



# ANUMUKTI

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### WORLD COURT DECLARES NUCLEAR WEAPONS' THREAT AND USE ILLEGAL

**I**n a landmark decision on Monday, 8th of July, the International Court of Justice declared that the threat and use of nuclear weapons would be "contrary to the rules of international law applicable in armed conflict" in just about any imaginable circumstance.

The only exemption to this sweeping declaration of illegality was the court's holding that "in the view of the current state of international law and at the elements of fact at its disposal, the Court cannot conclude definitively whether the threat or use of nuclear weapons would be lawful or unlawful in extreme circumstances of self-defence, in which the very survival of the state would be at stake."

The single vote on these two provisions was seven to seven, with the president casting the deciding vote. However, since three of the dissenting judges did so because they took the complete illegality

view and did not agree with the possible "extreme circumstance" exception, the vote for general illegality was, in effect, ten to four.

The court unanimously stressed that, in accordance with Article VI of the Nuclear Non-proliferation Treaty, "there exists an obligation to pursue in good faith and bring to a conclusion negotiations leading to nuclear disarmament in all its aspects under strict and effective international control"

The Court was also unanimous that nuclear weapons, like any weapons, are subject to the law of armed conflict protecting civilians, combatants, the environment, neutral nations, and succeeding generations from the effects of warfare, as well as United Nations Charter prohibitions of threat or use of force except in self-defence.

Peter Weiss, co-president of the International Association of Lawyers Against Nuclear Arms, wel-

comed the Court's opinion, stating, "This was an appropriate sequel to Wimbledon, with a group of unseeded states, carrying the day against the world's top seeds. The court has charted a clear path toward nuclear abolition, in terms both of its legal analysts and its appeal to start taking Article VI of the NPT seriously."

Commander Robert Green, Royal Navy (ret.), of World Court Project UK, said: "With this remarkable decision, I could never have used a nuclear weapon legally. This places a duty on the military to review their whole attitude toward nuclear weapons, which are now effectively in the same category as chemical and biological weapons."

In response to a request for the advisory opinion from the World Health Organization concerning the legality of use of nuclear weapons in view of their health and environmental consequences, the Court found that it has no jurisdic-

tion because the legality of nuclear weapons is not within the scope of WHO activities. Ann Marie Janson, WHO liaison for International Physicians for the prevention of Nuclear War (IPPNW), commented that, This case was initiated by the WHO, with a boost from IPPNW, which understands that prevention is the only medical response to the threat of nuclear war. We are happy that the court referred to the need to protect the environment and future generations from nuclear damage in the General Assembly case, but we are disappointed that these same health aspects were understood only by the three dissenting judges in the WHO case."

The Court's opinion in the General Assembly case comes as a blow to the United States, United Kingdom, France and Russia, all of which urged the Court not to consider the case. The case was initiated by international peace and disarmament groups including the International Association of Lawyers Against Nuclear Arms (IALANA), International Peace Bureau (IPB) and International Physician! for the Prevention of Nuclear War (IPPNW). Not having direct access to the World Court, they successfully petitioned the World Health Assembly and the United Nations General Assembly to make requests for advisory opinions. Predrik Heffermehl of IPB stated, "This case is an encouraging example of the ability of people's organisations to make use of international institutions like the World Court, which are meant to serve the world's people and not their governments."

*WISE News Communique 455*

*Contacts: IALANA secretariat:  
tel: +31-70-3634484, fax:  
+31-70-3455951*

## *From The Editor's*

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### The Moral High Ground

Some people, just a very few, are moral. Many more are moralistic. To be sure some moral people are also moralistic. Being moral necessarily implies that one's conduct is governed by certain principles which one adheres to, even when, as they say, the going gets tough. Being moralistic means that one demands moral conduct from others regardless of whether one is moral oneself or not.

Moral people are quite often exasperating to those around them. It can be annoying some times to adhere to a high moral standard expected of oneself especially when the outcome is likely to be not in one's immediate interest. And yet moral people however exasperating and however exacting their standards do command universal respect. Such a one was Gandhi. He was called many things in his life but even his most antagonistic adversaries respected him for his commitment to principles.

India, the nation which has officially enshrined Gandhi as the father of the nation, has preferred in its dealings with the world outside to be moralistic rather than moral. And whatever respect one may have for moral people, moralistic people with their sanctimonious lecturing are just a pain in the hind quarters.

Indian insistence on universal nuclear disarmament is a sound principle. But our advocacy of it would command respect if and only if we ourselves believed in nuclear disarmament and renounced in a legally binding way any intention of ever producing a nuclear weapon. This should not be too difficult. The World Court has already declared threat and use of nuclear weapons as illegal. For weapons which can never be detonated, nuclear weapons do cause tremendous destruction of the population whose supposed security is the cause of so-called cause of their production. The books we have reviewed in this issue bear ample testimony to prove this point.

Nuclear bramhacharya is not the abstinence of the weak. Like the real thing it does take some doing. But like bramhacharya supposed does, it too would confer unimagined power. It would allow the country to capture the moral high ground and lead an assault with rest of the world against the thuggery of nuclear powers and their international (dis)order. But those who have become used to scurrying around the nuclear high-table (security council) with their tongues almost touching the ground, hoping for an invitation or may be any odd crumb are not the ones to do it. The least they can do is stop being moralistic.

*Surendre Gadtkar*

## DAE Re-engineers the Regulatory Board

*L'Affair Gopalakrishnan, in which the Department of Atomic Energy unceremoniously and shabbily remand Dr A Gopalakrishnan from the chairmanship of the Atomic Energy Regulatory Board, has been too much in the news to require special coverage in Anumukti. On the next page we have an editorial assessment of Dr Gopalakrishnan's tenure. The following is an edited version of an article of his where he describes the impasse which has stalled the construction of reactors at kaiga and Rawathbata.*

On May 13, 1994, the under surface of the pre-stressed concrete dome in Unit-1 of the Kaiga nuclear power plant collapsed during the final stages of construction. The two 220 MW reactor units at kaiga and two similar units of the Rajasthan atomic power project I (RAPP 3 and 4) which are all under construction, are to use the same dome design. In view of this both the Nuclear Power Corporation (NPC) and the Atomic Energy Regulatory Board (AERB) urgently constituted separate failure investigation committees to go into the reasons for the Kaiga failure. Both these committees submitted their reports by May 1995. More than two years have passed since the dome collapsed, but till today the NPC and the Department of Atomic Energy (DAE) have not finalised even the design basis for the re-engineering, let alone a revised design. Construction of the containment structures at all the four reactor projects is at a halt.

The loss of electric power generation due to this delay at the Kaiga unit-1 and 2 alone will amount to Rs 800 crores so far. Similar losses at RAPP-3 and 4 can be estimated at about Rs 500 crores. These do not include the

large additional interest expenses the DAE has incurred on borrowed capital. In addition, there is a multiplier effect through the loss of industrial production as a result of non-delivery of electric power to various parts of Karnataka and Rajasthan.

failure. A set of indirect factors which point to the need for improvement, were also included in the report. The Atomic Energy Commission (AEC) discussed the investigation reports of the AERB and NPC committees in July 1995. They accepted the AERB report and directed the NPC to follow its recommen-

dations while carrying out the re-engineering of the inner containment structure. Why, in spite of this directive given one year ago, should the impasse continue and the NPC be unable to proceed with the task?



### The New Watch-Dog

The AERB investigation committee which examined the causes of the Kaiga dome failure included some of the best experts in the country in the fields of pre-stressed concrete design/ construction methodology and quality assurance. They carried out extensive independent analysis of the dome, examined material test data and studied the voluminous inputs provided by all the concerned parties before finalising their report. They reported the cause for the collapse based on analyses and corroborative evidence. The investigators have also stated the deficiencies in the design that eventually led to its

Unfortunately, these findings of the AERB investigation on the Kaiga dome failure could not be disclosed to the media or the public because the DAE opposed such action, even though the report does not contain any information or data of a proprietary or secret nature.

On certain critical design aspects, the NPC is seeking deviations and concessions from the AERB beyond acceptable limits. While deviations could be allowed to a certain extent, it is incumbent on the designer to provide either analytical or experimental evidence to the

regulatory body to prove that such departures will not have any adverse impact on the safety and integrity of the structure. NPC is yet to satisfy the AERB in this matter.

It appears that the re-engineering of a pre-stressed concrete dome

with four large openings, to match an already constructed cylindrical wall with pre-fixed stressing cable locations, is becoming too complex a task for the NPC. This could be the reason why the NPC is considering various alternate concepts of dome design even at this stage.

#### *Leaving matters to be decided*

Whenever a major failure incident occurs, it is common practice to fix the responsibility for the failure, if detailed investigations provide a sufficient basis for doing so. Following the serious fire incident at the Narora Atomic Power Station Unit-1 in 1993 and the Kaiga dome failure in 1994, AERB investigation committees had submitted detailed

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## Dr. A Gopalakrishnan:

Dr. A Gopalakrishnan was not the first chairman of the Atomic Energy Regulatory Board. Dr. A K De and Mr. S D Soman preceded him in that chair. Both these worthies knew very well that they held their offices at the pleasure of the chairman of Department of Atomic Energy. They therefore cut their sails accordingly. In fact, Mr Soman when asked to investigate certain wrongdoings in the Department of Atomic Energy, slunk away abroad for 'treatment' and then whiled away the little time left before retirement. The least that can be said about Dr. Gopalakrishnan's tenure is that he did try to take the watchdog role of AERB seriously. The fact that two years after the thankfully unique collapse (sorry "delamination") of the containment dome at Kaiga, construction of the roof has still not got AERB's OK, is a tribute to Dr. Gopalakrishnan's sense of responsibility as well as his tenacity in standing up to DAE pressure. He also deserves praise for proceeding with regulation of X-ray units whose unregulated proliferation does constitute a great health hazard. His performance after the fire at Narora in 1993 when he forced stoppage at other nuclear power plants to check if they too suffered from the same fault, was also exemplary and it did come up with faults in the turbine blades at Madras which prevented similar fires there and in other places. He deserves the nation's thanks for having tried to regulate with extremely limited powers of his office, the monster created in the name of nuclear power.

Having said all this, it must be added that the most that can be said of Dr. Gopalakrishnan is that he tried. There can be no doubts regarding his failure. The acrimonious manner of his departure just shows that nucleocrats remain as smug and self satisfied as ever and the danger to common people from their activities is as great as ever. They are likely to brush aside the Gopalakrishnan years as an unhappy episode when their misdeeds were sometimes exposed to the public gaze. They are also likely to be extra careful in future appointments of members of AERB. Thus, the impact of Dr. Gopalakrishnan's tenure over the long run is likely to be negative. The blame for this lies not only with the nuclear establishment but also to some extent with Dr. Gopalakrishnan himself. He did not (probably by choice) and while he had the opportunity, make changes in institutional procedures which would have ensured continued openness and accountability at least in the AERB. His successor in a press conference has had the cheek to say that, "If I am saying that we are making progress, you have got to believe me." Dr Gopalakrishnan's claim that " he believed in keeping the public informed about nuclear safety matters to instill confidence in the transparency of operation" now rings hollow. A person more committed to openness and transparency and less obsessed with personal self-promotion could have, even with limited powers, left a better legacy.

is more than few hundred crores of rupees. An essential step in building up a safety culture is to reward those who contribute to the enhancement of safety and extend just reprimands and penalties to those who have clearly neglected their safety responsibilities. Not do-

ing this in the case of the Kaiga incident is also one cause of the present difficulties.

*Dr. A. Gopalakrishnan  
Former Chairman,  
Atomic Energy Regulatory Board  
Times of India July 25, 1996*

# Germans Say No to Nuclear Waste Dump



*Wendland is a nose shaped region of Lower Saxony that juts out in what used to be East Germany. In the days before the reunification of Germany, West German nucleocrats thought it to be an ideal place for storing nuclear waste. The region was sparsely populated, not industrially 'developed' and hence by definition 'poor'. In case of accidents or leaks, the consequences would be borne by their 'brothers' across the border. Thus, it satisfied all the time honoured criteria of nuclear operations: to find a weak and defenceless population which cannot protest, and 'develop' it into the modern age. But as Burns said it so well- "The best laid plans of men and men.," With no consideration for the consequences, the Soviet empire collapsed and the always hoped for day of German unification arrived in the lifetime of those who had, whatever the hopes and the rhetoric, never expected it to happen. From being in a remote region in the forests in a corner of the country, Gorleben (the village where the waste repository is located) is now right in the middle, easily accessible from all sides. This backward' rural region is quite satisfied with itself and does not care for nuclear 'progress'. Each and every farmhouse in the region has the sign CastorNIX painted on it. Last year when the first Castor arrived carrying its load of nuclear waste, the authorities found that all the villages in the regions had repainted their names as Gorleben. This caused a great confusion in police who were unfamiliar with the region.*

*Castor and Pollux -the heavenly twins-are two legendary Greek brothers, who were inseparable. They had a fight in which Castor being human died while Pollux who was the son on Zeus the king of the gods, survived. On being offered immortality, he refused if Castor was to have no part of it. The final solution was that they lived half the time in heaven and the other half in hell. Why, the container is called Castor is obscure to me. Perhaps it has to do with the fact that the container is of a modular design which fits in with another part-the Pollux-which can be lowered into the earth. Or may be nucleocrats ( who live in a heaven of their own) have inadvertently hit upon the truth: In a new twist to the old tale, a few live in heaven whereas there is hell on earth due to nuclear waste! The following two reports describe the resistance to the May 8, 1996 movement of nuclear waste shipment from Le Hague in France to Gorleben in Northern Germany. 19,000 policemen were deployed from all over the country to in order to ensure the shipment reached its destination.*

**A**fter the first Castor shipment last year those expecting the resistance to decrease found they were mistaken. Not only in Wendland itself but also all along the transport route the resistance has increased since last year. Another shipment was due to come this year from the nuclear power station at Gundremmingen in southern Germany but this was cancelled, apparently be-

cause the police did not think they would be able to "protect" it.

The Castor train carrying the high-level radioactive waste left the French reprocessing facility at Le Hague on its way to Gorleben sometime in the evening of May 6. It had already been decided by groups campaigning against the shipment in Germany that there should be no obstruction of the train at the

Franco-German border, in order to avoid giving any wrong nationalistic signals.

Soon after crossing the border, the Castor encountered its first resistance-a camp set up across a level crossing in W6rth. The police had to clear the tracks before the train could proceed.

As the Castor train made its way across Germany it symbolised the nature of nuclear state, with an advance party of police and engineers making preparations to clear the route ahead, at least three police helicopters flying in formation in front of the transport, and finally the transport itself, heavily guarded on all sides. Level crossings were closed 15 minutes before the arrival of the train, and police were monitoring all the bridges and level crossings along the route. It was like a military operation through hostile territory.

Despite the police presence, people managed to get onto the tracks in a number of places. In Darmstadt, Minden, Altenbeben and Gottingen, the train was blocked where actions in many other cities, not even on the route of the Castor-Landau, Mainz, Bingen, Erlangen, Marlberg, Tri , Konblez, Spre-

ling, Verden, Bielefeld, Bad Hersfelu, Bochum, Bonn, Dusseldorf, Dulsberg, Koln..

### *Dannenberg: End of the Line*

Dannenberg is the end of the train line where each Castor must be lifted by a huge train on to a low loader lorry for the final stretch by road to Gorleben. Despite the banning of demonstrations there, 10,000 people held a rally in the town centre on May 4. They then marched to the main street and blocked it creating the slogan "Wir stellen uns quer" (We are blocking your path) by forming giant letters out of groups of people on the street.

On Tuesday, 6th May, 1800 people repeatedly blockaded the low-loader as it was being prepared for the journey. The police became very brutal with the demonstrators who included local farmers block-

ing the route with their tractors. The next day police took pre-emptive action against tractor blockading by vandalising 150 tractors that were packed in a nearby forest. Windows were broken and tires slashed.

### *Day X2: Military Tactics Force the Waste Through*

Castor was due to arrive in Dannenberg at 4.00 AM on 8th May. However, a small group of demonstrators managed to hold the train for half an hour just outside the town. When it finally arrived, there were four thousand people waiting for it near the loading crane. What followed then was a forcing through of the Castor with water canon and riot police. (See Next Story)

*Andreas Speck  
Peace News June 1996*

## Wir Stellen Uns Quer (We put Ourselves on the line)

2.30 AM the Castor train reached Uelzen, lower Saxony. We try to reach the tracks, but the police stand shoulder to shoulder in riot clothing, equipped with shields and long truncheons. Their lines are impenetrable. Several water canons and ready and a helicopter circles overhead, accompanying the shipment.

The Castor sets off along the tracks—used only for Castor shipments—towards Dannenberg. Each bridge and railway crossing is guarded by police. In the flat open land near Dannenberg the headlights of the convoys of the police vans rush through the darkness towards Dannenberg or Gorleben. Above, a helicopter circles with a powerful searchlight.

longer possible to prevent the storage of the second Castor in the

above ground building which is designed to contain the planned 420 Castors. Nonetheless, we will do our utmost to increase the costs of the transport.

At 5.56 AM the Castor arrives in Dannenberg. It is lifted by a crane onto a waiting lorry. The 18 km road journey from Dannenberg to Gorleben begins. Thirty police vans, six water cannons, and several bulldozers precede the Castor while three thousand police accompany it. Those officers next to the Castor have to swap positions with others every ten minutes since in this short period of time they will receive their annual legal dose of radiation. Female police officers are not allowed near the Castor for fear of damage to their progeny

Half a kilometre on, at the crossing first blockade, thousands of protesters watch as straw boles

which have been set alight are extinguished with water cannons and pushed aside with bulldozers. Over a thousand people huddle together on the road; the Greens from the Lower Saxony government are also here. People turn their backs on the approaching water cannons and bow their heads.

Rows of police precede the water cannons, duck as they shoot water at the protesters, then run to beat the protesters off the road with truncheons over a metre long.

Panic breaks out, people scream and run away; some are chased and beaten. A Green politician's mouth is stuffed with sand by the police as she cries out for help. 30 people are badly injured; one woman, suffered a fractured skull, though it is not clear if this is the result of a truncheon or a stone thrown by a protester.

## Russian Repression

From the adjacent fields people have begun throwing stones and bottles at the police. Twenty police officers are slightly injured. Once the road is finally cleared of protesters, the convoy inches forward. The protesters cut across fields to overtake the convoy which is moving at snails pace. Along the road people erect barricades of dead trees pulled out of the adjacent forest, and set straw bales alight. Ahead on the road police prevent tractors from blockading the road. They smash the tractor windows, slash their tyres and break of the valves to let the air out. Fifteen farmers are beaten up; two were taken to the hospital.

It takes over six hours for the convoy to travel the 18 kilometres to Gorleben. In front of the Gorleben intermediate Storage Plant is another blockade of 300 people who are carried away to clear the road which is then cordoned off. We are treated more politely since they know that it will take at least another hour before the Castor arrives. Once they have cleared the road the police stand shoulder to shoulder behind riot shields. Behind them are the dogs.

At 1.07 PM the Castor arrives into the Storage Plant, accompanied by six helicopters circling overhead. Thousands of people stand in the woods and watch as the convoy passes. Some cry, others whistle or hurl abuse, others are too stunned to say anything. The second Castor has made it to Gorleben-at a cost to the state of DM 55 million. It is an expensive business but the government remains firm. It expects the protest to diminish but at the moment this seems unlikely. During the first Castor transport, 3.000 people came out on the streets in protest, and (14,000 police); this year there were over 6,000. Instead of diminishing resistance the shipment has radicalised many people.

*Gisela Renolds, Wustraw, Wendland  
Peace News June 1966*

**A**lexander Nikitin is the person responsible for detailing the criminal abuse of the North Sea by the Russian Navy by large scale dumping of nuclear waste. The Russian Government does not deny the truth of what Nikitin says. It just wants to gag him and others like him. He was arrested on February 6 and charged with espionage.

On June 10, 1996 Nikitin was denied bail, and his trial was handed over from a civilian to a military court. Nikitin, a former naval captain, has been held in a St Petersburg jail by the Federal Security Service (FSB - the former KGB). He faces a minimum ten-year sentence, and a maximum penalty of death.

Neither Nikitin nor his lawyer, well-known civil liberties advocate Yury Schmidt, was allowed to attend the June 10 hearing on the case. The hearing took the form of a closed-door submission by an FSB prosecutor to a civilian judge. As a researcher for the Norwegian environmental group the Bellona Foundation, Nikitin helped prepare a report on radioactive contamination of the environment by the Russian Navy's Northern Fleet. Naval authorities allege that Nikitin divulged secret information to Bellona. However, the jailed activist and his supporters insist that all the information contained in the report was freely available from non-classified sources. Bellona's report, which was eventually released on April 19, painted a horrifying picture of neglect by the Northern Fleet of nuclear waste security.

In an interview published by the Moscow daily Izvesliya on June 8, Schmidt charged that the way was being prepared for gross

violations of his client's rights. A military trial would "not exclude the possibility of the case being heard in a biased, bureaucratic manner,"

The navy experts who prepared materials for the prosecution did so, Schmidt told Izvestiya, not on the basis of the Russian constitution or the recently-adopted Law on State Secrets, but of "old orders from the Defence Minister which contradict the constitution and the law "

The basis of the charges against Nikitin, Schmidt continued, lay in events from 30 to 35 years back. But the Law on State Secrets states that the maximum length of time for which material can be classified as secret is 30 years.

Meanwhile, one document cited by the navy experts as containing "top secret information" proved to be an abridged version of an Izvestiya article from March 1995. Bellona activists say that attempts to submit their sources as evidence in the investigation have been refused. In sum, Schmidt told Izvestiya, the only "secret" he had encountered in the case was the passionate wish of the armed forces to hide the catastrophic situation in the area of nuclear safety, compounded by the desire of the FSB to prove its usefulness.

The desperate blundering of the military and security authorities should not, of course lead one to underestimate their seriousness in wanting to rid the country of environmental whistle-blowers.

*Contact: Bellona Foundation, PO  
Box 2141, Grunerlokka, N-0505  
Oslo  
Email: bellona@oslonett.no*

# Testing, Testing, 4, 3, 2, 1...

The first nuclear test took place at Alamogordo in Nevada US, on July 16 1945. The latest on June 8, 1996 conducted by China at Lop Noon In between, at least 2045 nuclear explosions have been carried out by the US, Russia, Great Britain, France, China and India.

As of 1994, the number of tests stood at 2036, of which the US had done 1030, the USSR had done 715, France had done 192, the UK 45 and China 41. Since then, China has continued to test at an increased rate, and France has conducted six tests, bringing the total to approximately 2045 tests. The numbers are in fact a lower bound since although these nations are not ashamed to test they are sometimes reluctant to reveal that they have tested. The 'peak year' for testing was 1962, with 96 US tests and 44 Soviet tests. The largest nuclear test ever was carried out by the Soviet Union in 1961. It was a massive 58 megatons, four times the size of the largest US test, of 15Mt.

Besides the official nuclear powers, the Indians have carried out a 'peaceful nuclear explosion' in 1974. A possible nuclear explosion that may have been either South African or Israeli has been detected by spy satellite in the South Atlantic, and the Pakistanis, the Israelis, and the South Africans are known to possess nuclear weapons which they may have not found it necessary to actually test. The Israelis are assumed to possess about 200 warheads, and the Pakistanis an unspecified number, though a French journalist puts it at 15-20, with 80 for India. South Africa has admitted to having 7-8 warheads, which it now says it has completely dismantled.

Recent press reports say however, that as many as 1000 nuclear artillery shells are still possessed by South Africa, and that some of this may have fallen into the hands of white extremists. It is hard to judge just how much of this is true, and the SA government has insisted that it has dismantled all its weapons, but it is possible that some part has not been dismantled as stated

Other 'would be' nuclear powers include Iraq, which conducted an ambitious weapons program that included the development of both plutonium and uranium weapons. Another was North Korea, whose program of gas-graphite reactors coupled with a large reprocessing capability seemed to be tailor-made for plutonium production for weapons purposes. Neither Iraq nor North Korea seem to have quite mastered the arcane art of weapons design however, though it seems likely that they would have done so given the time.

Questions have also been asked about the nuclear intentions of both Argentina and Brazil, both dominated for years by military regimes and neither of whom have signed the NPT. Both countries have ambitious nuclear programs, and both possess secret, unsafe\* guarded reprocessing and enrichment facilities. Both however, in recent years, have exhibited some willingness to open up their nuclear programs to mutual inspection and to the IAEA

## *US Testing*

The first ever nuclear explosion by anyone was carried out at the 'trinity' test site in New Mexico from a device suspended from a tower on

July 16 1945, and was the culmination of the largest secret industrial R&D effort ever, namely the Manhattan Project, involving construction of nuclear reactors, enrichment plants, reprocessing plants and design and research facilities on an unprecedented scale.

Since then, the US has exploded 1,030 weapons and triggers for weapons of a variety of types and range of sizes with the most recent test happening on Sept 23 1992, since when an effective moratorium has applied. Of these, 215 tests have been carried out above ground, and 815 underground.

US tests have included 5 underwater tests, 55 bombs dropped from aircraft, 56 exploded from towers, 36 from barges moored in shallow water, 28 on the surface of the ground or sea (which creates the maximum fallout) 40 exploded from balloons or rockets, and up to 1980, 465 exploded underground in shafts or tunnels. Of all these tests, 935 have been carried out in Nevada from 1945-1994, 43 at Eniwetok atoll, 30 at Christmas island, including a number of joint UK-US tests, 23 at Bikini Atoll, 12 at Johnston Island, 3 in Alaska, and 3 in New Mexico.

The test program started relatively slowly, with three 'tests' in 1945 (two of them on Hiroshima and Nagasaki), two in 1946, none in 1947, 3 in 1948 including the ones at Eniwetok, none in 1949 or 1950, rising to 16 in 1951, 77 in 1958, none in 1959 or 1960 when a brief moratorium was in effect, and a frenzy of 98 atmospheric tests in 1962 just before the signing of the partial test-ban treaty in 1963. The US has also revealed a number of unannounced tests.



## Russian Testing

Since 1949, the USSR has conducted 715 nuclear tests (compared to the US's 1030) with the first on August 29th 1949, and the most recent in October 1990. Of these tests, 508 have been underground, and 207 atmospheric. These tests have been conducted either at the Semipalatinsk 'polygon' site, or on the island of Novaya Zemlya, in the Russian north, beyond the arctic circle. 496 tests have been carried out in Kazakhstan, 132 at Novaya Zemlya, 2 in the Ukraine, 2 in Uzbekistan, and 1 in Turkmenistan. 81 'peaceful nuclear explosions' have been carried out in Russia, and 26 in Kazakhstan.

Russia has exploded a total of 257 megatons in the atmosphere, out of a global total of 438 megatons, of which 141 was exploded by the US, and 22 by China.

The first Soviet thermonuclear or fusion device was tested in August 12 1953, a year after the US test of the 'mike' device at Bikini. It was a 'single-stage boosted fission' device (ie a device in which a fission reaction was 'boosted' by a surrounding layer of lithium-6 deuteride), with a 200-300 kiloton yield. Later on in 1954, the idea of using radiation compression to compress and ignite a physically separate thermonuclear secondary was arrived at, and such a device was tested in November 1955. The largest thermonuclear device ever was tested by the USSR in 1961 above ground, at Novaya Zemlya. The Soviets also conducted the largest ever underground test, of 3.5 megatons. The largest ever US atmospheric explosion was 15 mega tons.

## UK Testing

The UK exploded its first nuclear 'device' on Oct 3 1952 on an island off the west coast of western Australia. Subsequent UK tests were conducted at Maralinga and Emu Field in the desert of South Australia. Other tests were carried out at Christmas Island, first by the UK alone and then in cooperation with the US. Subsequent tests have been carried out at the Nevada test site.

### Secrecy and Deception

*The public has tolerated nuclearism because it has been kept in ignorance and deliberately deceived. Every government with a nuclear establishment has pursued similar policies. The U.S. government for example, even deceived the public about the very detectability of underground nuclear explosions. In September 1957, after the first underground test in the Nevada flats, the government claimed that the explosion could not be detected beyond 250 miles. The deception was exposed by an investigative journalist who found that seismic stations as far away as Fairbanks, Alaska some 3,000 miles away had detected the shock.*

Meanwhile, it has turned out that the UK just like the US, exposed servicemen (mainly Australians) to radiation, and has left plutonium scattered over the Australian desert, necessitating a costly cleanup program for which the Australian government has attempted to bill the UK government, which has refused to pay, causing a considerable worsening in the normally cosy UK-Australian relationship.

The UK chose, with Australian connivance, to test its weapons in the Australian desert because 'nobody lived there'. Australian aborigines did in fact both live and

hunt there, and a group of them wandered through the fallout area. No attempt was made to warn them of any danger. No record is kept of what happened to them.

The UK has conducted 45 tests to date, of which the most recent have been conducted at the US test site in Nevada. The UK is therefore affected directly by any US testing moratorium, though it has not formally agreed to US announced moratoria. The most recent

UK

test was on Nov 24 1991. The UK, like France until very recently, favours a 100-500 Kt 'threshold' for nuclear testing, rather than a zero threshold, a position in which it has been sustained by the US Pentagon.

## French Testing

France entered the nuclear race in February 1960, with a series of four above-ground tests in what was then French Algeria.

France was forced to shift its test site to Mururoa and Fangataufa atolls in the South Pacific, when it was found that Algeria was too close for comfort, since shifting winds could bring the fallout over France itself. When the 1963 partial test ban treaty and the 1970 NPT were signed, France refused to sign either, and like China, continued to test above ground • (or above the sea in this case) • at Mururoa and Fangataufa until it was forced by a case brought by Australia and New Zealand to the World Court, to bow to global public opinion in 1975, and take its testing program underground.

France has conducted 204 tests to date, of these, about 180 have been in the Pacific at Mururoa and Fangataufa.

France has insisted that its testing program at Mururoa hurts no-one,

and that environmental effects on the coral atoll are minimal or non-existent. However, it has been forced to shift the testing of larger weapons from Mururoa to Fangataufa to limit damage to Mururoa, and there is evidence that considerable damage has in fact been done, both by previous programs of above surface testing, and by the current program of below ground testing.

Atmospheric tests conducted by France from the mid 1960s to 1975 have released most of their radioactivity directly to the atmosphere and the ocean, and have resulted in significant contamination. Hundreds of kilograms of plutonium and fission products have been scattered over the ocean floor. In addition, large quantities of waste have been left: contaminated earth, waste from decontaminating equipment, contaminated clothes, etc.

A map published in *Le Monde* on Oct 3, 1995 shows severe fracturing of the ocean floor at Mururoa. The French government says the map is "Greenpeace propaganda" and is a forgery."

Scientific missions have been given limited access to Mururoa. Though allowed to take only limited samples, have all detected radioactive iodine, cesium-134, and plutonium, both in the lagoon and outside the 12-mile exclusion zone.

Underground testing involves exploding the device or warhead at the bottom of a borehole about 1000m deep. The explosion vaporizes rock in its immediate vicinity, creating a cavity in which most fission - products are deposited inside the cavity. French authorities claim that they are vitrified in the melted and vaporized rock of the cavity when that cools, and that absolutely none can enter the wider environment. However, extensive Assuring takes place in a radiating

pattern from the cavity, and the floor of the atoll is also extensively fissured. Ocean water circulates freely through the fissures.

France has observed a moratorium on testing from 15 July 1991, to September 4th 1995, when the last test series commenced President Chirac said that this series of tests was designed to assure the 'safety' of French warheads, but it looks rather as if the purpose was to finish the development of the TN75 warhead, and to continue the development of other warheads, as well as to develop a simulation capability which would enable warhead development even without testing.

The Sept 7, 1995 test at Mururoa, of 20Kt, was for the TN-75 warhead. The TN-75 is a warhead with stealth characteristics, significantly more sophisticated than anything France now has, and is in effect a new warhead.

The last French test was a 120 kiloton blast carried out on Jan 27th 1996 at Fangataufa Atholl.

France now says that from 1997, tests will be simulated in the 'laboratory'<sup>1</sup>, and through computer programs.

The French 'laboratory' consists of an enormous complex under the control of the CEA's Division des Applications Militaires (DAM), in the south of France. The installation, called CESTA (Centre d' Etudes Scientifiques et Techniques d' Aquitaine), contains 240 massive lasers of 30Mw each. The laser installation will it seems, have a dual role: the investigation of fusion phenomena for the development of fusion power, and the study of thermonuclear explosions. However, it will not be useful for the study of fission explosions, for which hydronuclear testing facilities and hydrodynamic testing facilities similar to the US's DAHRT facility will be required

## Chinese Testing

China conducted its first nuclear test in May 1964, and its 43th test on May 15th 1995, a bare three days after the NPT Review and Extension conference decided to extend the nuclear nonproliferation treaty. Another test was carried out on Aug 17th. The May 15th test was of 40-50Kt, while the Aug 17 test was around 60-70Kt. While the May 15th Chinese test passed with only pro-forma expressions of regret from the international community, the August 17th test was marked by vigorous protests sparked in part by concern over French testing. The author was the organizer of one such demonstration outside the Chinese consulate in Sydney, Australia.

Of these 44 tests, 23 have been atmospheric, and 21 underground. China conducted the world's last atmospheric test, in 1980.

China had been part of an agreement between the five nuclear powers to exercise 'utmost restraint' in the period leading up to the planned signing of a comprehensive test ban treaty (CTBT) in 1996.

While France and the US have now agreed to back a 'zero threshold' CTBT, which means in effect that no mini-nuclear tests are permitted, China has held out for either a relatively large 'threshold', or for the permitting of 'peaceful nuclear explosions', a formula which seems also to have some following in Russia, too.

Chinese nuclear testing has been carried out at the Lop Nor nuclear test site about 265Km southeast of Urumchi, the capital of Sinkiang. China has carried out a nuclear test roughly *every* 284 days since it began testing in 1964, and has a nuclear stockpile of about 450 weapons with a cumulative explosive power of 250 megatons. China is

weapon design. In these tests, plutonium or highly enriched uranium is largely or often completely replaced by natural or depleted uranium. But the other components of the device remain unaltered. Implosion and compression take place in the same way and are recorded with high speed X-ray cameras. A series of such tests can help designers perfect symmetrical, stable compression.

4. Experiments in nuclear fusion to develop understanding of the thermonuclear component of weapons as well of the deuterium—tritium boosters that make the fission components of warheads more efficient

5. Computer-simulation or information-site tests. Yield information relevant to weapons design.

6. Theoretical models (other than computer models)

7. There are tests on 'passive' or other components of weapons, which check their integrity and strength, or which examine weapon assemblies to ensure, for example, that they do not detonate when dropped accidentally or hit from one side (one-point safety test).

The last category of tests has nothing to do with the design of new weapons: such tests can at best help maintain existing arsenals. Logically, therefore, they should not be included in the scope of CTBT until dismantling of nuclear weapons arsenals begins. Similarly, there is adequate clarity that the first category, full-fledged nuclear weapon test explosions, must be totally prohibited. What of the rest?

## What can be learnt about nuclear weapons design from which type of test?

- yield less than 50 grams of TNT equivalent: Information about one-point safety.
- 2 Yield less than 200 grams Information about achievement of criticality.
- 3 Yield under 1.8 kgs: Criticality tests, measurements of temperature and pressure as criticality is achieved an other essential design information on the characteristics of the weapon at the very start of the nuclear explosion.
- 4 Yield up to several hundred Kgs Data enabling estimation of the yield of the weapon, and all the other data from the lower yield tests.
- 5 Yield of a few tens of tonnes: Development of advanced weapons consisting of fissile materials only (no thermonuclear component)
- 6 Yield of a few hundred tonnes: Most of the essential data about boosted fission as well as thermonuclear weapons

### *How Comprehensive!*

The nuclear powers have been unwilling to forgo nuclear testing, even in the face of huge financial costs to themselves and opposition from their populations, unless they are able to continue weapons development by other means.

A lively debate has taken place in the weapons establishments of the US, France, and Russia over the extent to which computer simulation and programs of the same sort as the US Science-Based Stockpile Stewardship Program', and the French PALEN program need to be supplemented by 'hydronuclear' tests of the power of a few Kg of TNT, and very small nuclear tests of up to 100 tons of TNT (04 kilotons).

The original position of the different nuclear weapons states: The United States wanted a "comprehensive" test ban that would permit hydronuclear tests up to 4 pounds; Russia would like to do tests of a few tens of tonnes; France would like several hundred tonnes. China would like a limit of several hundred tonnes if any exceptions are allowed because it feels that lower limits would enable the superpowers to design new weapons more easily than states with less technologically sophisticated equipment.

### *Ban the Bangs: All the Bangs*

The disarmament movement and non-nuclear nations have argued that a test is a test, and that the allowing of 'mini' nuclear tests would enable warhead development to continue, while making enforcement of a test ban more technically problematic. Some nations party to the CTBT negotiations have wanted to ban not only low-yield nuclear tests proper, but also 'hydronuclear' tests and computer simulations.

India has tried to insert a definition of nuclear testing into the CTBT text that includes any release of nuclear energy at any yield however small, produced by fission or fusion bought about by the explosive or other compression of fissile material. This definition covers hydronuclear testing.

### *Difficulties in Detection*

A ban on all tests including low-yield tests and HNEs is not without difficulty! It is easy enough to pick up tests of the type being done at Mururoo and Lop Nor of 20-150 kilo tons, and down to about 1 kilo-ton. Smaller tests than 0.1 kilo-ton and very small low-yield' tests would be difficult (though not impossible) to detect via existing seismic methods. Discussions on monitoring arrange-



currently developing two new missile systems, one for deployment in the late 1990s, and one for deployment round 2010, as well as a new sea-launched missile for use in a new submarine series. China has also been testing long-range missiles off the north coast of Taiwan.

Chinese weapons are designed at the Ninth Academy of the Chinese Academy of Engineering Physics at Mianyang, and plutonium has been produced at two reactors in Gansu and Sichuan. Plutonium production has currently ceased, but a

new plutonium production reactor is planned.

The Lop Nor Test Site is in a part of China which is not inhabited by ethnic Chinese, but by Moslem Uighur people, who would prefer to be independent. Much of the fallout from atmospheric testing has in the recent past fallen on the Tibetans, who are also subject to waste disposal and uranium mining. People close to the Lop Nor test site have complained of increases in the incidence of cancers and leukemias, and there have

been demonstrations against testing. Military authorities have admitted that 'a few deaths' have occurred.

China shows no inclination to desist either from weapons testing, or from provocative missile tests, and insists that it has already shown 'utmost restraint' by testing 'only' 43 (now 44) times. One more test, doubtless to come soon, will give it the same testing experience as the UK has. China plans at least three more tests before the year is out.

## Nuclear Testing and Weapons Design

Over the decades the information provided by nuclear tests has enabled the development of an enormous battery of techniques for the design of nuclear weapons, including theoretical methods and calculation! computer codes, and diverse kinds and sizes of laboratory experiments. While full scale testing of nuclear weapons is the one way in which all the relevant characteristics of a new warhead design can be definitely determined, new weapons can be designed without full scale tests. The degree of confidence in the functioning of a new warhead that has been designed without full-scale tests depends on (i) the range and sophistication of the techniques that are used in the design process, (ii) the complexity of the design, and (iii) the relation of the new design to the designs of warheads that have already been tested.

Nuclear weapons have been successfully designed without full scale tests. In fact, the design of the bomb dropped over Hiroshima was not tested prior to use. That is because the scientists and engineers of the Manhattan Project were very confident that the relative simplicity of the "gun-type" design corn-

bined with the various theoretical, laboratory and non-nuclear field tests were sufficient to guarantee success. In contrast, they were far less sure of the implosion design that was needed for the plutonium weapon used later on Nagasaki, since the timing of the firing of the conventional explosives that triggered the weapon was so critical.

### *Types of Tests*

There are seven broad categories of techniques that can assist in the design of new warheads without full-scale testing: (By full-scale weapons tests one means the detonation of a nuclear explosive device and the release of large quantities of nuclear energy running into thousands of tons of TNT equivalent.)

1. Nuclear explosions ranging from a few tens of pounds to a few hundred tons of TNT equivalent or less that are not quite full-scale explosions, but which yield most of the crucial information about the functioning of the weapon, other than its exact explosive yield.

2. Hydro Nuclear Explosions (HNEs): These are small scale nuclear explosions which are usually, but not always conducted at test sites, which have low yields, of a few kg of TNT equivalent. Hydro nuclear explosions are tests which use a limited quantity of plutonium or highly enriched uranium, but do involve a chain reaction. The chain reaction takes place upon detonation, but proceeds far more slowly than in a complete device. The explosion blows the HNE device apart before much energy is released. This stops the chain reaction. The prefix 'hydro' denotes that the core of the HNE device behaves like a fluid under compression by a chemical high explosive. Sufficient energy may be released to melt the core, but not enough to heat it to plasma temperatures and make it explode "like a bomb".

3. Hydrodynamic tests: These study the dynamics of materials (in particular, dummy explosion assemblies) in motion and under compression, but do not involve a release of fission energy. These experiments are typically conducted above ground, in laboratories. These tests by themselves cannot establish the yield of a particular

ments are being vigorously pursued, and it seems likely that an international monitoring system possibly in some association with the IAEA, will be created, incorporating seismic, radio nuclide, hydroacoustic, and infrasound detection technologies.

The discussions cover rather, the number of monitoring stations, the exact 'mix' of monitoring methods, the point at which inspections might be required, and the relationship between the international monitoring system and national systems (mostly US and Russian spy satellites). They also cover funding and institutional arrangements.

### *The new positions*

President Clinton has announced that he strongly backs a zero threshold CTBT. and has been followed in this by the French who have affirmed that they will not test any more and will rely on the PALEN simulation program to maintain stockpile confidence. In France's case, the sudden conversion to a Zero threshold CTBT is a result of the intense global pressure they have been under.

### *The Letter but not the Spirit*

In theory, programs such as France's PALEN program and the US 'Science-Based Stockpile Maintenance' program in combination with sophisticated computer-simulation programs do no more than maintain existing nuclear capacities. Even to maintain existing nuclear capacities however, runs counter the original thinking of a test ban treaty, which was precisely

that in the absence of tests, nuclear powers would over the years lose confidence' in their stockpiles. This wasn't a danger to be avoided: It was central to the whole idea!

The danger lies in the very sophisticated nature of the stockpile maintenance programme in especially the US, with a heavy reliance on facilities such as the DARHT facility (Dual-Axis Radiographic Hydrodynamic Test Facility), which performs ultra-high speed x-ray photographs of the high-explosive part of a nuclear explosion, in which the warhead material is compressed by high-explosives into a supercritical configuration, and the NIF facility. NIF is an ultra-powerful (and ultra-costly) laser device designed to look at nuclear fusion by focusing vast amounts of laser light on tiny tritium/deuterium pellets, providing the necessary conditions for fusion reactions to occur. Concern has been raised that this facility will in fact also duplicate the conditions of a thermonuclear 'secondary', enabling research related to the design of thermonuclear weapons to take place.

While the design of NIF is quite different to that of an H-bomb secondary, the thermonuclear reaction being explored is of course the same. What is of more concern however, is that whatever difficulties there may be in transferring NIF data directly to weapons-related research and new weapons design, NIF will be built in. and its institutional affiliations will be with, the Los Alamos Weapons Research Lab, and it has been widely seen within the lab itself as well as the wider public as a vastly expen-

sive toy to keep one-time weapons designers from boredom. Of the two facilities NIF and DARHT however, DARHT has no mission apart from weapons design, and it would be possible to design a weapon without NIF, but not without DARHT (or DARHT's predecessor). Yet concern has been expressed over NIF, while DARHT has attracted almost no attention. DARHT is to be built in two stages, with one X-ray machine being built by 1997 and a second to be added by the year 2000. The two independent axes of observation will enable three-dimensional observation of the compression of materials simulating the pit of a warhead.

Like the US, France also has an ultra-powerful laser facility on the drawing boards, (and in an advanced stage of construction) also nominally for fusion-related research, and like the US, the French facility is under the wing of the CEA's PALEN program. Coupled with a possibly substantial hydro-nuclear testing program, and ultra-powerful computer simulation capabilities, it may be possible for at least some weapons development to continue even in the complete absence of actual nuclear tests though weapons designers will always say that nothing beats the thrill of a real nuclear test.

*Sources: John Hallam  
foesydney@oeg.apc.org  
Arjun Makhijani: Science for  
Democratic Actum  
'Testing Times' by Praful Bidwai  
and Achin Vanaik*

## **Six Steps to Nuclear Disarmament**

**T**here used to be a time when asking for nuclear disarmament was like asking for the moon. It was an idea

confined to a tiny minority that refused to accept that the fears and human suffering of the last 50 years was the most that one could

hope for. Times have changed. The tiny minority has grown in numbers and gained support from surprising quarters; former nuclear

weapons designers, war planners and even generals have begun to speak out in favour of a nuclear weapons-free world. And for the first time they have a plan based on the experience with the abolition of chemical and biological weapons. In 1952, there was an agreement not to use "poisonous gases" and "bacteriological methods" in war. It was a deliberate act of restraint, many countries had these weapons but promised not to use them, and that promise has by and large been kept. From the promise not to use them to banning them altogether, has been a long but not very difficult road. It was long only because it was being travelled for the first time, and the way was uncertain.

Biological weapons were banned by the 1972 Biological Weapons Convention and about 130 countries have signed so far. The convention bans the development, production and stockpiling of dangerous biological materials for any thing other than "peaceful activities. The Chemical Weapons Convention was opened for signatures in 1993 and so far about 160 countries have signed. This is an even stricter convention: it bans the production, development, possession and use of chemical weapons and has created an Organisation for the Prohibition of Chemical Weapons to make sure that no country cheats on its commitments. The precedent is clear. Countries must first agree not to use a particular kind of weapon and then negotiate a convention to ban its development, production and use. This approach can be applied to nuclear weapons. The whole strategy on nuclear deterrence is premised on threat of use which has now been declared illegal by the World Court.

The demand for talks leading to a Nuclear Weapons Convention can be raised *in* the United Nations General Assembly. In its very first resolution in January 1946, the

General Assembly unanimously adopted a resolution that nuclear weapons should be abolished. Fifty years is high time that UN begins implementing that first resolution. Only the nuclear weapons powers could possibly be opposed to such a demand, and it is by no means clear that all the nuclear powers would be opposed. Those that are opposed would be exposed, isolated and deservedly condemned by the international community.

What is important, however, is for a deadline to be built into the talks on a convention. It should be ready for signature by the year 2000. A date is required and this choice is better than any other. Firstly, a clear deadline, set in advance, will make sure talks don't drag on for years. Secondly, the time is long enough to negotiate a treaty. Thirdly, and most importantly, as interest increasingly focuses on the coming of the 21st century, a Nuclear Weapons Convention could become the right of passage into a newer and better future. As such it could capture the world's attention, and with the whole world watching not even the US would wish to be seen as trying to hold the future hostage.

While these negotiations are going on, those countries that don't have nuclear weapons must create additional nuclear weapons free zones such as those established in South America by the Treaty of Tlatelolco, in the South Pacific by the Treaty of Rarotonga and the recently announced African Nuclear Weapons Free Zone. The effect of these treaties is to constrain the movement of nuclear weapons. The aim must be to restrict nuclear weapons to the territory of the countries that actually made them.

The first step towards a world free of nuclear weapons is that the missiles, submarines and planes that carry them need to be withdrawn from active duty. Then nuclear weapons must be taken out and

decommissioned. A disabled war-head is much less dangerous; it cannot go off accidentally, and it is useless to anybody who tries to use it. To make sure that no country tries to hide a few bombs away, everything must be kept under international safeguards. Teams of inspectors, and guards, from many countries will have to work together to keep an eye on each country that has stores of nuclear weapons.

The second step must be to destroy the nuclear capable delivery systems the aeroplanes and missiles that are used to carry the nuclear weapons. Without delivery systems even if a country managed to hide a nuclear weapon or two from the international inspectors, it would have no way of quickly taking them to a target and exploding them.

The third step is for all kinds of tests of nuclear weapons to be banned by a Comprehensive Test Ban Treaty. The first step in such a ban must be to close all the nuclear test sites, this is because testing nuclear weapons is more than just letting off of a nuclear explosion: it is actually a giant scientific experiment, costing millions of dollars, requiring many scientists and large amounts of sophisticated equipment. Closing the test sites will mean that a country wishing to explode a nuclear weapon as a test will have to first prepare a new test site. This can be seen from satellites; it cannot be kept a secret.

The ban on tests must also include those conducted in laboratories. Nuclear powers have been testing nuclear weapons for decades. This has allowed them to create computer models they can use to design new kinds of bombs. To make sure that computer Simulations of nuclear weapons is not taking place, all nuclear weapons laboratories will have to be subjected to international monitoring.

## Reviews

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Since the objective is a nuclear weapons free world, it only makes sense to get rid of existing nuclear weapons if no new ones are being made to replace them. Otherwise, old bombs will be replaced with new bombs, and the process will continue. To ensure this requires a stock taking of all weapons usable radioactive materials: how much material for making nuclear weapons is there already, and where is it. This means that the nuclear facilities in all countries will have to be visited by international teams of inspectors who will undertake this nuclear audit. The report on this audit must be a public international registry of all the radioactive material that can be used to make nuclear weapons. Any country trying to hide nuclear weapons material from the nuclear auditors will not be able to hide more than a small amount. There can be no secret stockpiles of this material that is of any military significance.

Once the amount and location of all the material is known, the factories for making nuclear weapons-and these are factories-can be closed down and all the specialised equipment dismantled. This is the fifth step. It will make it enormously difficult for any country to ever produce more than a few nuclear weapons, unless it is prepared to get caught and face the international consequences.

To complete the process of abolishing nuclear weapons forever the sixth and final step is to ban the military and commercial production and processing of all radioactive materials needed to make nuclear weapons. The ban must include the commercial sector because some of the materials produced by commercial nuclear power stations can be used in the production of nuclear weapons. There is no way of avoiding if any ban is to be permanent. Ending the nuclear weapons age will mean an end to the nuclear age in all its different forms.

*Dr. Zia Mian*  
*Sustainable Development Policy*  
*Institut*

*e*

*P O. Box 2342, Islamabad Pakistan*

### Radioactive Heaven and Earth

### Plutonium: Deadly Gold of the Nuclear Age

### Nuclear Wastelands: A Global Guide to Nuclear Weapons Production and Its Health and Environmental Effects

Nuclear weapons production and testing comes at a considerable real cost in terms of human health and the health of the environment. However, these costs though indisputable are difficult to evaluate because of the following:

1. Governments (all governments of nuclear weapons states and India of the "Peaceful Nuclear Explosion fame) have deliberately withheld whatever information is available from public view. The attempt has always been, irrespective of the ideology of the state to allay public fears rather than to educate so that anyone and everyone can decide for themselves.

2. The information that is available especially regarding the people at highest risk is seriously flawed. No attempts were made to study the effects of nuclear weapons testing on these people seriously. The people who conducted the tests in all countries were absolutely convinced in the first place that nuclear weapons were essential to security of the country and as a corollary felt justified in subjecting their own populations to risk. The studies that have been conducted on health effects of atmospheric nuclear tests and from venting of underground nuclear tests are grossly inadequate. The estimates of doses that high risk populations have received are serious underestimates made more with a view to decrease com-

pensation claims than with any scientific objectivity.

3. No serious studies have at all been done on risks to future generations from underground testing. It is well recognised by everybody that storage of long-lived radioactive waste is a risky business. No country in the world has been able to construct a repository for long-lived radioactive nuclear waste despite strenuous effort. And yet nuclear weapons powers have been without a care in the world conducting one underground explosion after the other which in effect means pumping long lived radioactive waste into the ground whose rocks have been fractured by repeated explosions.

These and many others detailing the harm done by different processes involved in the production of nuclear weapons are the conclusions of the remarkable series of books published by International Physicians for the Prevention of Nuclear War (IPPNW) in collaboration with Institute for Energy and Environmental Research (IEER). It ought to be noted that the harm done has been mainly to the populations of the nuclear weapons states themselves for whose security presumably the bombs were being built in the first place, It is a different matter that all the nuclear weapons powers have so chosen these populations that they have been unable to protest effectively for long.

The books are very well produced and have extensive documentation. Whatever information is available from different countries has been meticulously collected and verified. However, a small error which my nit-picking self cannot pass over without comment: The map on page 558 in Nuclear Wastelands showing actual and potential nuclear weapons production and testing sites in India and Pakistan, has left out Kakrapar entirely. Similarly missing are a number of heavy water production facili-



ties whereas some have **been included**. Although the books are detailed scientifically exacting studies, at the same time they can be profitably read by any interested lay person. To

use modern jargon for a book which eschews jargon, they have demystified the subject. Those interested in the subject should contact us or Dr Arjun Makhijani at the address given

these books free or may be for the cost of shipping.

*Contact Address:*

*Dr Arjun Makhijani*

*IEER, 6935 Laurel Avenue Takoma Park MD 20912 U.S.A.*

*Surendra Gadekar*

below. It might be possible to obtain

## Excuses, Excuses...and a cry for help

*Anumukti* is a bimonthly publication. A bland statement like this normally implies that an issue is produced every two months. Unfortunately, we have never ever in the last nine years been able to stick to this schedule but at least we were able to bring out six issues every year and you our readers were indulgent enough to allow us this laxity without too much protest.

This year has been a disgrace. From August '95 till now we have been able to produce counting this just three issues. An incensed reader has demanded his money back. Others too have justifiably complained.

What can I say? I have bitten off more than I can chew and this incompetence is the result. In a moment of weakness five years ago, I had agreed to become trustee of Suruchi Shikshan Vasahat Trust. This organisation was started by the pioneering efforts of Shri Mohan Parikh, who believed that an institute imparting training should first and foremost be able to run itself as a successful business and not depend on any donations from altruistic individuals. Suruchi started as a printing press and later as a place for research and extension into alternative energy and agricultural hand tools. In Mohan Parikh's time it did pioneering work which was awarded the Jamnalal Bajaj Award for application of technology to rural areas. Alas, as is true of many institutions, it could not sustain the thrust of its founder and many ills presently beset it. And being a trustee who happens to live not very far away (20 km) it has fallen on me to set things right. This is a herculean effort and I am not up to it. Certainly not up to doing that and managing to bring *Anumukti* out on time. There are distractions galore. Like an invitation to go to Vienna for the "Ten Years of Chernobyl" (a detailed report in the next issue) Conference, which we combined with a trip to Germany (See Germans say no to nuclear waste on page 5), the Netherlands and the US. Both a holiday as well as a chance to renew contacts and learn afresh about the nuclear issue.

What we now propose to do is to bring out a double issue on Chernobyl next. There is a great deal of accumulated material. Hopefully this would be done quickly enough so that we do catch up a little. However, the real problem is not the present crisis but an absence of helping hands in the long term. Hence, this appeal. We would welcome, nay greatly appreciate any constructive help from anybody who feels committed to either the antinuclear cause or the alternative energy cause.

## Subscription

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Editor *Anumukti*

Sampoorna Kranti Vidyalaya

Vedchhi, 394 641 India

Tel: 02625-22074

[Admin@Anumukti.ilbom.ernet.in](mailto:Admin@Anumukti.ilbom.ernet.in)

*Anumukti Team: Sumesh Chandran, Sanghamitra and Surendra Gadekar*

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