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<http://meaindia.nic.in/opinion/2005/06/07op02.htm>

I wonder if India will sell us their best technology, or if they will force us to use second best so they can keep the lead?

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**By 2020, India can be nuclear reactor leader**  
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By Kumar Chellappan

**Chennai (India):** We will be the world leaders in fast breeder reactor technology by 2020. Countries like the United States, Britain and Russia are likely to seek our guidance and cooperation in setting up fast breeder reactors, says Dr Baldev Raj, director, Indira Gandhi Centre for Atomic Research (IGCAR) at Kalpakkam.

Dr Baldev Raj, a distinguished scientist, points out that the country has successfully completed research and development studies on fast breeder reactors (FBRs) and the Department of Atomic Energy (DAE) has decided to go in for four more FBRs of 500 MW capacity each. "Besides the FBR currently under construction on its premises,

Kalpakkam could accommodate two more FBRs each of 500 MW capacity," says Dr Raj. Work on the new reactors will begin once the FBR under construction becomes operational, he explains.

"I am saying that we can become world leaders with complete confidence. Our main asset is the 300 reactor years of experience which our team has gained since 1968," he adds

FBRs are the second stage of India's nuclear power programme. The country's nuclear programme began with pressurised heavy water reactors (PHWRs). India has two boiling water reactors and 12 PHWRs operating across the country. Six more PHWRs are in various stages of construction at Tarapur, Kaiga (Karnataka) and Rawatbhata (Rajasthan). Two reactors of 1,000 MW each are coming up at Kudankulam in Tamil Nadu.

As of today, India produces 2,770 MW of electricity through the PHWRs. The DAE has set a target of 20,000 MW power by 2020. "Announcements of some more reactors are on the anvil and I am sure we will meet the target of 20,000 MW by 2020 itself," says said S.C. Chetal, director, reactor engineering group, Kalpakkam.

The availability of fuel for the PHWRs was a major problem. Natural uranium consists of 99.3 per cent uranium-238 and 0.7 per cent uranium-235. Of these two forms only uranium-235 can be used as a nuclear fuel. In a conventional nuclear reactor, during operation, some uranium-238 is transformed into plutonium-239, which can also be used as a nuclear fuel. By recycling this plutonium to make new fuel it may be possible to exploit at most about two per cent of the potential fuel value of the world's natural uranium resources.

However, a FBR can convert uranium-238 into plutonium-239 at a rate faster than it consumes its fuel. By repeated recycling of the fuel it should be realistically possible to exploit 50 per cent of the fuel value of the uranium feed. This means that fast reactors could extend 25-fold the energy output from the world's uranium fuel reserves.

The fast breeder test reactor set up at Kalpakkam

in 1968 was the laboratory from where technologists like Ramalingam and Chetal mastered the know-how.

The 1974 Pokhran nuclear test brought with it a series of embargoes against India's nuclear programmes. France, which had offered to help India in the construction of the fast breeder test reactor, backed out following the international embargo. "But technology denied became technology gained," says Dr Plazid Rodriguez, former director of IGCAR and a metallurgist of international repute. "The adversity forced us to look for more avenues and thus was born the new fuel technology," Dr Rodriguez explains.

Dr Raj says India's energy requirements for the next century or so could be met in part by the FBRs. "We have a vast reserve of thorium on the Kerala coast and this could be used as reactor fuel. Since FBRs will generate more fuel than what they consume, there is no need for India to worry about the availability of fuel," says Dr Raj.

The FBRs are being designed and built using indigenous technology. "We do not require any foreign assistance to construct, commission and maintain the FBRs. The company entrusted with the manufacture of the reactor vessel is purchasing high-quality stainless steel from abroad only because of the delay in getting the product from Indian suppliers," says S.C. Chetal.

India's energy planners are unanimous that only nuclear power stations offer a permanent solution to the country's energy needs. The coal available in the country is of poor quality. Transportation is a major problem. Hydro-electric stations have their own limitations with the number of people to be displaced and ecological disturbances. But nuclear power stations are free of all these handicaps, points out Dr Raj.

Work on the 500 MW FBR, costing Rs 3,492 crores, is in full swing at Kalpakkam. "Though the scheduled date of commissioning of this FBR is September 2010, we are confident that the reactor will start supplying power to the southern grid by June 2009 itself," says S.C. Chetal, a veteran mechanical engineer who is one of the pioneers in

*10 million rupees/crore*

the design and development of FBR technology.

The FBR under construction was designed by S.C. Chetal and his team. His cabin at IGCAR has become the main strategy room. Every evening, heads of all projects assemble here to take stock of the situation.

"Work is progressing on a war footing. Orders for the purchase of various components have already been issued. All equipment required for the reactor is being readied in various public and private sector units in the country. The installation work will begin in 2006," says S.C. Chetal, who is busy designing next-generation FBRs that have been planned as twin units. All reactors to be set up after 2010 are being designed as twin units. The twin unit consists of two reactors as a single entity of 1,000 MW which will reduce the cost by 10 per cent, he explains.

Referring to the safety of the reactors and radiation hazards, Dr Raj says there is no threat to the environment, or the people, from nuclear reactors. Dr Anil Kakodkar, chairman, Atomic Energy Commission, rates nuclear power as the cleanest form of energy. "Nuclear energy is greener than green," Dr Kakodkar said during one of his trips to Kudankulam. "The defence-in-depth philosophy is the governing principle of India's reactors. A system fails, another backup system takes over," says Mr Ramalingam.

S.C. Chetal is more emphatic about the safety of the reactors. "In the event of an earthquake people can very well go to the nearest nuclear power station. That is my assessment," he says.

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