

**GOVERNMENT OF INDIA
ATOMIC ENERGY
LOK SABHA**

UNSTARRED QUESTION NO:6538
ANSWERED ON:16.05.2012
NUCLEAR PROGRAMME
Jaiswal Dr. Sanjay

Will the Minister of ATOMIC ENERGY be pleased to state:

- (a) whether the country's nuclear programme envisages a three-stage development;
- (b) if so, the details thereof;
- (c) whether the country is still languishing at the first stage itself since when the programme was originally mooted in 1962, as the State-II Fast Breeder technology is still being experimented;
- (d) if so, the reasons therefor;
- (e) whether such failure is partly due to lack of mobilization by the Government of a high talent pool in the sector; and
- (f) if so, the steps being taken by the Government to attract the best technical talent for the civil nuclear programme of the country?

Answer

MINISTER OF THE STATE IN THE MINISTRY OF PERSONNEL, PUBLIC GRIEVANCES & PENSIONS AND PRIME MINISTER'S OFFICE (SHRI V. NARAYANASAMY)

(a)&(b) Yes, sir. The Indian nuclear power programme, right from the inception, has been envisaged as a three stage programme, in order to provide long term energy security to the country, based on indigenous nuclear fuel resources.

The first stage makes use of available Uranium resources most optimally in Pressurised Heavy Water Reactors to produce energy as well as Plutonium.

In the second stage, this Plutonium is used as fuel in Fast Breeder Reactors to generate power and also to produce additional Plutonium from Uranium. This helps in multiplying the fissile resources as well as the installed nuclear electricity generation capacity. When the required capacity addition has been achieved, at an optimal time, Thorium needs to be introduced in these Fast Breeder Reactors to produce Uranium-233.

In the third stage of the Indian nuclear power programme, Thorium and Uranium-233 based reactor systems will be deployed on a large scale, providing several centuries of energy independence to the country.

(c)&(d) It is not true that the country is still languishing at the first stage itself. In fact, the second stage programme has made significant progress, and steps for the third stage have also been initiated.

In the first stage of programme, India has attained commercial maturity in the design and development of Pressurised Heavy Water Reactors.

The second stage envisages setting up of Fast Breeder Reactors coupled with reprocessing plants and plutonium based fabrication plants. Indira Gandhi Centre for Atomic Research (IGCAR) is engaged in the design, construction and commissioning of liquid sodium cooled fast breeder reactors and associated technologies upto closing the fuel cycle. An experimental Fast Breeder Test Reactor is in operation at IGCAR since October 1985, with excellent performance of the indigenously developed Uranium-Plutonium Carbide fuel and the sodium systems. The construction and operation experience of FBTR has been utilized in the design of 500 MWe Prototype Fast Breeder Reactor (PFBR). The construction activities of PFBR are in advanced stage of completion by a separate organisation (BHAVINI) and activities towards commissioning the reactor by next year are in progress.

As regards the fuel cycle for fast reactors in the second stage, the process for reprocessing of short cooled Plutonium rich mixed carbide fuel of FBTR with high burn-up has been established for the first time in the world after reprocessing of FBTR mixed carbide fuel pins with 155 GWd/t burn-up.

The third stage of the programme will be launched after sufficient base capacity of the second stage FBRs are put in operation. All efforts towards technology development and demonstration are being made now, so that a mature technology is available in time.

To accelerate thorium utilisation, BARC has designed an Advanced Heavy Water Reactor (AHWR). The 300 MWe Advanced Heavy

Water Reactor is specially meant for large scale commercial utilization of thorium, generating most of its power from insitu burnup of thorium. The design of all nuclear systems of the reactor has been completed and associated confirmatory R&D is in a very advanced stage. Detailed engineering is being carried out in Consultancy mode.

(e) The Nuclear Power Programme suffered a small setback due to the embargo following the nuclear tests in 1974. This resulted in some slowdown in both Pressurised Heavy Water Reactor (PHWR) and Fast reactor programmes. However, the department could overcome the hurdles and launched into the phase of complete indigenization. The self-sufficiency achieved by the country was possible due to the high talent pool available in the department. A separate organization (BHAVINI) has been formed by the Government for construction and operation of commercial fast reactors, and BHAVINI is already executing the project with adequate pool of human resources.

(f) Availability of talent pool in the department depends on the ability to attract talented scientists and engineers. Department of Atomic Energy is taking many steps to do exactly that.

Human Resources Development Division, BARC has the mandate of implementing two mainstreams of recruitment (OCES) and (DGFS)

OCES is a One-Year Orientation Course for Engineering Graduates & Science Post-Graduates at BARC Training Schools at BARC, Mumbai; RRCAT, Indore; NFC, Hyderabad; IGCAR, Kalpakkam& AMD, Hyderabad

DGFS (DAE Graduate Fellowship Scheme) has been devised to further strengthen research-education linkage in areas of interest to DAE programmes. The scheme provides excellent career opportunity to students qualifying for admission to the MTech Course at different IITs viz. Bombay, Kanpur, Delhi, Kharagpur, Roorkee, Madras, NIT Rourkela, IT-BHU Varanasi and Institute of Chemical Technology Mumbai.

BARC also offers Dr. K.S. Krishnan Research Associateship (KSKRA). Research Associates selected under the prestigious KSKRA programme are given an opportunity to work on R&D programmes of national importance relevant to the DAE mandate.

Anytime during the 2nd year of associateship, subject to satisfactory performance, the KSKRAs are absorbed in service in one of the DAE R&D units.

The Department of Atomic Energy (DAE) supports extramural research and development activities in nuclear and allied sciences, engineering and technology through its nodal funding agency - the Board of Research in Nuclear Sciences (BRNS). BRNS continuously strives to encourage, enthuse and support scientists and engineers in pursuing excellence in R & D programmes of interest and relevance to DAE. The main activities of BRNS include:

- (a) Identify and fund R & D programmes and projects.
- (b) Award fellowships to pursue doctoral programmes.
- (c) Award research grants to young scientists.