

“Fast-breeder reactors more important for India”

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By T.S. Subramanian

Embargoes have only increased India's self-reliance in the nuclear field, says Anil Kakodkar, Chairman of the Atomic Energy Commission and Secretary, Department of Atomic Energy. In a recent interview to The Hindu in Mumbai, Dr. Kakodkar spoke of the importance of fast-breeder reactors in meeting the country's energy needs. Excerpts:

Question: What are the achievements and failures of the Department of Atomic Energy in the last 50 years?

Dr. Kakodkar: We have a large, capable human resource pool of scientists and technologists. This, I think, is a very important achievement. The second important achievement is that our programme, on the basis of self-reliance, has demonstrated that we can take our R&D efforts, carried out in our laboratories, to commercial scale of excellence in the marketplace.

The third achievement is that the first stage of India's nuclear power programme, presently consisting of 12 Pressurised Heavy Water Reactors (PHWRs), is completely in the industrial domain. It will grow on its own steam. Lastly, as a result of the consolidation of the entire work done in the last 50 years, we now have a clearly defined roadmap for future R&D and its commercialisation.

In terms of failures — I will not call them failures — but we did see several challenges. For example, embargoes have been a major challenge. Embargoes have not deterred us from making progress and, in fact, they have made our self-reliance that much more robust. Obviously, the dimensions of our programme would have been bigger if we had been able to do things at a much faster pace.

Without the embargoes?

Yes, without the embargoes. On the whole, I will say that we have now succeeded in this very frontline technology in all its dimensions. We have different technologies for various applications.

Can you give examples?

Nuclear energy applications in agriculture, health, food security and so on. While we have done this, we have also contributed towards nuclear weapons ability in the country. India today is a country with nuclear weapons to ensure its long-term security. At the same time, we have domestic capability to guarantee long-term energy security in a manner that will help in preserving the environment and avoiding the adverse impact of climate change.

How important are the fast-breeder reactors in ensuring India's energy security?

Fast-breeder reactors are more important to India than to other countries which have capabilities in nuclear power technology. This is because of the nuclear resource profile we have in the country. Our uranium reserves — what we have — as per the present state of exploration will be able to support 10,000 MWe generating capacity, which is not large. But it is the starting point for setting up fast reactors. When the same uranium, which will support 10,000 MWe generating capacity in the PHWRs, comes out as spent fuel and we process that spent fuel into plutonium and residual uranium, and use it in the fast reactors, we will be able to go to electricity capacity which will be as large 5,00,000 MWe. This is due to the breeding potential of the fast reactors, using the plutonium-uranium cycle. That is the importance of the fast-breeder reactors under Indian conditions, compared to other countries.

France, the U.S. and the U.K. have not persisted with their breeder reactors programme. Are we entering an area others have backed out from?

That is not true. There is a programme called Generation Four Initiative Forum, GIF for short. This is a programme led by the United States in which ten other countries are participating. They have nuclear power reactor configurations that are important for the future. They have identified a total of six configurations, six reactors. Out of that, three or four are fast reactors. So the importance of fast reactors in future energy requirements is recognised well worldwide. In fact, in Russia, an 800 MWe fast reactor is under construction. The ground reality now is that uranium is available at a much cheaper price internationally. In this situation of plenty of uranium availability, there is no urgency for these countries to move on to fast-breeder reactor technology. This, however, is not the case with us.

How many breeder reactors will we build in the near future?

We are making a beginning with the first 500 MWe and we will complete it by 2010. After that, we will build more similar units. We have planned four in the programme up to 2020. The development of the fast-breeder technology will go on at the IGCAR. In this development, we will proceed in two directions.

One direction is to go for higher capacity reactors, may be developing 1,000 MWe reactors. The other direction is to use the reactor design and its associated fuel cycle, which will have a shorter doubling time because we get into a higher and higher generating capacity through the breeding process. The faster the breeding, quicker will be the rise in the fast-breeder reactor's capacity. So we should pursue both the directions: one is the higher reactor unit size, and the other, the fuel cycle, which has a shorter doubling time. In this, we have drawn the entire road map including R&D activities, the development that should be done and, the new energy systems to be built.

The 300 MWe Advanced Heavy Water Reactor (AHWR), which will use thorium as fuel, is your pet project. Why the delay in its construction, which was to begin before the end of last April?

The fast-breeder reactors constitute the second stage of our programme. While we have scarcity in terms of uranium, our thorium resources are abundant. [The third stage of the programme using] thorium-uranium 233 fuel can run in a sustained mode for a long time. So we have made this as our third stage after we have sufficient capacity through breeder reactors. For if you irradiate thorium at a higher capacity level, then you will

have a very long programme at a higher capacity level. We are also working on development [of reactors] that will allow growth with the thorium fuel cycle. Besides, we have programmes on other applications of thorium, such as the high temperature energy generation. All this constitutes the third stage of our nuclear power programme, that is, demonstrating large-scale electricity generation using thorium. We are very happy with the support promised by the Prime Minister.

The AHWR will be one of the first elements in the third stage. Its design is complete. We have prepared the project report. We have completed a peer review by knowledgeable people other than those who designed it. A fairly large amount of R&D work has been completed. There is more R&D work to be done. It is true that we should have started the AHWR construction this year. But we felt that since the reactor will be ultimately implemented in the public domain, it is important that its design is also reviewed by the Atomic Energy Regulatory Board (which keeps a tab on safety in nuclear power facilities in the country). So we have now created an arrangement wherein for such developments [reactors], which will ultimately go out of the BARC for use by the society or industry, safety aspects should be entrusted with the AERB. We are in the process of making that arrangement now.

The Prime Minister has asserted that India would not be the source of proliferation of sensitive technologies and also spoken about the developments in the neighbourhood. Do you see a toughening of India's stance on proliferation issues?

If you look at India's track record, it has always behaved in a very responsible fashion. At the same time, we carry out our indigenous efforts in a self-reliant manner for developing technologies and their implementation in the national interest. This is of course a legitimate right. India is one sixth of humanity. One sees that when such barriers are imposed, they put some kind of resistance to the pace at which we can grow.

Then one has to question the justification for such a process. It is our policy to act in a manner that this nuclear technology is managed in a responsible way. We have come to this level, based on our own self-reliant effort. On the other side, [in] a regime which they have put in place, clandestine activities still go on. What we are talking about is a regime which facilitates development, addresses the development of a large country like India. What he [the Prime Minister] said was rather than arresting proliferation by irresponsible people, today's framework seems to be creating barriers for our development. We want a system which addresses the true proliferation concerns and still solves the problems we face in our development. For we are talking of a large fraction of humanity.

Will the dialogue with the U.S., Next Steps in Strategic Partnership, be of any use to India for developing our nuclear power technology?

I don't think so.