Peace Now!

Volume 4 : Issue 2 , June 2006 The Bulletin of the Coalition for Nuclear Disarmament & Peace

EDITORIAL

It was not supposed to happen. Just three years before the Chernobyl accident, writing in the *Bulletin of the International Atomic Energy Agency* (Vol. 25, June 1983), the head of IAEA's safety division claimed: "The design feature of having more than 1000 individual primary circuits increases the safety of the reactor system – a serious loss of coolant accident is practically impossible… the safety of nuclear power plants in the Soviet Union is assured by a very wide spectrum of measures…" But, on April 26, 1986, Unit 4 of the Chernobyl reactor complex did go 'prompt critical' and exploded. Despite the nuclear industry's efforts to play down its significance, it remains the most destructive industrial accident to date.

The accident played a part, though by no means the only one, in the global nuclear power profile; in the European Union, it actually precipitated a decline in the number of operating reactors. Now, more than twenty years after the accident, there seem to be signs of a nuclear revival. Chernobyl offers us several lessons to put this in perspective.

Nuclear power alone among all electricity generating technologies comes with the possibility of catastrophic accidents. While reactor safety has improved since Chernobyl, the fundamental characteristics that make them prone to accidents – highly interactive complex systems with parts that

Chernobyl: What Is It?

In April 1986, Chernobyl (Chornobyl' in Ukrainian) was an obscure town on the Pripiat River in north-central Ukraine, north of Kiev and slightly south of the border with Belarus. Both Ukraine and Belarus were provinces of the then USSR. The name of the town was associated with the nearby Power Complex that consisted of four nuclear reactors.

On April 26, the city's anonymity vanished forever when, during a test at 1:21 A.M., the No. 4 reactor exploded releasing large amounts of radioactivity into the atmosphere. Carried by the wind, the radioactive materials released spread far and wide. Practically every country in the Northern Hemisphere received some radioactive fallout. The world first learned of history's worst nuclear accident from Sweden, where abnormal radiation levels were registered at one of its nuclear facilities.

Just as the town of Hiroshima has become synonymous with the destructiveness of nuclear weapons, Chernobyl has become forever a symbol of the catastrophic accidents that are associated with nuclear power.

are tightly coupled – remain unchanged. These make it hard to foresee all possible accident modes and plan accordingly. Further, small unexpected events quickly spin out of control. Therefore, with nuclear reactors, major accidents simply cannot be ruled out.

Nuclear power advocates realize that the public is, justifiably, concerned about such accident possibilities. It is for this reason that they keep reiterating that nuclear power is safe. Chernobyl reveals that just as assurances about the safety of the Soviet Union's reactors proved false, today's assertions about safety might prove false too and so should not be trusted. This also means that the evaluation of safety of reactors and of health impacts of accidents, real or hypothetical, should be performed by individuals and organizations independent of nuclear utilities. In India, the Atomic Energy Regulatory Board (AERB), which is supposed to oversee the safety of all civilian nuclear facilities, is not independent of the Department of Atomic Energy (DAE) because it answers to the Atomic Energy Commission, which is headed by the Secretary of the DAE.

Another lesson from Chernobyl is that when accidents occur at nuclear facilities, details about the accident and its potential (even if considered low probability) impacts must be made public as soon as possible. In contrast, the first reaction to Chernobyl by Soviet authorities was to impose enormous secrecy on the event itself and its fallout. This resulted in thousands of unnecessary deaths and victims of cancer and other serious illnesses. This secrecy cannot be attributed entirely to the Soviet system of government; nuclear establishments around the world, including in India, operate largely in secret.

All of this leads one to the question – what lesson does Chernobyl offer for the continued reliance on and further expansion of nuclear power worldwide. Deciding on the future of nuclear power depends on many considerations: environmental sustainability, economics, ethics, international security, and safety, to name some. These are all contentious and will remain so. If there is one normative consideration that can be advanced into this debate, it should be that of democratizing the decision making. Chernobyl demonstrates that nuclear technology poses a risk to people around the world, and that their consent, based on a sound understanding of the issues involved, is a pre-requisite for making any decisions about nuclear power.

The future of nuclear power is important not only in its own right but because it impinges fundamentally on a goal that CNDP espouses: nuclear disarmament. Though the nuclear industry is loath to admit it, there is a very close relationship between nuclear power and weapons. There are two primary reasons for the overlap. The first is that all nuclear reactors produce weapons useable plutonium. Similarly facilities for the enrichment of uranium for use in light water reactors, can also be used to produce weapons useable Highly Enriched Uranium (HEU). In general, many of the physical steps involved in the two pursuits are the same and the infrastructure for one can contribute substantially to the other.

Second, as part of a nuclear energy programme, people have to be trained in various aspects of nuclear physics and technology. These people can then apply the same skills to nuclear weapons research and development. The DAE's trajectory, from an organization intended to develop atomic energy for peaceful purposes to the purveyors of a nuclear arsenal offering multiple weapons designs, offers a striking illustration of this reality. Making nuclear weapons, therefore, would become a matter of choice and not of capability. A nuclear powered future makes nuclear disarmament intrinsically unstable.

Smiles from Chernobyl
-But Why are they Smiling?

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"What we remember from childhood we remember forever - permanent ghosts, stamped, inked, imprinted, eternally seen". (Cynthia Ozick)

I am sitting at the end of a long table listening to a women in her late forties talk. It is early in the afternoon and springtime in Kyiv. My interpreter is doing her best to translate both words and the emotional content they hold. The woman is originally from Chernobyl, her name is Valentina, and she calls herself a refugee.

For many of us the tragic events of 1986 have left only sordid images and deep emotional scars. Growing up in Scandinavia in the eighties, I have clear memories of the events that transpired. Not so much of where I was, or what I was doing, but more of the horrific images that flashed across our television screen every evening, and the entourage of earnest men speaking about the consequences. As a young boy I had no clear idea of what was going on around me. It is therefore strange, twenty years later, to remember the fearful feeling that was no doubt transmitted through my mother's concerned face, as she realized that the nuclear fallout had reached Sweden and was on its way to Norway. A young boy remembers such things. For me, Chernobyl will always be a symbol of fear.

Almost two decades later, in 2002 while studying project management and social innovation at the Kaospilot school in Århus, a group of students started talking about Chernobyl. Just a few days earlier, one of us had wound up next to a hideously deformed man on the plane. My fellow student was at first reluctant to talk to him but later learned that he was a "Child of Chernobyl". At the time of the accident he was still in his mothers womb. Eighteen years later, as he sat on the plane with most of his face and upper body mangled, he told my colleague that he expected not to reach the age of twenty. The damage to his internal organs was too severe, and his doctors had told him to make the most of his time on this earth. The young man's story sparked a creative search in our group for ways of keeping the memory of Chernobyl alive, and helping those who were still suffering. Thus began my involvement with the Children of Chernobyl, and planning for the Smiles from Chernobyl project.

Three weeks after that we decided to start a project in the Ukraine I find myself sitting at the table in the offices of the "Zemlyaki" (Countrymen). The name is derived from their unbroken attachment to the land they call their own - the land of Chernobyl. I was led here by chance, or perhaps something greater, to a small inconspicuous apartment on the outskirts of Kyiv. On the wall around me are paintings and cartoons with vibrant colors and striking motifs.

Valentina is telling me her story. She is trying to explain what happened to her "on that morning". "It came as a total surprise", she says. She and her unborn child were just getting out bed, and she could feel that something was amiss. Her husband had been working the nightshift and had not come home as usual. Looking outside she could see a cloud hanging on the horizon, and people rushing around in the streets. Her house was located in the workers town of Pripyat, just a few kilometers from the Chernobyl nuclear plant.

"At first it was like a dream come true", she says. Her husband had found good stable work as an operator. They had been given a house in a newly built town. There were kindergartens for the children, good schools, an Olympic sized swimming pool, a cinema, beautiful natural surroundings along the river, and even an amusement park, built especially for the city. "Life was good in Prypiat".

As Valentina continues, I realize that I do not have to understand her words to follow the emotions of her experience. Her voice and facial expression communicate the profound grief and deep commitment to her cause that only a mother who has lost a child can convey. Her hands tremble and tears run down her face as she recalls moving out on her balcony to sit with her breakfast in the morning air. She remembers the face of the young policeman approaching her and telling her that there had been an accident, and that she had better stay inside. She recalls the lonely hours spent pacing in the living room, waiting for some word on her husband. What was going on?

After a while her thoughts turned to her unborn child, only two months away. She

remembers trying to calm herself that the police and authorities were probably taking care of the situation. Several hours passed before there was a knock on the door. A policeman, this time a more experienced officer, calmly told her that there had been a slight accident at the station, and that civilians were being evacuated for their own safety. "There is probably nothing to worry about, it is just a safety precaution", he said. Valentina tried asking where they were going, and when they would be coming back. The officer replied that they would be taken to a safe place, and that she should pack an overnight bag with just a few essentials. "Oh, and you might want to put out some food for the animals as well", suggested the officer as he turned halfway down the stairs on his way to deliver the message next door.

Valentina remembers the worried looks and anxious conversations in the back of the army truck. Most of the evacuees are women and children. Rumors fly; "explosion", "radiation", "someone died in the blast", "officials are coming from Moscow", "what have you heard?" No word from her husband yet.

Back at the table, Valentina is reluctant to talk about her husband. "I never heard from him again" she mumbles quietly. Wiping the tears from her eyes, she instead rejoices in her son who is now eighteen years old. He is doing well, all things considered. Having been diagnosed with cerebral defects he has managed to adapt and is doing well in school. Life must go on.

Some 40,000 people were settled in this ghetto-like compound in the suburbs of Kyiv. At first they were told it was only temporary. Twenty years later, they are still here. This is the new home of the Zemlyaki – a community centre and meeting place for those who were exiled as a result of "human error and faulty technology", the terms often used to describe the cause of the Chernobyl accident. A small but dedicated group of women are doing their best to keep the memory alive with their own museum. A museum, they say, that tells a different story from the one offered by the official, state-run museum on Chernobyl in downtown Kyiv. Zemlyaki also helps acquire and distribute medicines to the people of the community who are suffering from exposure to radiation. The government has long since abandoned its medical relief program for those whose illnesses are deemed not to be "a direct result of radiation". Proper medication is almost impossible to come by and the black market is crowded with half-baked, phony medicines that have little impact on the afflictions they claim to treat.

Along with the museum, the Zemlyaki have an impressive art gallery, which prominently features the physician turned artist, Victor Petrov, who started painting in the midst of the disaster for mental relief. At the time of the accident he was working as a physician at the Prypiat infirmary. His first hand experiences, transformed into images on a canvas, are so powerful that you can almost feel the radiation burning on your skin.

The table we are sitting at is crowded. We have been greeted as honoured guests, and several women have come to talk to us, and share their stories. Emotions run thick in the room. The sincerity and resilience that these women display has a profound impact on me. Their stories are all similar. All of them remember the beautiful nature and good life in and around Chernobyl. All of them hope to go back to their beloved country. But there is almost no official support. Ever since Ukraine became independent, the government has preferred to blame the former Soviet regime and has gradually reduced its already meagre obligations to the victims.

All of a sudden one of the women starts chanting. The other women follow suit and suddenly they are all singing together. The gloomy atmosphere is relived by the tender voices of women in song. They are calling their loved ones. The ones they have lost. Remembering them in their song and rejoicing. A few moments later a group of youngsters enter the room. Everyone gathers on the floor and one of the older boys takes out his guitar. Within a few magical moments the tone of the room is transformed, from a commemoration of tragedy and loss into a celebration of life in song and dance. It is truly astounding to witness. It is as if they have collectively decided, without speaking, that this was enough sorrow for one day. These are the people who, more than anyone else, know the devastating consequences of humanity's flirtation with nuclear power. They have lost and suffered, cried and mourned, and all of a sudden everyone is signing, laughing, even smiling. Why are they smiling?

As is widely known, the actual impact from the Chernobyl accident remains controversial.

A September 2005 report from the United Nations, International Atomic Energy Agency, World Health Organization, the World Bank, and the governments of the three most impacted countries (Ukraine, Belarus, Russia) states that in all the Chernobyl accident will claim a total of 4000 lives. By mid 2005

the report claims, only 50 people have died as a direct result of nuclear exposure.

In start contrast to such official figures are the casualty estimates put out by several on the ground NGOs and scientific institutions. For example, Professor Edmund Lengfelder, who has been working in Belarus since 1991, warns of up to 100 000 new cases of thyroid cancer in the coming years. Local groups, like the Zemlyaki, often cite numbers from the Liquidators committee, claiming that up to 100 000 of the people who were ordered to clean up the mess, have died.

Deaths can be counted, cancers diagnosed. But the quality of life for the thousands of people suffering from chronic diseases and failing immune systems is more difficult to measure. No one is willing to claim responsibility for conditions that are not directly related to the accident. Sitting around the table, hearing the women talk about how their children struggle to cope with reduced lung capacity, imbalanced nerve systems, and even holes in the brain, it dawns on me why happiness is so much a part of the environment at the Zemlyaki.

This is their medicine. This is what they can provide to those who suffer, and will continue to suffer, when proper medical supplies and official recognition is eluding them. They provide mental support and a social network for a dignified life, despite all odds. They sing, dance, paint, and remember in an effort build a life worth living. In the fight against mental despair their strongest weapon is laughter.

They smile because their souls are free.

They smile to honor the memory of those that they have lost.

They smile because they are dignified.

I am forever grateful to the women of the Zemlyaki for bringing to my world a different memory of Chernobyl. Not the one of fear and devastation that has followed me since youth, but one of joy and laughter. I relish in the wisdom of these women, who have realized the healing power of the Smiles from Chernobyl.

Chernobyl: The Politics of Counting Deaths

M. V. Ramana

Twenty years after the Chernobyl accident, we still do not know the true extent of its health consequences. Estimates of the number of deaths as a result of the accident range from a few tens (31 was the official Soviet figure for some years after the accident) to hundreds of thousands. While there are technical difficulties in attributing a particular incidence of cancer to radiation exposure and some of the necessary data is not available partially as a result of secrecy, the primary reason for the range of estimates is underlying organizational and institutional politics.

The technical difficulty arises from the fact that there are two kinds of effects due to radiation exposure: deterministic and stochastic. Deterministic effects occur only at high radiation doses. Only the firemen and the personnel of the power station on the night of the accident were exposed to such high radiation doses. Of these, at least 134 individuals were clinically diagnosed with "acute radiation sickness".

At lower radiation doses, such as the typical doses that the vast majority of those exposed to radioactive matter from the accident would have accumulated, the health impacts take time to develop and are not uniform; not all people exposed to the same level of radiation would exhibit the same effects. However, there is considerable evidence that exposure to radiation by a population would result in a statistically increased number of health effects of various kinds, in particular cancers. But these cancers would occur against the background of a much larger number of cancers induced in the same population from both natural and anthropogenic (other than radiation) causes. Thus, it is difficult to determine if the excess of cancers is merely a statistical fluctuation of the background or if it is caused by radiation exposure due to the accident.

The primary reason for the range of estimates of casualties, however, is that the figures for casualties are the site of intense political battles. There has been a sustained effort, mostly by or at the instigation of institutions and people connected to the nuclear industry, to diminish the magnitude of the numbers of deaths attributed to the accident. This is understandable – the consequent argument is that if even the worst nuclear disaster has resulted in only a "relatively small number" of deaths, then nuclear power cannot be all that unsafe. On the other hand, there are vested interests on the side of institutions and individuals, especially in the affected areas, that drive them to

exaggerate the extent of deaths and other health consequences.

A good example of the first tendency is provided by estimates of the number of thyroid cancers resulting from the accident. Thyroid cancer was one of the health impacts expected to manifest itself early; initial estimates suggested that there would be "thousands to tens of thousands of…thyroid tumours over the next few decades". In 1991, however, the International Atomic Energy Agency (IAEA) concluded that "there is no clear pathologically documented evidence of an increase in thyroid cancer of the types known to be radiation related". This was despite the reports that had been submitted to the IAEA by 1990 that "unusually numbers of thyroid cancer cases in children" had been noted in Belarus and Ukraine. But the IAEA chose to play these down. The reasons are not hard to discern: the IAEA's primary mandate is to promote the use of nuclear energy.

The first partial acknowledgement of this increase from an organization associated with the United Nations was at a 1995 World Health Organization (WHO) conference in Geneva where the first statistics on the rise in thyroid cancers amongst children was presented. But the WHO did not publish these results. When asked, then Director-General Hiroshi Nakajima candidly admitted that the proceedings were not published because "it was a Conference organized jointly with the IAEA. This was the problem."

The problem goes back to May 1959, when an agreement was signed between the IAEA and WHO. Article I of the agreement states that: "the IAEA has the primary responsibility for encouraging, assisting and coordinating research on, and development and practical application of atomic energy for peaceful uses throughout the world, without prejudice to the right of WHO to concern itself with promoting, developing, assisting and coordinating international health work, including research in all its aspects."

The IAEA appears to have interpreted this as giving it the right to decide what information about radiation health effects is distributed to the public.

As time proceeded, the increase in thyroid cancers could scarcely be denied. In 2000, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), recorded that there were an "unusually high numbers of thyroid cancers observed in the contaminated areas during the past 14 years" and went on to observe that "the number of thyroid cancers (about 1,800) in individuals exposed in childhood, in particular in the severely contaminated areas of the three affected countries, is *considerably greater* than expected based on previous knowledge. The high incidence and the short induction period are unusual… If the current trend continues, additional thyroid cancers can be expected to occur, especially in those who were exposed at young ages" These "form the largest number of cancers of one type, caused by a single event on one date, ever recorded".

A more recent attempt at underestimating the impact of the accident is the 2005 report of the Chernobyl Forum. The Forum was convened by the IAEA in 2003 to "generate 'authoritative consensual statements' on the environmental consequences and health effects attributable to radiation exposure arising from the accident as well as to provide advice on environmental remediation and special health care programmes, and to suggest areas where further research is required". In September 2005, the IAEA put out a press release announcing that the Forum had determined that only up to 4000 people could eventually die as a result of radiation exposure from the Chernobyl accident. This was hailed by officials from the Indian nuclear establishment as having settled the debate on "how many deaths and how much disease really resulted from the accident". Though the Forum's report does not seem to be publicly available, in particular the health effects section that is coordinated by the World Health Organization, draft versions

The Fate of those not included in the Death Counts

Alina, aged fifteen, had…been diagnosed with thyroid cancer in 1992, and her thyroid gland had been completely removed. She had just undergone a second surgery to remove knots that had spread to her trachea. Alina wobbled her head, straining to find ways of resisting the surgical pain… "I have to live…I was afraid of this second operation. The nodules can still spread into the lungs and to the brains. If they go into the brains it will be too late; it will be almost impossible to save me. But if the nodules spread into the lungs, they can still save me." She wanted to be saved. "But everything is normal right now," she reassures herself. "I have to drink iodine and take daily doses of thyroxine. If I don't have that hormone I'll be faint, and I won't be as lucky."

From Adriana Petryna "Life exposed : biological citizens after Chernobyl" (Princeton: Princeton University Press, 2002).

are available on the internet.

The principal way by which the Forum manages to come up with such a small figure is by focusing on just the populations of the most heavily exposed areas. However, there are much larger populations, both in the affected countries themselves and in the rest of the world, who have been exposed to lower levels of radiation.

There is general scientific consensus that there exists no threshold below which radiation exposure is harmless; even very low doses always increase the risk of cancer. Further, the biological risk from radiation exposure seems to be a linear function of radiation dose at low doses. If a given dose is shared among N people, the risk of cancer death per person is reduced to 1/N, but since each of N people now suffers this risk, the total probable number of cancer deaths remains the same. Thus, the net effect of a low level of radiation exposure to large populations could be sizeable.

The estimated collective radiation dose to the entire world is 600,000 person-Sv. Estimates of cancer risk from radiation exposure are roughly 0.03 to 0.06 cancer deaths per Sv of radiation. Therefore, the collective radiation dose mentioned above would result in roughly 18-36,000 deaths over a long period of time. This is much higher than the misleading figure of 4000 that the IAEA has been attributing to the accident. Since these occur against the background of millions of cancer deaths from causes not related to Chernobyl, they cannot be detected statistically. But they would still be the result of the accident.

The Forum's estimates also suggest a systematic pattern of avoiding attribution of increases in other health impacts such as leukemia and congenital deformities by arguing that these do not correlate adequately with estimated radiation dose rates. Setting this high standard of evidence, seemingly justified by the ambiguities inherent in relating cancer to radiation exposure, is also a direct result of the vested interests involved.

Consider the case of leukemia in children who were exposed to radiation doses from the accident while still in the uterus. Several studies in the past, starting with the landmark work by Alice Stewart and her collaborators, have established that such children face an increased risk of cancer. Similar increases, within the expected ranges, were found in some regions that were subject to radioactive fallout from Chernobyl as well. There was not a single published study that did not find an excess. And yet the experts convened by the Forum dismissed them as "not entirely convincing" and concluded that "there is neither strong evidence for or against an association between in utero exposure to Chernobyl fallout and an increased risk of leukaemia".

The Forum also dismisses the steady increase in congenital malformations in Belarus – figures for the number of babies born with congenital malformations have risen from roughly 5 per 1000 in 1983-86 to about 10 per 1000 by the late 1990s – as not resulting from Chernobyl. The cited reason: "there is no evidence that there is a difference between low level or high level contaminated areas." This is dubious and no effort, apart from the suggestion of increased reporting of malformations, is made to find plausible explanations for this increase. Yet, the Forum's experts went on to recommend that the exposed "population should be *reassured* that heritable effects and birth defects have not been shown to be increased by the accident" (our emphasis).

Despite these efforts at trying to minimize the impact of Chernobyl, the Forum was forced to admit to some concrete and unexpected, at least in magnitude, effects. One is the increase in thyroid cancers. Another somewhat unanticipated radiation induced effect was the development of cataracts both among young children and emergency and recovery workers. These appear develop at exposures to radiation doses lower than previously experienced.

Another unanticipated consequence is the "mental health impact of Chernobyl", which according to the Forum, "is the largest public health problem caused by the accident to date". This may seem trivializing the other impacts. Nevertheless, it is testimony to the "complex web of events and long-term difficulties, such as massive relocation, loss of economic stability, and long-term threats to health in current and, possibly, future generations," unleashed by Chernobyl "that resulted in an increased sense of anomie and diminished sense of physical and emotional balance."

These, of course, are not the only health effects. And there are quite likely to be more such impacts manifesting themselves over the coming years. We cannot predict with confidence what the fate of the grandchildren and the great-grandchildren of the Chernobyl victims. But one can predict with fair confidence that the nuclear industry, should it survive till then, will continue to deny these impacts of Chernobyl.

The State of Nuclear Pakistan

Zia Mian and A.H. Nayyar

Pakistan's nuclear program is now over fifty years old. It was launched in October 1954, when the government announced the creation an atomic energy research and development program. The announcement came on the same day and was reported alongside a meeting between Pakistan's prime minister and United States president Eisenhower at the White House. In December 1953, US President Eisenhower had proposed his *Atoms for Peace* initiative, a way to win allies in the Cold War by sharing American nuclear technology with developing countries and so helping them participate in what was described as an imminent "atomic age." Signing up for *Atoms for Peace* offered an easy way to show support for Eisenhower and Pakistan's leaders were seeking to build an alliance with the United States that would deliver military and economic aid and political support that Pakistan could use to bolster its position in its conflict with India.

Pakistan quickly began to receive military and military advisors as well as economic advisers who came to help it prepare its economic development plans. They imagined a nuclear future for Pakistan. In the first economic plan, meant to cover the period 1955-1960, the planners described their task as "the formulation of programs and policies designed to lead [Pakistan] by a consciously directed and accelerated movement from a largely technologically backward and feudalistic stage into the modern era of advanced technology now on the threshold of atomic age."

The Pakistan Atomic Energy Commission (PAEC) was set up to manage the effort. It used the *Atoms for Peace* program to send young scientists and engineers for training in nuclear science and engineering in the United States, and in time received a US–supplied research reactor. The first power reactor, a 137 MW pressurized heavy water reactor, was designed and built by Canada, near Karachi in 1970. Pakistan's refusal to sign the 1970 nuclear nonproliferation treaty, especially after India's 1974 nuclear test raised fears of a matching Pakistani nuclear weapons program and Canada ended its supply of fuel for Kanupp. This forced Pakistan to develop its own nuclear fuel technology, and look elsewhere for further nuclear reactors.

A 300 MW light water reactor was provided by China and started operating in 2000, at Chashma in northern Pakistan. It is fuelled by China. Work is about to start on a second power reactor at the same site. The new 300 MWe reactor is expected to cost $850 million and be completed in 2011. But costs are likely to be larger and the construction time longer. All these reactors are under international safeguards.

The current nuclear generating capacity is about 340 MW, because the Karachi nuclear power plant has been working at about 40 MW since its life extension in 2002 (it is expected to be retired in 2019). The actual generation is significantly lower.

Pakistan plans to increase its nuclear capacity to 8800 MW by 2030, enhancing the contribution of nuclear energy from the present 0.8% to 4.2%. These ambitious expansion plans face several potential obstacles. The first of these is that as a state that is not a signatory of the nuclear non-proliferation treaty, nor one that has all its nuclear facilities under IAEA safeguards, Pakistan is not eligible to purchase nuclear reactors from states that are members of the Nuclear Suppliers Group. China which had built the first Chashma reactor in the late 1990s joined the NSG in 2004, and is no longer allowed to sell reactors to Pakistan. The second Chashma reactor was apparently included in the original deal and is 'grand-fathered'.

Secondly, nuclear power plants are capital intensive with high construction costs and long construction times. Pakistan has relied on cheap credit from Canada and from China respectively in purchasing its two nuclear power reactors. But apparently China did not extend sufficient credit to meet the foreign exchange component of the third power reactor (Chashma-II) and Pakistan had to seek additional international donor support. This problem is likely to get worse if Pakistan tries to purchase a large number of bigger and so more expensive reactors to meet its goals. Funding for new nuclear reactors will have to compete against the demand for money for generating capacity that is cheaper to build and could come on line more quickly. Only if both these issues are addressed would any nuclear expansion be feasible. To meet these challenges, in 2005, PAEC proposed that foreign companies could be invited to

build, own and operate nuclear power plants in Pakistan with equity sharing in 'nuclear power parks'.

PAEC is the most important force shaping policy and attitudes towards nuclear energy in Pakistan. A major source of its enormous political power is that the civil and military nuclear programs of Pakistan are intermingled (as is the case in several other countries, particularly India). This has meant that for decades PAEC has been able to claim to represent both national scientific and technological progress and national security. One measure of its continuing success at avoiding accountability is that even as recently as 2005 PAEC refused to provide its budgets to Parliament.

Pakistan's nuclear weapons program was launched in the early 1970s, as part of PAEC. Led by some of its American trained scientists, this effort gained urgency after India's 1974 nuclear test. The goal was initially to follow a plutonium path to a weapons capability, through either diverting spent fuel from Kanupp or building a plutonium production reactor and separating the plutonium. But Pakistan first succeeded in producing fissile material for its nuclear weapons through the covert acquisition of centrifuge uranium enrichment technology by A.Q. Khan, a Pakistani metallurgist trained in Europe who worked for Urenco, a joint British, Dutch, German conglomerate.

Pakistan was able to enrich uranium by the early 1980s and was assumed thereafter to have a nuclear weapons capability. In 1998, Pakistan followed India in testing its nuclear weapons. The nuclear tests ushered in period of intense crisis in South Asia that included both a war (1999) and a prolonged near-war situation (2001-2002) in which leaders in both states threatened the use of nuclear weapons. The uranium enrichment program is believed to have produced sufficient material so far for about 50 nuclear weapons. Pakistan also has a dedicated production reactor, at Khushab, for weapon plutonium, and may have started separating plutonium from it in recent years.

PAEC dominates the scene in other ways. It controls the overwhelming majority of scientific activity in the country, in terms of numbers of scientists and access to financial resources. This has historically given it a capacity to influence policy making in science and science related areas, as well as in nuclear energy and national security. PAEC has a near-monopoly on nuclear expertise; it runs its own training institutes and nuclear engineering courses are not offered in universities. As a result there is no academic community able to offer independent peer review of PAEC claims, and no significant critical technical input into public debate and policy making on nuclear issues.

There is no significant movement in Pakistan against nucler energy, nor even any full-time independent research institutions or grass-roots activists working on this issue. This is true in other important public policy areas also. It is due partly to the suppression of the growth of civil society and social movements by successive military regimes and authoritarian civil governments. Political energies and resources have been directed to organizing for basic economic and social needs, democracy and human rights, especially the rights of women. The emergence of a small environmental movement in the 1990s with both think-tanks and grass-roots organizations, and the network of groups mobilized against nuclear weapons (the Pakistan Peace Coalition) that took shape after the 1998 nuclear tests suggest things may be starting to change. But it is likely to be a long time before a broad, resilient and capable civil society capable of contending with the state will emerge.

The most significant public debate over nuclear energy in Pakistan was triggered in 1999 by a technical study assessing the safety and possible consequences of a potential accident at the Chashma nuclear power plant, which had then just been recently completed but was not yet operating. The study identified a number of safety concerns; these included evidence of earthquake hazards at the site, the questionable reliability of the design given that it was based on a Chinese prototype with an uncertain operational history; and the questionable quality of the reactor components, some of which had never been manufactured in China before. An additional concern followed from details of a 1998 accident which shut down for a year the prototype reactor in China. Unable to diagnose and make the repairs on a reactor they had designed and built, China contracted a US nuclear engineering company to assess the problem and make repairs. Similar assistance would not be available to Pakistan because it is not a party to the Non-Proliferation Treaty.

The study used data from the Chernobyl accident to constrain the possible radioactivity release that might follow a melt-down and containment failure at Chashma. It used a simple atmospheric dispersion model and data on wind patterns, local population

density and standard cancer risks from radiation exposure to estimate that there could be 12,000-30,000 cancer deaths in the event of a major accident at the plant. The radioactivity that would be released could also contaminate the near-by Indus River, a crucial source of water for much of the country.

The Chashma report was reprinted by a leading environmental policy think tank in Islamabad, the Sustainable Development Policy Institute. The issue was debated in newspaper articles, seminars at major think tanks, and at a public debate hosted by the Ministry of Environment to which senior PAEC officials were also invited. The Advocacy and Development Network, a group of leading local NGOs working on sustainable development, took a public position calling for a halt to further work on the Chashma nuclear reactor pending an independent inquiry into its safety. Given the public interest, PAEC agreed to let one of the authors (AHN) of the report see the reactor safety documents that are otherwise regarded as confidential. The campaign failed in that the Chashma reactor commenced operating without an official independent safety review.

The debate around the safety of the Chashma reactor also led to a push for a more independent nuclear regulatory body. Pakistan's Nuclear Regulatory Board established in 1997 was far from being an independent watchdog body, even though it was officially described as one. The Chairman of PAEC, who is responsible for all nuclear facilities in the country, was also Chairman of the Nuclear Regulatory Board. There was no provision for either a separate budget or separate professional staff. A determined campaign finally led to an amended Nuclear Regulation Act that established a more autonomous Nuclear Regulatory Authority. However, reflecting PAEC's continuing monopoly on nuclear expertise, even the PNRA relies for its staff on PAEC personnel, including its chairman.

In conclusion, nuclear energy is a small, almost negligible, part of Pakistan's energy sector in terms of generating capacity. It has become important because of the enormous and unaccountable power of the Pakistan Atomic Energy Commission that manages it, and the link to the nuclear weapons program. These factors have made it difficult to create or sustain a significant and critical policy debate, or mobilize masses on the issue of nuclear energy and its role in Pakistan's future, despite its potential for catastrophic failure, the unresolved problems of waste disposal, and the distortions that it creates in energy planning because of its need for large amounts of scarce capital and skilled personnel for long periods of time.

False Assumptions of the Nuclear Deal

Amulya K. N. Reddy

The Indo-US nuclear agreement signed by Prime Minister Manmohan Singh and President George Bush has been claimed to be a landmark in Indo-US relations and a historic achievement. Here an attempt will be made to scrutinise the baggage of assumptions with which the deal has been approached.

Assumption No 1: Nuclear power (NP) is important to India's electricity sector

One would have expected the focus of a US-India agreement to include a broad spectrum of energy initiatives including clean coal and renewable technologies. Instead, the emphasis has been almost exclusively on nuclear power. This bias is strange because NP accounts for a trivial 3 per cent of India's power, i e, 3,310 MW, out of a total of about 1,10,000 MW. In fact, NP does not even contribute as much as the 3,595 MW of wind power. (Though wind power is seasonal in character, this drawback can be overcome if it is coupled to hydroelectric generation or other sources of peak power such as natural gas.) The comparative contributions of nuclear and wind power must be seen in relation to the enormous investment on NP compared to the abysmally low investment on wind power. The reason why renewable energy technologies (solar, wind, small hydro and biomass) and efficiency improvements are not part of the agreement is probably because they are not backed by lobbies as powerful as the nuclear establishment. It is also possible that the real reason for the discrimination in favour of NP is its weapons implications.

Assumption No 2: India's current NP contribution would have been higher had it not been handicapped by various constraints

India's current NP contribution is handicapped by various constraints such as (1)

indigenous availability of cheap uranium for the pressurised heavy water reactors (PHWRs), (2) the unavailability of enriched uranium for its pressurised light water reactors, (3) the inadequacy of indigenous heavy water production for its PHWRs. Though all these are important, the real constraint is probably financial. NP is more expensive, compared to coal-based thermal plants for electricity generation. Thus, even if the material constraints are removed (as the Indo-US nuclear agreement envisages) it is not certain that nuclear power will leap forward at the rate that is planned (20,000 MW in 2020).

Assumption No 3: NP should play a major role in India's future energy scene

One would have expected the relative emphasis on various technologies of electricity saving and generation to be arrived at rationally from an integrated resource plan (or least cost plan). Though the methodology of least cost planning has been independently developed within the country, it appears that the Planning Commission has not worked out such a plan for India. In the absence of such a least cost mix, the choice of energy technologies cannot but be ad hoc and subject to the pressures of lobbies.

Even in the case of an arbitrary choice of NP, some justification has to be given to the public. It was shown at the Kaiga debate in 1989 that when the more sophisticated and modern discounted cash flow (DCF) techniques are used instead of the Atomic Energy Commission's crude rate of return calculations, NP becomes cheaper than coal only when unrealistically and unacceptably low interest rates are used. This qualitative conclusion was reestablished using more updated figures in a more recent paper published in *Economic and Political Weekly*.

In fact, there is no empirical evidence that the expansion of nuclear power has led to a reduction of CO2 emissions. On the contrary, as the late Japanese chemist and Right Livelihood Award winner, Jinzaburo Takagi, has shown, even as nuclear power has expanded in Japan, its national CO2 emissions have increased.

Apart from costs, a number of other issues militate against NP - safety, waste disposal, vulnerability to terrorist hijacking of nuclear materials, and proliferation. Against this background, the government has invoked the need to mitigate global warming and the Planning Commission claimed that NP "is an important tool for decarbonising the power sector" in the future energy scene.

To scrutinise this decarbonisation mantra, it must be noted that the total greenhouse gas emissions (mainly carbon dioxide), consists of two contributions: (1) emissions from the power sector, and (2) emissions from other sectors including transportation.

In the case of India, the emissions from the power sector due to the combustion of coal, natural gas, and other fossil-fuels in power stations were 36 per cent of the total emissions in 1990 and 45 percent in 2000. Hence, even if the power sector contribution were to be drastically reduced through the replacement of electricity from thermal combustion with electricity from nuclear plants, the emissions from sectors other than the power sector will remain large, i e, about 55 per cent in 2000. However, in a distant future, when the dream of zero-emissions electric vehicles replacing automobiles is realised, the emissions from the transportation sector, another about 20 percent, can perhaps be eliminated.

The decarbonisation hope is actually weaker when one considers (1) the fact that even the nuclear route leads to CO, emissions from the nuclear fuel cycle and (2) the extent to which thermal sources are replaced by nuclear sources in the generation of electricity. Even assuming that the plans for nuclear power expansion are completely successful, the extent of decarbonisation of the power sector is limited.

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reduced at the same time - lower the emissions

from the power sector, whereas the emissions from other sectors can continue to increase.

It follows that the assumption that nuclear power is justified because it will de-carbonise the energy sector has no validity - this argument could be forgiven if it came from generalist bureaucrats or technical establishments with vested interests in nuclear technology but not after participation of an independent technical body like the Planning Commission. Even more inexcusable is the neglect of the potential role of efficiency improvements and renewable sources in discussions of the future of the power sector.

Assumption No 4: India needs recognition as a NW state

Nuclear weapons are unique – their impacts are primarily on innocent civilian non-combatants, particularly women and children; they are intrinsically indiscriminate; they are largely uncontrollable; they are instruments of mass murder on a scale unparalleled in human history. The security implications of nuclear weapons have been discussed in detail in the valuable 2003 volume *Prisoners of the Nuclear Dream*. In contrast to the dream that India's security has increased through the Pokhran II demonstrations of the bomb, it has been forcefully argued by several authors including Amartya Sen and L Ramdas that in fact India's security has decreased. As a matter of fact, the first India-Pakistan war in 30 years after 1971 took place after the development of nuclear weapons in both the countries. The economic implications have been addressed in a carefully argued essay in the same volume by Rammanohar Reddy, which highlights the fundamental choice facing the country. Thus being a nuclear weapon status is not something to aspire to.

Assumption No 5: India can pursue its weapons programme outside the scope of IAEA

inspections, i e, it can separate its civilian and military nuclear programmes without inviting inspection

It is hoped that by being recognised as a de facto weapons state, India would be accorded the associated 'privileges' of access to the nuclear fuels that are desperately needed by the NP programme. In return, India has agreed to identify and separate civilian and military nuclear facilities and programmes and place all the civilian nuclear facilities voluntarily under the safeguards regime of the IAEA.

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The agreement to separate civilian and military nuclear facilities must be seen against India's prevarication on the power-bomb nexus. Starting with the pre-Pokhran I secrecy about the military implications of its nuclear power programme, there was a vehement claim that there was no military connection at all, followed after Pokhran II by the claim that there was a role in the bomb programme. Now there is an admission that there is a power-bomb nexus and there are civilian and military facilities, but they could be identified and separated and only the civilian facilities would submit IAEA safeguards. This should be seen as a hope rather than a certainty.

Conclusion

The assumptions underlying the Indo-US nuclear deal have been found to be very shaky if not invalid. Rejecting all the assumptions discussed above, the result is the anti-NP anti-NW perspective. Dismissing the weapons assumptions and accepting all the NP assumptions, the result is the well known pro-NP anti-NW stance of some left parties. There is even the unusual anti-NP pro-NW stand taken post-Pokhran II by some elements close to the BJP; this follows from accepting the weapons assumptions and rejecting the NP assumptions. Unfortunately, the government has ignored the invalidity of the assumptions and adopted a pro-NP pro-NW position.

This is an edited version of an article that appeared in Economic and Political Weekly in August 2005.

Amulya Reddy: In Memory

Many in CNDP would remember the late Amulya Reddy – chemist, energy analyst, pioneer of appropriate technology for rural and sustainable development, and committed teacher – from his address at the inaugural plenary at the November 2000 meeting in Delhi when CNDP was first set up. Though he was keenly aware of the security, political and economic implications surrounding nuclear weapons, he was firm on insisting, in that talk and elsewhere, that in "the ultimate analysis… the issue of nuclear weapons is a *moral* question. It is a question of right and wrong, good and evil, ethics." The question of ethics was also the focus of many of his passionate writings against the bomb after the 1998 nuclear tests.

It is also the ethics of living and practicing science in a "dual society with...islands of elite affluence amidst vast oceans of poverty of the masses...", as he characterized India, that drove him to switch from working on electrochemistry to rural energy issues. This work led him to question the ruling paradigm on energy, which he named the "GROSSCON" (growth oriented supply-side consumption directed) paradigm. Instead he, along with 3 colleagues from different parts of the world, proposed an alternate energy paradigm christened "DEFENDUS" (development focused end use oriented service directed), which was aimed at both providing energy services for development and being environmentally sustainable. It did this by combining cheaper sources of renewable energy and improved energy efficiency without rejecting conventional energy sources. Amulya and his collaborators applied the DEFENDUS paradigm to the state of Karnataka (where he lived and worked) and came up with a plan that, when compared to the official plan, called for two-thirds the energy requirement, half the generation capacity increase, and half the capital cost, without reducing the quality or quantum of energy service. This least cost plan also showed that nuclear power was the most expensive and inefficient way to meet energy demands.

Amulya's argument against nuclear power was not only that it was expensive (as he demonstrated quite convincingly), but also that it was unsafe, environmentally unsustainable due to having to deal with radioactive waste, and, most important of all, closely linked with nuclear weapons. This link, he maintained, was inextricable and inescapable. Thus, for him, it did not make sense to be opposed to nuclear weapons but support nuclear energy. It is therefore appropriate as a mark of respect to Amulya that this issue of *Peace Now* focus on questions related to nuclear power, using the twentieth anniversary of the Chernobyl accident as a point of departure.

Amulya wrote extensively on a number of different issues. To get a flavour of his writings, visit the website http://www.amulya-reddy.org.in/

MVR

Fueling a Flailing Sector: The Economics of Nuclear Power

Suchitra J. Y.

For all of its grandiose plans involving immense increases of nuclear generation capacity, the nuclear establishment in India has never rigorously studied the relative economic efficiency of nuclear power *vis-à-vis* alternative sources of power. This is for many reasons. For one, the Department of Atomic Energy (DAE), which runs the nuclear programme in the country, has always been generously funded by the government. Second, it has never been held accountable for its poor performance in spite of the continuous flow of large sums of money from the government. Third, the political and strategic considerations that both dictate the need for nuclear energy in India and also shape the direction which the nuclear programme takes often assume overwhelming importance and fade the economic considerations out. For instance, most recently, the Indo-US joint statement in 2005 seems to have infused a lot of optimism into a sagging nuclear energy sector in India, and pro-nuclear advocates now aver that this sector should increase manifold in the coming decades – notwithstanding the absence of any analysis of the economic rationality of such expansion.

The Department of Atomic Energy (DAE) has historically overestimated the nuclear capacity that the country is capable of achieving – in 1980, installed nuclear capacity was 600 MW, while 8000 MW had been predicted; by 2000, there should have been a whopping 43,500 MW; however, what was achieved was only 2720 MW. Currently, after nearly six decades of experience in nuclear power, there is only 3310 MW of nuclear power in India, constituting around 3 per cent of the installed electricity generation capacity – hardly a significant share in the country's energy mix. Such repeated failure has not stopped the DAE from making unrealistic projections for the future either.

Current projections envision installed nuclear capacity to increase to 20,000 MW by 2020, and 40,000 MW by 2030. The strategic planning group of the DAE is even more ambitious: 62,900 MW by 2032 and 2,74,560 MW by 2052. The bulk of this large scale expansion is based on breeder reactors, especially those based on metallic fuel – in 2052, out of the total installed capacity, 2,60,000 MW is expected to be from such reactors. Such projections have little basis – there is not a single industrial scale breeder reactor in the country yet. The first such reactor, the 500 MW Prototype Fast Breeder Reactor (PFBR) in Kalpakkam, Tamil Nadu, is supposed to be commissioned in 2010 as per the DAE's reports. Given the DAE's track record of delayed projects, it would be a surprise if it did meet this schedule. In fact, the PFBR is already delayed; in 1990, it was supposed to go on line in 2000. The sole breeder reactor operating currently is the Fast Breeder Test Reactor that was long delayed in construction and plagued with accidents and other stoppages since it commenced operations. Globally many countries have abandoned breeder programmes for reasons of safety and economics. No country has actually constructed and operated an industrial scale breeder reactor based on metallic fuel.

The nuclear establishment has always claimed that they would provide not only a significant source of electricity, but also that it would be a cheap energy source, and in particular, compare very favourably with electricity from coal based plants. While the DAE has never substantiated such claims with any robust economic analysis, studies conducted independent of the DAE show that they don't stand up to closer enquiry. One such study published in the Economic and Political Weekly in April 2005 comparing the costs of generating electricity at the Kaiga atomic power station and the Raichur Thermal Power Station (RTPS) VII - both base load plants of similar size and vintage in Karnataka - shows that the former is significantly more expensive as the latter under realistic assumptions. The largest component of the cost of producing electricity at nuclear reactors is the capital cost of the reactor, which includes the construction cost (Rs. 1,816 crores for Kaiga I & II, and Rs. 2,727 crores for Kaiga III & IV), and the considerable costs of the initial loading of uranium fuel and heavy water used in the reactor. The corresponding construction cost in the case of RTPS VII is Rs. 491 crores.

The analysis shows that nuclear energy is competitive only at very low discount rates on the capital. A low discount rate technically implies that there is an abundance of capital in the economy and that the present consumption can be sacrificed for the sake of benefits further out in the future. This is, however, not the case in a country like India where capital is scarce and there are multiple demands on the same for infrastructural projects, including those for electricity generation. Therefore, an alternative technology such as electricity from coal power plants, which is competitive at relatively higher discount rates, reflects a more realistic position of the economy. Given the exorbitantly high capital costs involved in nuclear energy, a larger proportion of nuclear capacity therefore implies that poorer sections of society cannot afford electricity, at least without greater subsidies.

This economic comparison is largely based on assumptions favourable to nuclear power. In particular, the nuclear case does not include the true costs of dealing with radioactive wastes. The unsolved problem of dealing with radioactive waste has caused many countries to rethink the nuclear option. In India, the DAE treats spent nuclear fuel by reprocessing it and segregating the waste into different categories on the basis of their radioactivity. Based on available data on the government expenditures on the Kalpakkam Reprocessing Plant (KARP) in Kalpakkam and associated facilities, we have estimated that the cost of reprocessing is approximately Rs.26,000 per kg of radioactive spent fuel. This figure is based on assumptions favourable to reprocessing, and under other assumptions, the cost is likely to be as high as Rs.30,000 per kg of spent fuel. (This translates to approximately Rs.6,700 – Rs.6,900 to produce one gram of plutonium.) Internalizing this cost would increase the cost of electricity from the Kaiga reactors by about 40%, making it even more uneconomical.

The DAE justifies reprocessing on the grounds that it produces plutonium, which is used as fuel in breeder reactors. As mentioned earlier, the DAE's plans for expansion of nuclear power are largely based on breeder reactors. Once again, there is no sound economic analysis to back up this choice. Around the world, breeder reactors have proved even more capital intensive than the more common light water based reactors. This necessitates taking a closer look at the economics of the breeder reactors in India as well, as we suspect that it is unlikely to be as cheap as the DAE claims. The first step to this is a calculation of the economics of reprocessing spent nuclear fuel and the cost of producing plutonium, the results of which we have detailed earlier.

The DAE has estimated that the unit cost of producing electricity from the PFBR is Rs. 3.20. This sounds unreasonably small and we hazard a guess that the cost of producing plutonium has not been included by the DAE as an input cost in its calculations of the cost of electricity from breeder reactors either. If this were the case, it would be yet another testimony to the sloppiness of the DAE's economic calculations. Should this be added, the cost will be significantly higher.

The data released by the DAE on the expenditure on the nuclear power programme in general, and plutonium production and the breeder programme in particular, are highly suspicious. Even with respect to few numbers that the establishment publicly releases, there are no proven calculations of how they have been arrived at and a detailed break up of costs is never made available.

Any attempt at acquiring information on the same is met with the DAE scrambling for cover under the 'strategic' significance of the nuclear power sector and the potential misuse of such information if made public. A recent petition we sent to BHAVINI, the organization responsible for the construction of the PFBR, asking for information on the estimated costs of various steps of the construction and operation of the reactor, such as that of fabricating fuel and that of waste management, came back with the concerned authority refusing to provide most of the information requested. The excuse: as per Section 8(I)(a) of the Right to Information Act, there shall be no obligation to give information, among other things, pertaining to the following: "Information, disclosure of which would prejudicially affect the sovereignty and integrity of India, the security, strategic, scientific or economic interests of the State, relation with foreign State or lead to incitement of an offence." The appropriate officer at BHAVINI wrote "It is felt that the information you have requested falls within the above definition and therefore, BHAVINI will have no obligation to give the information requested to anyone." How, for example, annual

waste management costs would fit the description above is anybody's guess.

While reprocessing in India is considered not merely a waste management mechanism because it produces plutonium, *even* if one were to consider it merely as a waste management technique, then the alternative waste management mechanism – direct disposal of spent fuel – is economically a more viable option to pursue. Our estimate for the direct disposal cost per kg of spent fuel is Rs.1,100. Not only is direct disposal cheaper, it is also a more environment friendly and safer option to pursue when compared to reprocessing.

India continues to invest heavily on nuclear energy despite its poor performance and economic irrationality. The environmental and safety concerns surrounding nuclear energy make it only less attractive. If the 'big push' that this sector has been getting of late is motivated by the need to increase energy levels in the country and ensure that a majority of the population has access to electricity, then clearly the wrong route is being taken. To provide electricity to a vast and spread out populace, the mode of electricity generation has to be decentralized and community based – nuclear energy satisfies neither criteria.

The nuclear power programme in India has always been funded generously by the government. In the initial years, this was perhaps more out of the excitement to explore and develop a new source of energy in the country. Subsequently, such funding is testimony to the political clout of the DAE. In 2002-03, the budget allocation towards the DAE was a whopping Rs.3351.69 crores, a sum several times that which was allocated to renewable or decentralized sources of energy.

It must be pointed out, in conclusion, that the Indian nuclear power programme is only representative of flailing nuclear programmes across the world. Most countries where nuclear energy constitutes even a reasonable share in the total installed capacity manage to sustain their programmes through huge government subsidies. Nuclear power has been found to be economically unsustainable by the USA and European countries – the USA has not constructed a single reactor in the last thirty years. If at all this changes, it would be testimony to the Bush Administration's predilections rather than any changed economic scenario. Germany, Sweden, the Netherlands and Belgium have begun phasing out their nuclear power programmes. While Japan and France persist with their breeder programmes, it is at a very high cost to the government budgets. India seems to be following suit. Although some may hope that the entry of foreign players into the nuclear power sector in India will make the sector more competitive and efficient, there is no evidence to show that this will in fact happen. Does the country then really need to continue wasting public money on a thoroughly inefficient sector such as nuclear energy?

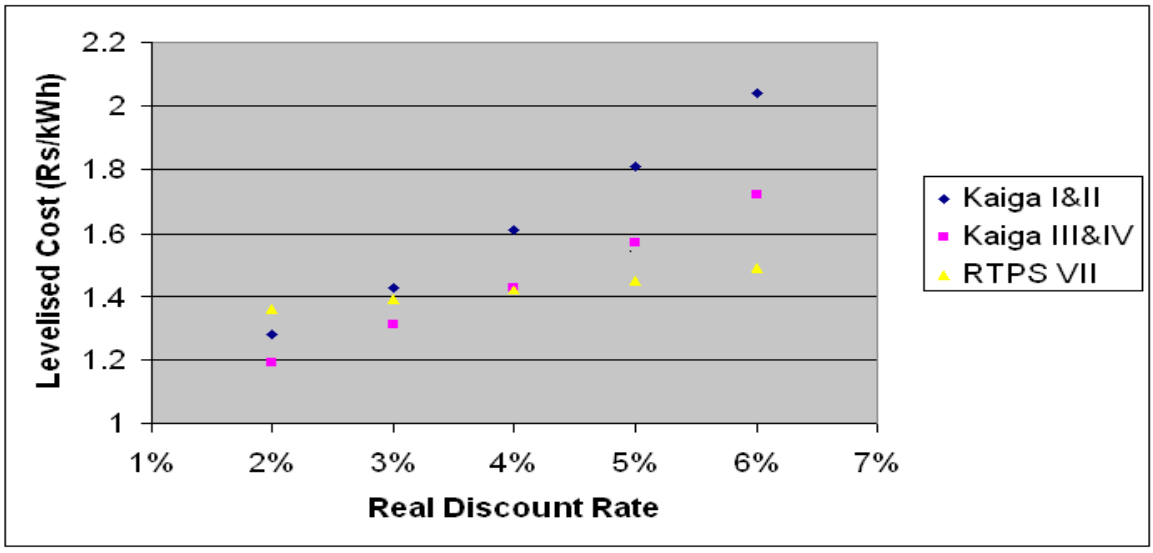

Figure 1: Levelised cost (the bare generation cost which does not include other components of electricity tariff like interest payments and transmission and distribution charges) of Kaiga I&II (operating reactors), Kaiga III&IV (reactors under construction; projected costs), and RTPS VII (operating thermal plant) as a function of real discount rate (a measure of the value of capital after taking out the effects of inflation).

CNDP Activities

Reaching out to victims of Earthquake

On October 20, 2005, IDPD team comprising of Dr Arun Mitra (also CNDP NCC member), Dr Shakti Kumar, Dr Sudhir Dhakre, Sh Kuldeep, Dr GM Malik, Dr Yasmeen Rauf, Dr Nazneen and Dr Wasim visited the earthquake affected areas in Kupwara, distributing relief materials to the affected people. While discussing possible measures and help that can be rendered, the team also held a meeting of its members and local doctors, stressing on the need for peace in the sub-continent.

In the aftermath of the earthquake, the National Coordinating Committee of CNDP issued the following Statement "NCC of CNDP expressed its deep shock and concern at the horrific consequences of the earthquake which has ravaged large parts of Kashmir and Pakistan. Our common sense of human decency, concern and solidarity naturally transcends all political and territorial boundaries. We wish to express that we are at one with the people who have suffered from this tragedy and that our hearts go out to them. The CNDP pledges itself to help the process of rehabilitation in whatever way it can. In this regard CNDP Rajasthan has organized a collection drive among school children to provide aid and express solidarity with the suffering people of Kashmir and Pakistan. It is the belief of the CNDP that the youth of today in both countries through mutual empathy and concern can help shape a truly fraternal future for India and Pakistan.

An exchange on "small arm violence and its impact on health"

Medical students from Punjab, Bihar, and Maharashtra had an interactive exchange of ideas and experiences with Dr Tejbir Singh, Head of Department of Community Medicine in Amritsar and IDPD General Secretary Dr Arun Mitra. Observing May 9, 2006 as anti fascist day the interaction focus on "small arm violence and its impact on health". Issues ranging from arms trade, conflict, to poverty, hunger, and related impacts were discussed. Participants felt that dialogue with media and policy makers should be taken up in future.

In Nagpur, a seminar was held in February by IDPD in collaboration with MRWS medicos decried the ongoing expenditure on arms race in South Asia. Medical students took active part and have also started a campaign "road to awareness". The role of medical practitioners was greatly emphasised, in particular how they can help in monitoring peace initiatives.

New CNDP Chapters in UP

Three new CNDP chapters have come up in Kanpur, Gorakhpur and Kushi Nagar in Uttar Pradesh. Kanpur chapter has its office at DAV Degree College and is coordinated by Dr Abhay Srivastava. In Gorakhpur, it is coordinated by Hari Sharan from the university campus. In Kushi Nagar Prakash Agrawal took up the initiative.

Monthly Seminar Series in Chhattisgarh

A monthly seminar series has been started in collaboration with the state unit of AIPSO since March to build up conceptual understanding on international peace and energy issues. So far three meetings have been held in March, April, and May on Present round of World Imperialism (main speaker Advocate OP Singh), The Agony of Iraq (Speaker: Tuhin Dev), Militarization and Development (Speakers: Ilina Sen and Meena Kuldeep). In the month of March, separate prize distribution programmes were arranged in 11 schools for the essay competitions held during Hiroshima Week in August, 2005.

Peace and Justice in South Asia: An International Conference in Mumbai

From 24th to 26th February 2006, Mumbai hosted an 'event' - not of the kind for which the megapolis has come to be known in the recent years. It was all about building up peoples' solidarity cutting across the constrictive state borders to forge a greater South Asian identity based on common cultural roots and heritage, but more importantly, geared towards creating a new world – a world based on Peace and Justice, free from violence and oppression - of all sorts and all hues.

Delegates came with enthusiasm writ large on their earnest, and mostly young, faces. They came, of course, from Mumbai and various corners of Maharashtra. They came from various parts of India, Kashmir and the Northeast included. They came also from Pakistan, Bangladesh, Nepal, and Sri Lanka, despite visa difficulties created by the government of India notwithstanding. A few came even from the US and Europe. Speakers came from all over the globe.

The CNDP, Mumbai was a leading constituent of Peace Mumbai, the special purpose umbrella organisation that was brought into being in order to organise this great event. Amongst the plethora of peace related issues, the looming nuclear danger, at

the national, regional and global level, found its highly visible place. The 'Concept Note', the 'Invite', the 'Welcome Address' and finally the 'Resolution' – all took due note of this truly life-and-death concern.

Amongst the leading CNDP activists from outside Mumbai, Achin Vanaik spoke at a plenary on the opening day. M V Ramana and Anil Chaudhary spoke at two different workshops.

Film Show to Commemorate Nuclearisation of South Asia

A film show was organised on May 13 in Mumbai to highlight the nuclear danger threatening the human race and the globe. It was attended by young enthusiasts and also veteran peace activists.

Two films were shown. First, a docu-drama on the disastrous Chernobyl accident, which had taken place twenty years back on April 26 in a Ukraine town, in the then USSR, bordering Belarus. Then, the all-time classic by Stanley Kubrick – Dr. Strangelove or How I Learned to Stop Worrying and Love the Bomb.

The show was followed by an informed and animated discussion session. It was led by Dr. Raminder Kaur, who had made these two films available. It was in fact her enthusiasm duly matched by that of Asad Bin Saif, who provided the venue at the BUILD office and all other logistical arrangements, and a leading local journalist Jatin Desai made the event possible. Amongst others, Sukla Sen from CNDP, NCC participated in the discussions.

Teachers – students interaction in Delhi

Teachers and students of Delhi schools and members of CNDP came together during April 28-29, 2006 at the Indian Social Institute for a dialogue on violence and peace. Topic on "building peace among student community" was discussed with Sandeep Seth and "nuclear disarmament, nuclear energy and the Indo- US deal" with Satyajit Rath and Praful Bidwai. Anuradha Sen and Vinita Bal shared experiences of initiating peace in various schools. Anil Chaudhary facilitated the interactions.

Teachers and students of 20 schools participated in the symposium. Video clips of previous school programs were shown during the session. With the sharing of experiences certain key issues were identified, which led to violence in the society. Many schools expressed their desire to follow up such type of dialogue and interaction.

Student participants expressed their understanding of violence through power point presentations, poetry, speeches and role-play. The students' expressions exhibited a high level of sensitivity and understanding of the issue and an enthusiasm to be peacemakers. Session on "nuclear disarmament and Indo and US nuclear deal" gave further dimension to the need for a nuclear free world.

It was decided that such kind of interaction and dialogue would be further carried forward to more schools and institutions.

Membership Form

Annual Membership Fee: Students Rs. 20, Individuals Rs. 100, Organisations Rs. 500

Name:

Organisation:

Address:

Phone:

e-mail:

Please mail your Draft/Cheque, drawn in favour of "PEACE-CNDP", payable at New Delhi, to

CNDP
A-124/6, Katwaria Sarai, New Delhi 110 016

CNDP

The Coalition for Nuclear Disarmament and Peace (CNDP) is India's national network of over 200 organisations, including grassroots groups, mass movements and advocacy organisations, as well as individuals. Formed in November 2000, CNDP demands that India and Pakistan roll back their nuclear weapons programmes. Our emphasis:

- No to further nuclear testing
- No to induction and deployment of nuclear weapons
- Yes to global and regional nuclear disarmament

CNDP works to raise mass awareness through schools and colleges programmes, publications, audio and visual materials, and campaigning and lobbying at various levels.

CNDP membership is open is both individuals and organisations. So if you believe nuclear weapons are evil and peace is important, fill in the Membership Form!

For Private Circulation Only
Published from CNDP, A-124/6, Katwaria Sarai, New Delhi - 110 016, Telefax: 26517814
E-mail: cndpindia@gmail.com, Website: www.cndpindia.org
Editor of this Issue: **M. V. Ramana**