LETTER FROM BOMBAY

# Progress in nuclear technology

## India's power needs require research now in advanced techniques

by S. K. Ghaswala

India is a country with 1.3 million square miles of land, 523.9 million people and one nuclear power plant. In operation since early this year (SN: 2/28, p. 221), the 400-megawatt plant at Tarapur near Bombay represents this country's first toddling nuclear step. Although the plant was built largely by and with United States aid—a cause of political controversy in India (SN: 6/21, p. 603)—it has served to increase the Government's enthusiasm for more nuclear projects. Looking to the time when India's nuclear technology will be off and running, nuclear planners have lined up a host of projects.

Probably the most essential is the breeder reactor program, where India can get more fuel out of a reactor than it puts in. This is vitally important if India is to attain nuclear self-sufficiency since it has little uranium but a good deal of thorium, which a breeder could convert to a fissionable fuel. The breeders would be a major part of an effort to give India a viable atomic energy program in 20 years.

To accomplish this goal, Dr. B. D. Nag Chaudhuri, member of the planning commission of the Indian Government, maintains that India should start right away with work of an advanced nature, not only on breeder reactors but related areas such as liquid metal coolants, ceramic fuel elements and sophisticated process-control instruments. This concept of plunging into new technologies—a concept often propagated but rarely acted upon—would not only give India greater self-sufficiency, but also substantially increase the employment potential of engineers and scientists without any appreciable large-scale financial investment.

Another project being given high-priority consideration is the agro-industrial complex (SN: 8/10/68, p. 146). Here, nuclear power would desalt water from driven wells and power a 1.2-million-ton fertilizer plant and a 50-ton aluminum plant. To do the job, two nuclear reactors, each with a 600-megawatt capacity, are envisioned in India's northern Uttar Pradesh region.

It is estimated that the complex, which would cover 1.5 million hectares would increase agricultural production by 22.8 million tons of food grains, producing a net income of $641 per hectare from the tilled land. This would be accomplished by mechanized farming, but could be approached even by traditional bullock farming.

It could also help alleviate India's critical unemployment situation. By the end of this year, nearly 100,000 engineers are expected to be seeking jobs, and it could offset the glut somewhat by providing employment for at least 500,000 people, many of whom would be engineers and technicians.

The Indian Atomic Energy Commission feels it has worked out the details of the idea to a degree no one else has approached. Given Government approval and the money, the IAEC believes that the scheme can be put into effect immediately. Dr. Vikram Sarabhai, IAEC chairman, insists that the project must be given priority and that there should be no vacillation of policy on this matter.

"The present study," he says, "has prepared the base for political decision-making at the highest level to insure that the policy of the Government is supportive to the concepts which are involved in realizing the agro-industrial complex."

Another project, which India is sorely in need of and in which nuclear power could play a vital role, is water desalination. There are many desalting methods around today, ranging from flash distillation and freeze separation to electrodialysis and reverse osmosis. Although primarily envisioned for the flash-distillation process, nuclear power could supply the energy for reverse osmosis to meet India's special needs. For example, it could prove highly economical and efficient for agricultural applications, particularly where crops are rotated, as with hybrid maize-potato-peanut production. Prime targets are the coastal area of Gujarat and the inland areas of Rajasthan, Bihar, Orissa, Mysore and Punjab, all of which suffer from severe water shortages. Reverse osmosis using nuclear power would cost about 27 cents per 1,000 gallons of water compared with about two to four times that for nonnuclear flash distillation. Necessary items (membranes, membrane supports, filters, plumbing and high-pressure pumps) could be made in the country.

To insure that the country's nuclear technology continues to grow, nuclear research centers are envisioned. The major one in India is the Bhaba Atomic Research Center at Trombay, 15 miles north of Bombay, where about 5,200 scientists and technicians are engaged in an all-out effort to develop industry, medicine, agriculture and power generation in India. Additional centers should contribute further to India's nuclear growth.