India breaks new ground in nuclear power program

by Susan Maitra in New Delhi

India's Department of Atomic Energy (DAE) has reconstituted a committee to select sites in each of the northern, southern, western and eastern regions of the country for nuclear power stations, each consisting of a cluster of four 500-megawatt heavy water or breeder reactors. The policy move, announced by Prime Minister Indira Gandhi's government in late December to the Consultative Committee of Members of Parliament attached to the DAE, marks a major step forward in India's nuclear power program.

This decision follows the successful completion and start-up of the 235-megawatt nuclear reactor at Kalpakkam in July, the first almost completely indigenously built heavy water reactor in India. The Kalpakkam milestone gave nuclear scientists, as well as the population, renewed confidence in the ambitious program for self-reliance in nuclear technologies set by Prime Minister Nehru following India's independence.

A 'nuplex' approach

This latest step is consistent with the government's earlier decision to commission 10 gigawatts of nuclear power by the turn of the century. However the concept of putting such large nuclear reactors in a single cluster generating 2,000 megawatts of power is a marked advance in planning. In the early 1960s the late Indian scientist, Dr. Vikram Sarabhai, had developed the concept of establishing such clusters; he suggested that they would help optimize power consumption efficiency, and would be the center around which agro-industrial complexes can be built and townships will rise. But even as late as last August Indian experts were only contemplating clusters of 235-megawatt reactors.

The new thinking is thus based upon the notion of efficient consumption of electrical power locally. The plan will enable immediate utilization of the existing regional grids without spending too much in upgrading them. Moreover, it will provide the necessary balance of power sources in the regional grids, which would otherwise be reliant on the large "super-thermal" (non-nuclear, non-hydro) power stations now under construction. At the same time such a large input of power locally will help support the emergence of agro-industrial complexes and the infrastructural development neccessary for the creation of new townships. As the government told the MPs, the added investment necessary to develop many separate sites will be avoided and the time required to construct the plants reduced by "clustering" the larger size reactors.

The other important shift in policy concerns the fact that the selection committee was specifically charged with locating a site for such a 2,000-megawatt nuclear power station in the eastern region. Eastern India, the most power-starved region in the country, is rich in poor-quality coal deposits. It had been a conscious policy of the government *not* to build nuclear power stations in the region but to exploit coal for electricity generation instead. This policy was boosted by cost estimates showing that a coal-fired station is cheaper than a nuclear powered electricity generating station. The neo-Malthusian lobby in India has championed a thermal power program based on labor-intensive coal mining.

Coal versus nuclear

However, two facts seemed to have helped shift the old policy. First is the fact that coal-based power generation has given the eastern region the lowest capacity utilization rates in the country. Secondly, it has been found that the installation of a coal-based thermal power station, even at the coal pithead, is not much cheaper than a nuclear station of similar capacity.

In the 1950s, when India started its nuclear power development program, a cost estimation was made comparing the relative capital cost of nuclear power plants and thermal plants. Based upon this, it was reckoned that a nuclear power plant was viable only at a distance of more than 800 kilometers from the coal pithead. Over the years, however, the cost gap has narrowed, principally because India's coal-mining sector has remained so inefficient. It is estimated now that building a nuclear station is about 25 percent more expensive

than installing a coal-based power plant of similar capacity at the pithead. By 1990, according to some experts, even this difference will vanish.

The Indian nuclear program started in the 1950s with the goal of becoming self-sufficient in nuclear energy generation. A long gestation period proved necessary to develop manpower and research facilities and to gather sufficient data to channel the research experience into building commercial reactors. But during this period Indian scientists and engineers built two nuclear reactors—the last one at Kalpakkam is about 95 percent indigenous—and completed another reactor left unfinished by the Canadians who walked out of their contract in 1974 in protest against India's peaceful nuclear explosion.

While the first Indian-built nuclear reactor is having normal teething problems, difficulties with the Canadian-supplied RAPP-I are extremely serious. A recent report by an expert committee headed by N. B. Prasad, a former Union Energy Secretary, on the malfunctioning of the Canadian reactor went so far as to suggest that the government scrap the reactor.

LWR lobby raises head

Indian scientists consider the report's recommendations drastic for another reason as well. The Prasad committee has reportedly proposed scrapping altogether the heavy water reactors, the basis of India's nuclear program, and adopting light water reactors (LWRs) instead. This is nothing less than a call to repudiate the basic plan upon which Dr. Homi Bhabha and Dr. Sarabhai founded India's nuclear program and the past 30 years of research and development progress with it.

Although it has not been confirmed that the Prasad Committee in fact advocates such a course—the report has not yet been released by the government—the mere suggestion has aroused the scientific and technical community, which points to the reasoning behind the Bhabha-Sarabhai policy of developing heavy water reactors with natural uranium as fuel, as opposed to LWRs using enriched uranium fuel. India has a reserve of only 70,000 tons of uranium, about enough to last through the year 2000, it is estimated. Any outlay to build enrichment facilities would be both short-sighted and self-defeating they argued. Bhabha's plan was to develop breeder reactors in the second phase of the program and then use India's massive thorium reserves to fuel the next-generation breeder reactors. This way India would not depend on any other nation for nuclear fuel. This policy has been pursued for the last two decades, and within the next few months India's 40-megawatt test breeder reactor is expected to be commissioned.

The Tarapur object lesson

The reason why the Bhabha logic is pursued with such determination by the Indian government is not difficult to discern. That dependence for such a sensitive item on foreign sources can be catastrophic is well understood in India. The experience with the Tarapur Station was an object lesson.

In the 1960s India bought two LWRs from the United States. These two 210-megawatt reactors were installed at Tarapur, and the government signed a contract with the U.S. government to supply enriched uranium for the lifespan of the reactors. However, in the mid-1970s the Carter administration, with the rallying cry of "non-proliferation," called a halt to the supply of enriched uranium for Tarapur. It was clear that President Carter, during whose reign the U.S. nuclear industry was bankrupted, was using nuclear technology as a political weapon against India and the entire developing sector.

Fresh and very bitter memories of the Tarapur fuel dispute have led many Indians to view with concern the Prasad report and the simultaneous resurfacing of an offer of light water reactors from the U.S.S.R. (see Report from New Delhi, page 44). In 1978, during the Janata period, the Russians offered India a 1,000-megawatt nuclear reactor, asking full International Atomic Energy Agency safeguards. The Indian government neither accepted nor rejected the offer, but sought to weigh it further. Since then various meetings between the two parties have taken place. Last month Indian Atomic Energy Commission chairman Dr. Raja Ramanna, was in Moscow to discuss the issue, but no details of the talks have been disclosed.

A Soviet deal?

The Indian press points to two incidents to fuel speculation that the Prasad report could be a prelude to buying light water reactors from the Soviets. In one incident, an Indian official at the World Energy Conference, which took place in New Delhi last September, reportedly suggested switching over to LWRs. He is reported as saying that "It may be worthwhile to consider adopting thermal reactors of the pressurized water type to a limited extent to augment the nuclear electric capacity in the near term, provided such systems can be obtained on conditions acceptable to the country."

The other incident cited by the press here was Soviet Energetics Minister P. S. Neporozhny's reaction to the question in an interview during the World Energy Conference. The minister reportedly told Indian press men that India may be making a "mistake" in going for heavy water natural uranium reactors and that LWRs using enriched uranium of the type offered by the U.S.S.R. would be more economical if a number of them were set up. When told that launching such a program would permanently tie India to the Soviet supply of enriched uranium fuel, the Soviet minister quipped: "Why not?"

While the Soviets have every reason to want to step into the void left by the Americans in this crucial area, there is little doubt that they will, among other things, have to make a very substantial departure from their policy of outdoing the Americans in enforcing the "bogey of non-proliferation"—as Prime Minister Gandhi disparaged it in a recent speech—to clinch any such deal with India.