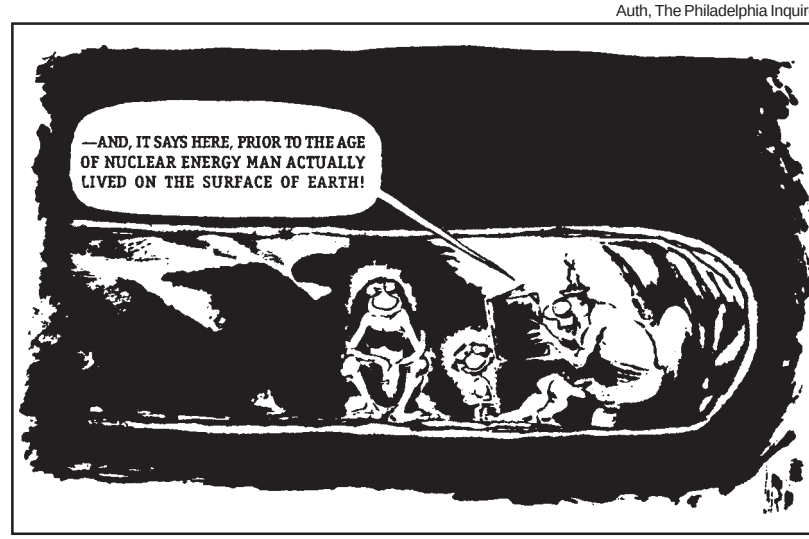
BARC: Faulty Reactor

The Bhabha Atomic Research Centre (BARC) appears in the news every now and then with fantastic claims of progress in all fields of nuclear science and engineering. However, the characteristic feature of its culture is to keep knowledgeable persons away from BARC, so that the veil of secrecy remains unchallenged and assertions remain unaffected by facts.

Among the notable units at BARC are the CIRUS and DHRUVA research reactors. The 40 MW CIRUS research reactor was of Canadian design, similar to the NRX reactor at Chalk River. It attained criticality on July 10, 1960. The CIRUS reactor uses natural uranium as fuel, heavy water as moderator, and light water as coolant. It attained full power on October 16, 1963.

The DHRUVA research reactor is based on the NRX research reactor of the Canadians. Because of the incorrect approach of the design team which worked on DHRUVA under the technical leadership of Anil Kakodkar, there was a mix-up. The intended operating pressure of 100 MW was taken as the design pressure, which should in fact be higher than the operating pressure. This major mistake was discovered after the construction of the reactor reached an advanced stage. The only thing possible to do at that stage was to lower the power to around 80 MW instead of the planned 100 MW. Kakodkar has since been elevated to the post of Director of BARC. In 1988, DHRUVA experienced heavy vibrations. Some repairs were done but DHRUVA could never reach a fully satisfactory operating condition thereafter.

Auth, The Philadelphia Inquirer



The AERB recorded in its annual report for the year 1992 that, since fuel failures at DHRUVA continued to be high and the cause of these failures could not be established, the Safety Review Committee for Operating Plants (SARCOP) was forced to stipulate a continuation of its earlier restriction on burn-up level. The restriction would be discontinued only after resolving the fuel failure issue. At the time of writing this article, it is not known if the fuel failure issue is resolved. The AERB has stopped bringing out annual reports. The public is in total darkness as to the safety aspects of all nuclear establishments including BARC. In fact, Dr R. Chidambaram himself filed an affidavit in January 1997 before the Bombay High Court, refusing to reveal the safety position of our nuclear establishments and he took refuge under the Official Secrets Act, 1923 and Atomic Energy Act, 1962. The matter is pending before the Supreme Court at present.

The directors of BARC are unable to control the leakage and the spread of radiation underground in and around BARC. An underground pipeline (36 inches in diameter) in the CIRUS complex developed a leak in December 1991. The leaking water was found to be radioactive, with Caesium-137 possibly accompanied by the emission of lethal isotopes such as Cs-134, Sr-89 and Ru-106. AERB also found that in the course of CIRUS operation over the years, radioactive water was being pumped through a 4-inch diameter leaky pipeline. On May 14, 1992 soil in the area of the Effluent Treatment Plant (ETP), Trombay—a BARC location—got contaminated due to leakage of liquid waste from mildsteel underground pipe of the ETP. Two million tonnes of liquid nuclear waste is stored in tanks at BARC, Trombay. These tanks are leaking due to ageing, corrosion and faulty welds.

Radioactivity in the form of Caesium-137 has been reported to be present in the soil, water and vegetation near the discharge lines of CIRUS and DHRUVA research reactors. Other areas on the BARC sites and the Trombay coast, where the storm drains meet the Thane creek, are heavily contaminated with hundreds of curies of Cs-137 in the soil, water and vegetation. The contaminated grass and other plant material grown inside the BARC facilities, auctioned every year, for the past 20 years and more, may have spread the radioactivity into the food chain through the milk of cattle fed on contaminated fodder, or may have otherwise entered homes in the form of packing. Considering the long half - life of Cs-137 (over 30 years), this contamination will persist as a threat to the safety of the people and the environment for a long time to come.

The bed of the Thane creek, which is an extension of the sea at Mumbai port, has become highly radioactive because of the nuclear effluents discharged by the research and reprocessing plants at BARC. The fish get irradiated, yet the fishermen have no knowledge of what is happening. The Thane creek separates Navi Mumbai from old Mumbai, and the radioactive contamination of the creek spells danger to the whole of Mumbai. The leaking liquid nuclear waste storage tanks at BARC spell danger to the population living around BARC. An urgent and independent inquiry into these problems is necessary. For example, the Waste Immobilisation Plant at Tarapur, which is under the control of BARC, witnessed leakage of Caesium-137 from cracked pipes in April 1995.

A specific incident is enough to illustrate that the nuclear radiation levels being allowed in India are much more than those permitted by international agencies. Dr Gopinath, the then Director of the Health Physics Division at the BARC, disclosed in 1993 at a meeting of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the numerical values of the radioactive discharges from Indian nuclear power plants. UNSCEAR was outraged and officially told the Indian government that these discharges were higher than the safe limits by about 100 times. Another instance of the nonchalant attitude of the Indian nuclear establishment towards radiation dangers is that the

radiation doses borne by personnel working in Indian nuclear establishments are at least 10 times greater than those in the United States, Europe, Japan and most other places in the world.

Black Diamonds

In 1992, it came to light that an illegal practice was admittedly going on at BARC for over 20 years. Senior BARC scientists were making money by using research reactor Apsara to irradiate natural diamonds, thereby making them dark in colour, as well as radioactive. These diamonds were then released into the market, both domestic and foreign, passing them off as rare black diamonds. According to the London-based Diamond Trading Corporation (DTC), these diamonds had a dangerously high level of radioactivity. The DTC warned the government of India through a letter in mid-1992 not to allow its nuclear facilities to be used to irradiate diamonds. It is difficult to know how many people all over the world are wearing jewellery studded with the irradiated black diamonds, and have unknowingly become victims of cancer and leukaemia. This criminal act was not allowed to come under police or CBI investigation.

NPCIL : Poor Functioning

As a result of poor functioning since its inception in 1987, the Indian government decided to make the pursuit of civilian nuclear power totally transparent, to have it generate its own funds, and to require it to compete with other public sector undertakings engaged in producing electricity. The NPCIL was established in 1987 to meet these objectives. The intent of the legislation was to put the NPCIL at par with the other national energy corporations. The main difference among them was to be restricted to the energy source utilised. The National Thermal Power Corporation uses coal or gas to produce electricity, the National Hydro Power Corporation uses hydro-power, and the NPCIL would use nuclear power to produce electricity. All the corporations would be required to meet equivalent standards.

However, the devastating CAG audit report for the financial year 1987-88 exposed the pathetic performance and false claims of the DAE. In his report for the year ending March 1988, the CAG, apart from pointing out many serious irregularities at DAE, also warned that the Narora Atomic Power Plant was pushed through without an appropriate design for its equipment and buildings, with overly optimistic time schedules for completion, and with unrealistic cost estimates. The CAG's most severe indictment of the DAE was that it had still not finalised the designs and drawings for the Narora project, though construction had commenced 13 years earlier. According to CAG, the Narora project had been mismanaged. There were unjustified delays in construction, electric work, piping work, instrumentation and in the placement of orders. The cost overrun was more than 188 per cent on a sample of 10 major heads of expenditure examined by CAG.

This was the first and the last audit by the CAG; the sole attempt to bring accountability into the affairs of the NPCIL had failed.

The Plans for Kudankulam

India signed an agreement with Russia to build two Russian VVER-1000 type power plants with a total installed capacity of 2000 MW of power at Kudankulam on the Tamil Nadu coast. The cost of the project is estimated to be around $3.4 billion. It will be one of the costliest nuclear power plants in the world. The cost of electricity production is calculated to be over Rs 6.5 crore per MW if all goes according to plan, which is unlikely. The planned cost per MW exceeds that of every other power plant so far built in India. It may be added that the cost of power from thermal or hydro resources is less than Rs 5 crore per MW, whereas for a nuclear plant it is more than Rs 7 crore per MW.

Like the American BWR at Tarapur, the Russian VVER-type reactors at Kudankulam do not fit into our originally planned three-stage programme of nuclear power development. The Russian reactors are of the Pressurised Water Reactor (PWR) type. Therefore, if we now acquire Russian PWR reactors, we will be the only nation in the world to use all the available modes of generating electricity from nuclear energy—namely, BWR, PWR, Pressurised Heavy Water Reactor (PHWR), and Fast Breeder Reactor (FBR) design types. All these design types are different from one another. When even advanced nations are finding insurmountable difficulties in harnessing just one of these types, our confidence in our ability to master all these types simultaneously is unparalleled. Such misplaced confidence can only take root where there is no regulation, audit and accountability to inquire into the financial investments and the potential risks to the environment and public safety.

It is a half truth to say, as our NPCIL says, that since the proposed plants at Kudankulam are VVER type PWR using ordinary water as coolant and moderator, and are different from the RBMK type graphite-moderated reactors used at Chernobyl, there will be no serious accidents at Kudankulam. The Three Mile Island (TMI) accident in March

1979 in the USA happened in a nuclear power plant of the PWR type, also known as light water reactors. Therefore, accidents do occur in VVER type light water reactors.

It is a deliberate misrepresentation to say that the Russian VVER-1000 type reactors are of proven design and therefore are safe. Dr Aleyx Yablokov, chairman of the Russian Federation National Ecological Security Council, has stated in a scientific study that the VVER reactors are highly unsafe. The International Atomic Energy Agency (IAEA) has also expressed doubts about safety of VVER type reactors. (as described in an article titled, "Hazards of Nuclear Power" by Professor Dhirendra Sharma in *Hindustan Times*, March 6, 1997). The distributed computer control system of the VVER type reactor being offered to India is reported to be currently under development by Siemens, Germany. Thus, it is devoid of substance to say that the VVER type reactors to be installed at Kudankulam are of proven design.

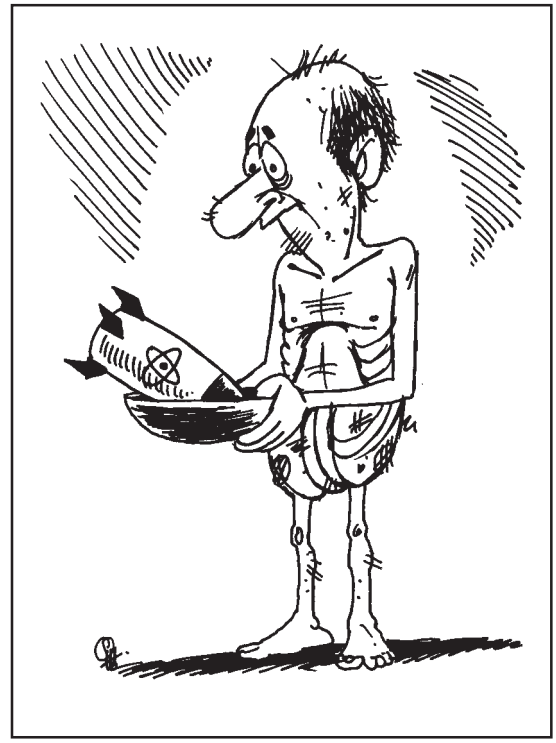
Our AERB does not have sufficient technical expertise to assess the safety of nuclear power plants. For technical help and advice, AERB depends on NPCIL and BARC, who, in fact, are supposed to be regulated by AERB. This is the situation that has been termed by the former AERB chairman, Dr A. Gopalakrishnan, as a total farce.

Light water reactors of the VVER type are as prone to accidents as are the graphite moderated reactors used at Chernobyl or, for that matter, the pressurised heavy water reactors deployed by us at Rawatbhata (Rajasthan), Kalpakkam (Madras), Narora (Uttar Pradesh), Kakrapara (Gujarat) and those under construction at Kaiga (Karnataka). Human error cannot be ruled out in the operation of any of these types of reactors.

In the United States of America, over 125 miles west of New York, in the middle of Pennsylvania's agricultural belt on the outskirts of the town of Harrisburg, in the quiet waters of the Susquehanna river surrounding Three Mile Island (TMI), the worst commercial nuclear accident occurred on March 28, 1979. After three years of outright denials, it was finally acknowledged in 1982 that meltdown of the core had occurred. The first figure given as the percentage of core meltdown was 20 per cent. This grew with each check, first to 35 per cent, then 45 per cent, until the final figure was put at 52 per cent. Finally, in August 1989, cracks were found in the pressure tank, which proved that the light water reactor had only been a hair's-breadth away from a disaster even more catastrophic than the 1979 accident.

All this was with a light water reactor similar to the Russian VVER type. Yet, NPCIL claims the VVER type is totally safe. We are able to learn many details from public sources of information about the accident at TMI, and to continue to follow the situation. But, in our country, even the facts of a containment dome collapse on May 13, 1994, at Kaiga nuclear plant under construction in Karnataka, are kept under wraps. Similarly, we do not know the details of a crippling fire that broke out on March 31, 1993 at NAPP in Uttar Pradesh. Thus, the Indian public is condemned to live with the unvalidated claims of their nuclear scientists.

The staple diet of the poor people in and around Kodankulam is fish. Have we ever thought what their fate will be if a nuclear power plant with five times more capacity than the one at Kalpakkam is installed there? The villagers near Kalpakkam are already in a desperate state, condemned to gather irradiated dead fish for survival. So, why drive Kodankulam to become even more contaminated? Will it not turn the Tamil Nadu coast into a killing field?



Irfan Hussain

NFC Expansion

The Nuclear Fuel Complex (NFC) at Hyderabad, the capital city of Andhra Pradesh, fabricates and supplies nuclear fuel to all nuclear plants in India. Despite the strong objections of the Committee of experts appointed by the government in 1995, the NFC management is going ahead with expansion plans. This expansion plan is being implemented despite the fact that the NFC has already been castigated for

dumping waste and contaminating the ground water. This is an illustration of the short shrift given to environmental concerns. The situation in and around Hyderabad on account of NFC has already become grave. The invisible contamination has started taking its toll. Mysterious and painful diseases have already visited residents in the vicinity of NFC.

All the uranium mined and refined at Jadguda is taken to NFC, where all of the complex churns out 50,000 tonnes of contaminated waste water per day. This huge quantity of contaminated water, containing radioactive materials and chemical wastes, is discharged into a waste storage pond, known as the lagoon, which is located in the northern part of the complex. The pond works on the principle of natural evaporation from the heat of the sun. However, evaporation is impossible, as 50,000 tonnes of waste water accumulates every day. Slowly, the contamination is seeping into the underground water table making it highly radioactive.

The contamination of the underground water supply is not limited to Ashok Nagar, near the NFC. Eleven other villages in the vicinity of the NFC face the same problem, and the contamination is spreading. Hyderabad has an acute shortage of drinking water. Consequently, many residential complexes install their own bore-wells to pump up underground water for consumption. A day may come when it will be highly dangerous to use the underground water and people may have to desert Hyderabad as has happened in the area near Hanford works in the USA. Already, the DAE has forbidden the people of Ashok Nagar to use their wells. This is not scare-mongering but a reality that we must face.

At present, the total fuel fabrication at NFC is serving the requirements of an installed capacity of less than 2,000 MW in all the nuclear power plants running in the country. But if the Kodankulam plant is commissioned to generate 2000 MW, the fuel that will be required will more than double. Consequently, the contaminated waste water will also be much more than the present 50,000 tonnes per day. It is not difficult to imagine the consequences for Hyderabad.

Cost of Nuclear Power

Together, our nuclear plants are operating at less than 40 per cent of their designed capacity. That means, with an installed capacity of 2180 MW, we are getting less than 872 actual MW of power. India has already invested more than Rs 80,000 crore on these nuclear power plants.

In our country, we have not been able to carry out a full and proper energy audit and cost benefit analysis of nuclear power plants. There is no scientific basis to believe that the cost of nuclear energy in India is or can be cheaper than it is in the UK, France, Korea and China. Nor is there any scientific basis to believe that the risks of nuclear technology are less for us than for these countries.

For the PHWR programme, we have invested heavily and also set up heavy water power plants at Nangal, Vadodara, Kota, Manuguru, Talcher and other places. Large investments are also being made in preparing the NFC at Hyderabad to manufacture fuel elements for BWR and PHWR power plants.

Nuclear Power in the World

At the time of the Chernobyl accident in the USSR, on April 26, 1996, about 160 nuclear power reactors were under construction around the world with the pace expected to accelerate. But 10 years later, by the winter of 1996, the number of reactors being built had dropped to 34, the fewest in 30 years.

Not a single plant was being built, or planned, in the United States. It has been 25 years since an order for a US reactor was placed that was not subsequently cancelled (the last was in 1973), and 19 years since an order of any kind has been placed. In the 1970s and 1980s, utilities not only stopped placing new orders but began cancelling existing ones. Since then, orders for some 120 US nuclear reactors have been cancelled. The public outcry, the regulator's watchful eye over ageing nuclear reactors, the technical problems necessitating frequent and prolonged shut-downs, these are some of the main problems facing nuclear power advocates in the USA. With competition growing in the electric power sector, the United States is likely to see a gradual phase-out of its remaining reactors. The New York investment house of Shearson Lehman Brothers predicted in 1993 that, for economic reasons, 25 of the current 110 US reactors would close prematurely by the year 2003.

In the United Kingdom, a similar about-turn has occurred. As the books were opened on the nuclear industry in preparation for privatisation, it became clear that the government had lied to itself as well as to the British public; the generation costs of nuclear power turned out to be about double of what the government had claimed. According to the *Financial Times* of December 1995, no new nuclear power-stations are likely to be built in the UK for at least a couple of decades to come. The last reactor built in the UK, called Sizewell B, was completed in 1995 at a cost of some $3000 per kilowatt of capacity,

nearly 10 times more than what it costs to build a gas-fired plant.

In France, where nuclear energy is the dominant power source, it has taken longer for the true costs to come to light. Until 1992, the amount of direct and indirect government subsidies being fed into the French nuclear industry was not known very clearly. An assessment conducted for the Dutch government found that once the subsidies are included, the cost of nuclear power in France was 30 to 90 per cent more than official claims. The hidden cost of nuclear power has left France's state-owned electric utility, Electricite de France (EdF), carrying an estimated debt of 145 billion francs ($29.6 billion)—a serious burden to the French economy.

In South Korea, which has the world's largest ongoing nuclear construction programme, completion costs for plants currently under construction are expected to be nearly double that of existing plants.

In China, nuclear power is estimated to be four times as costly as producing electricity from coal.

While around the world, 34 more nuclear plants are still coming up—mostly in the developing countries desperate to get new nuclear technology at any cost—a total of 84 reactors have already been shut down, most of them prematurely. The disasters at Chernobyl in the USSR and Three Mile Island in the USA have only alerted the dangers that exist before their occurrence.

The nuclear industry has been beset by problems since its inception, problems now believed to be endemic to the technology. Compounding the apparent intractability of the waste disposal problem is the rising costs of dismantling old plants that sometimes exceed those incurred in building the same plants in the first place. For instance, the Yankee Rowe reactor in western Massachusetts (USA), which cost 186 million dollars to build in 1960, will cost an estimated $306 million to dismantle.

Germany has had a similar experience with the 100 megawatt Niederaichbach plant in Bavaria, which cost about DM 230 million ($160 million) to build in 1972, but would need DM 280 million ($195 million) to dismantle.

Indian Nuclear Establishment's Response

On September 14, 1998, delivering the convocation address at Nagpur University in Maharashtra, AEC Chairman Dr R. Chidambaram, said that India is totally self-reliant in the field of nuclear technology, and control regimes would not affect our nuclear programme in any way.

It would be sensible to expect, if this were indeed the case, that self-reliant India should not have any need to purchase nuclear power plants from other countries. However, despite this reasonable expectation, after its nuclear tests, India signed an agreement with Russia to purchase a 2000 MW nuclear power plant which will cost more than $3.5 billion. Moreover, on September 22, 1998, while addressing the 42nd session of the IAEA at Vienna, Dr Chidambaram announced that India may procure light water reactors from friendly countries to achieve its target of installing 20,000 megawatts of nuclear power by the year 2020.

This statement to the world community from Dr Chidambaram is a repetition of what he has been telling his own country, after he received publicity as the hero of the Pokhran-II tests. The immediate predecessors of Chidambaram had made promises that by the year 2000 India would have 10,000 MW of nuclear power. If Homi Bhabha's projections made in the 1950s had materialised, we would have been producing at least 50,000 MW by now. But the actual figure is not even the claimed 1840 MW. At present, 25 percent of our energy budget goes to the DAE, which accounts for far less than 2 per cent of total power output. All of India's reactors are on the list of the most unreliable 50 in the world. They are being closely monitored by the IAEA. Can this state of affairs inspire enough confidence to go ahead with commissioning more plants to meet Dr Chidambaram's ambitious target?

Many revealing things can be noticed, if one examines carefully the reports of the Standing Committee on Energy of the 11th Lok Sabha. For instance, according to the 34th report of Standing Committee on Energy (1995-96) of the 10th Lok Sabha, with Mr Jaswant Singh as its chairman, they admitted in writing that over Rs 1,000 crore was wasted due to advance procurement of equipment from abroad for six units of 500 MWs and four units of 220 MWs. Equipment procured more than 10 years in advance became scrap due to long storage. We see here a nuclear scam, which is more serious than the fodder scam, urea scam or any bank scam. But under the veil of secrecy, it remains guarded from any further public focus.

However, we can be sure of one fact. Whether the operating base is 200 MW or 20,000 MW, no internal surpluses will accrue unless and until capacity factors improve the break-even point. This will be felt even more acutely when TAPS and RAPS become obsolete, since these vintage power stations were

procured at very low prices compared to their successors.

PUCL Nuclear Safety Petition

The extent of the commitment of our nuclear establishment to safety can be understood from the outcome of a judicial proceeding in Bombay High Court that ended in the fourth week of January, 1997. Upon coming to know through the print and electronic media that the AERB under the chairmanship of Dr Gopalakrishnan had compiled more than 130 nuclear issues affecting the safety of our nuclear establishments in the country, the organisation of the People's Union for Civil Liberties (PUCL) filed in the Bombay High Court a public interest petition which was drafted by this writer. Citing the grounds of right to life and right to know, the PUCL submitted in their petition that the nuclear safety issues compiled by AERB must be made known to the public.

Another submission of PUCL was that the Central government should be directed to provide statutory powers to the AERB to make it truly an autonomous body so that it might act as an effective watchdog for nuclear safety in the country. The Sarvodaya Mandal of Mumbai represented by Dr Usha Mehta, the noted Gandhian and freedom-fighter, also filed a petition in support of the PUCL petition.

To argue on the petitions, this writer appeared for PUCL and advocate M. A. Rane appeared for the Sarvodaya Mandal. We strenuously pleaded before the Bombay High Court that out of 130 nuclear safety issues compiled by AERB, at least 95 which admittedly were related to the nuclear power plants in the country, should be made public.

Opposing the petitions, Dr R. Chidambaram, the chairman of Atomic Energy Commission and secretary, Department of Atomic Energy filed an affidavit claiming secrecy and privilege.

From Chidambaram's response it would appear as if the affidavit is a unique invention to assure people of nuclear safety.

In his affidavit Dr R. Chidambaram said : "I say that the aforesaid document, prepared by the Atomic Energy Regulatory Board in November, 1995 which, among others, is a subject matter of this petition, is a document classified as Secret as it pertains to the nuclear installations in the country which include several sensitive facilities, carrying out activities of a highly classified nature, under the enabling provisions of the Atomic Energy Act, 1962." Dr Chidambaram invoked the provisions of Section 5 of the Official Secrets Act, 1923 and Section 18 of the Atomic Energy Act and stated," I am the appropriate authority empowered to act on behalf of the Central government for the purpose of Section 18 of the Atomic Energy Act." He stated further, "I say that I have considered the document and found that it relates to existing plant(s) used for the purpose of producing, developing and using atomic energy and their method of operation and processes operated therein."

Dr Chidambaram's affidavit went much further and said, "in the event of this hon'ble court holding that the plea of privilege is required to be taken even in a case of a document in respect of which an order has been issued under Section 18 of the Atomic Energy Act, I hereby claim privilege in respect of this particular document, viz. "Safety Issues in DAE Installations", in view of the fact that the government of India is apprehensive of the possible repercussions of the public disclosure of the said document on matters concerning national security. Privilege over the said official document is, therefore, claimed under the enabling provisions of Sections 123 and 124 of the Indian Evidence Act, 1872. I say that I have gone through the document personally and have given my careful attention to the said aspects before claiming privilege. I respectfully say and submit to this Hon'ble Court that if this document (which was submitted to the Atomic Energy Commission and is classified as SECRET) is required to be published, then it will cause irreparable injury to the interests of the State and will be prejudicial to national security."

This affidavit is, in fact, an addition to the six other massive affidavits and two sur-rejoinders from the senior officials of the nuclear establishment. Every affidavit, in effect, assured the Bombay High Court that all is well in our nuclear power plants. To assure nuclear safety through affidavits, is a unique invention of our nuclear establishment. Accepting the statements and submissions in the affidavit of Dr Chidambaram and the affidavits from the other officials of DAE, the Bombay High Court dismissed the writ petition at the admission stage itself.

To overcome the plea for making AERB independent of DAE, an office memorandum No. 18/1(18)/96-ER, January 7, 1997 signed by V. Ashok, director (ER) of the DAE, was placed on January 21, 1997, before the division bench of Bombay High Court constituted by Chief Justice M. B. Shah and Justice F.I. Rebello.

This memorandum was

reproduced by the Bombay High Court in its speaking orders and it reads, "As directed by the Prime Minister (Mr Deve Gowda), a Review Committee is hereby appointed to look into all aspects of the present regulatory process—inter alia, the scope of the regulatory process as originally envisaged and as it has evolved up to now and the changes that would be needed considering our own system; the need for the regulatory process to be both effective and speedy; the responsibilities, the bounds and the accountability of the regulatory body; the adequacy of autonomy for effective discharge of its functions; the role of outside experts; the mechanism for consultations of the people who are running the facilities so that any differences can be resolved; and the modalities for resolution of issues if differences persist between the regulatory body and the Unit concerned. The Committee so constituted would submit its report within four months."

As per the memorandum, Dr Raja Ramanna has been appointed chairman of the Review Committee which includes among six others, Dr A.P.J. Abdul Kalam, scientific advisor to the defence minister. PUCL raised objections before the high coqrt on the appointment of Dr Ramanna as the chairman of the review committee because it was Dr Ramanna who devised the earlier ineffective AERB. PUCL also pointed out that some of the members of the review committee may invite criminal charges under the Indian Penal Code for their criminal negligence because of which the nuclear safety issues have arisen. This author on behalf of PUCL stated before the court that the review committee as constituted by the said office memorandum is not only a fraud upon the court but also a fraud upon the nation as well. PUCL requested that the high court may not pass any orders to foreclose the criminal proceedings which may be necessary after full and proper judicial scrutiny. Chief Justice Shah assured in open court that no such orders will be passed by the high court.

To uphold the claim of government's privilege made by the AEC chairman, the high court relied on this office memorandum and recorded: "Though in the office memorandum nothing has been spelt out about the AERB report being placed before the Committee, we are assured by the learned Additional Solicitor General that the report would be placed before the Review Committee and whatever the Review Committee says about the report will also be considered. Thus we are satisfied that the government's privilege of this document has to be sustained. Accordingly, the prayer to disclose the report is rejected."

Having taken that view, the judges of the Bombay High Court dismissed the PUCL petition at the admission stage itself. In its speaking orders made available in May 1997, the Bombay High Court also recorded: "Merely because we have rejected the claim of the petitioners to have access to the AERB Report, it does not mean that we have concluded that no information for all times need be disclosed by AERB and/or the AEC (Atomic Energy Commission) or the Government of India in respect of the safety aspects of the Nuclear Power Plants. The doors of the Court are always open if the situation so warrants in a proper case."

The Bombay High Court, while dismissing the PUCL petition failed to notice the sophistry in the assurance to get a new structure of AERB fixed by the very same Dr Raja Ramanna who in 1983 devised the faulty and irrational structure of AERB and even repeatedly defended that structure.

Dr R. Chidambaram, having invoked the Atomic Energy Act, 1962, Official Secrets Act, 1923 and Sections 123 and 124 of Indian Evidence Act, 1872, before the Bombay High Court on January 1997, and having stated under oath in an affidavit that even the safety issues in nuclear power plants are official secrets not open to public knowledge, nevertheless, did not hesitate for a second, on September 5, 1998, to reject the suggestion that India's nuclear establishment is too secretive and to tell the US news magazine *Newsweek* : "We have annual reports. We have parliamentary committees to which we present all data. We answer parliamentary questions, now we invite media people (to visit) our nuclear centres."

A special leave petition seeking permission of the Supreme Court to appeal the orders of the Bombay High Court to dismiss the petition was granted in September 1998 and as of now, the matter is before the Supreme Court.

The International Convention on Nuclear Safety

India became one of the first nations to sign the Convention on Nuclear Safety (CNS), in September 1994. According to Article 8 of the Convention dealing with regulatory bodies, each contracting party shall establish or designate a regulatory body entrusted and provided with adequate authority, competence, financial and human resources to fulfil its assigned responsibilities.

Each contracting party shall take appropriate steps to ensure an effective separation between functions of the regulatory body and those of any other organisation concerned with the promotion or utilisation of nuclear energy.

The international practices on nuclear safety are codified by the CNS and are defined in IAEA Safety Series No.110 (1993) on Safety of Nuclear Installations described in Para 304 which requires: "effective independence from organisations or bodies that promote nuclear activities" and also stipulates that an "additional important function of the regulatory body is to communicate independently its regulatory decisions and their bases to the public". On both these considerations, the AERB in India does not meet the international requirements, largely because the AERB has been given only a subordinate role under the DAE.

The prime minister of India is guided by the DAE and has no independent source of information to know the truth about our nuclear installations. Even the AERB chairman has no direct access to the prime minister to apprise him of the problems in our nuclear installations. It has become a tradition in our country, right from the days of the first Prime Minister, Pandit Jawaharlal Nehru, to keep the DAE under the charge of the prime minister. It is only very recently that the Standing Committee on Energy (1996-97) of the 11th Lok Sabha, under the chairmanship of Mr Jagmohan, has asked some pertinent questions on the expenditure in DAE and the Standing Committee has also stated that it would like the issue of independent regulatory authority to be examined further.

Media and the Nuclear Establishment

How welcome knowledgeable media people are at the nuclear centres of DAE can be seen from the treatment meted out to a journalist from *The Indian Express*. On May 18, 1998, just before the commencement of a press conference held inside the BARC premises to explain to the media the scientific feats achieved at Pokhran-II, the Public Relations Officer (PRO) of DAE told I.S. Gopi Rethinaraj that there was a specific instruction from the AEC Chairman (Dr R. Chidambaram) not to allow him to attend the conference. Some journalists, including Lalitha Vaidyanathan of Press Trust of India took strong exception and requested the PRO to let Gopi in but to no avail. Gopi had to leave the venue, even though he was covering the science and technology beat for his newspaper and was given a security pass at the gate of BARC. Gopi was not welcome at the press conference because he was the only person amongst the journalists attending the press conference with a masters degree in physics, and he might have asked some uncomfortable questions on the Pokhran-II tests.

This was not the only incident of its kind involving Gopi. On August 28, 1998, Gopi called on Dr Placid Rodriguez of IGCAR research institute at Kalpakkam near Chennai (Madras) to interview him on the progress of fast breeder technology at IGCAR. So long as Gopi was asking general questions on the weather and the greenery, and Dr Placid's qualifications and degrees, a beaming Dr Placid was all honey. But the moment Gopi touched upon the safety issues connected with IGCAR facilities and the performance of the FBTR, Dr Placid got up from his chair and shouted rudely at Gopi, "Don't ask irritating questions. I have explained everything to you. Now you many go out of this room..." Malini Nair, the Chennai (Madras) correspondent of *The Telegraph*, who was accompanying Gopi was shocked.

The public is helpless. Our press is not as vigilant and informed on nuclear matters as the press in developed countries. Annual reports contain what the DAE wishes to say, parliamentary committees are filled with politicians who neither have knowledge of nuclear technology nor comprehend importance of nuclear safety issues, and their replies to parliamentary questions, tutored by the DAE, are mere denials. The government-invited media people are by and large a selected lot of those who are not able to ask, or choose not to ask, probing questions. The press in India is not sufficiently vigilant, capable politicians are not adequately informed and there is no awareness in general generating a strong public opinion against the mismanagement of our nuclear establishment. ❑

Dr Subbarao, who at present resides in Mumbai, is a former Captain of the Indian Navy, and a nuclear scientist. He is one of the victims of our Nuclear establishment. For a full account of his struggle against the incompetence and corruption in our nuclear research centres, see MANUSHI no.108.