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India Department of Atomic Energy, 'Research and Development Programme of the Department of Atomic Energy During the IVth Plan Period'

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Summary:

Research objectives for the Indian nuclear program include the development of fast breeder reactors and isotope production.

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Research and Development programme of the Department of Atomic Energy during the IVth Plan period.

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The objectives of the Indian atomic energy programme are on the one hand to develop the use of atomic energy as a source for producing cheap power and on the other hand to develop new uses of isotopes in agriculture, biology, industry and medicines to produce the isotopes needed and to promote their widespread use for improving the economy of the Country. The Research and Development work of the Department is necessarily designed to assist the achievement of the above objectives.

2. The main Centre for Atomic energy research is the Bhabha Atomic Research Centre at Trombay. The important research projects/schemes to be undertaken by the Bhabha Atomic Research Centre during the IV Plan period are briefly described below:-

(a) Development of Fast Breeder Reactor.

India has vast resources of Thorium and ^{the} country's nuclear power programme has, therefore, to be based ultimately on Thorium. For this purpose, the programme has to be implemented in three stages, the first stage by establishing power reactors based on natural Uranium, the second stage by establishing breeder reactors using Plutonium or Thorium and in the final stage Fast reactors based on Uranium-233 -Thorium Cycle which will have to be fed only on Thorium. Beginning has already been made for establishing natural Uranium based reactors and the first phase is expected to be completed by 1978-79 by which time it is hoped to install about 3000 MW of nuclear power. It is envisaged that it would be possible to embark upon the second stage viz. setting up of fast breeder reactors based on Plutonium-Thorium Cycle by the end of Vth Plan period. This, however, will have to be preceded by considerable research and development work in breeder technology. One of the important schemes to be undertaken during the IV Plan will be establishment of a Reactor Testing Station near Kalpakkam, Madras. This Station will inter alia include the following facilities:-

- i) Development of auxiliary facilities like Heat Transfer Laboratory, Liquid Metal Loops, Fuel Fabrication and Reprocessing Laboratories;
- ii) Prototype fast breeder reactor of about 20 MWe output which will give practical experience to Indian scientists and engineers for design and construction of fast breeder reactors;
- iii) A Zero energy fast facility which will provide facilities for studying the physics-design of large breeders.

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(b) Isotopes production and promotion of their use.

The Bhabha Atomic Research Centre is already producing a large variety of Isotopes at the two reactors - Apsara and CIRUS. When the Radiological Laboratories which are currently under construction are completed the Centre will be in a position to handle large quantities of Radioactive materials producing high intensity Radioactive sources using Cobalt-60 and other Isotopes. With such Isotope being available in the country, it is expected that their use in agriculture, biology, industry and medicine will greatly increase. Already the use of these Isotopes for the preservation of food and disinfection of grains has been demonstrated at the Food Irradiation and Processing Laboratory. Efforts will be made by the Bhabha Atomic Research Centre to conduct such activities using Radio-Isotopes on large scale industrial basis all-over the country. This would result in large quantities of grains and other preservation materials, like fish, vegetables, fruits, etc. to be transported from various parts of ~~the~~ the country without loss due to infestation and decay.

Radio-isotopes have also been used for developing new mutants of rice and ground nuts and large scale field trial crops are being tried out. The success already achieved to-date has indicated that the Radio-isotopes will play an important part in our food programme.

Large quantities of Isotopes have been used in medicine for variety of applications and demand for medical radio Isotopes is continuously on the increase. Plans to increase the demands of Isotopes are being worked out.

(c) Pure research activities.

Besides, the above mentioned important field of activities, basic research is conducted in physics, chemistry, biology and medicine. Particularly emphasis is laid on the use of techniques which have developed as a result of advances in the field of atomic energy. Broad details of research and development programme to be undertaken by the Bhabha Atomic Research Centre is given in Annexure-I.

(d) Computer Facility and other new projects.

The Bhabha Atomic Research Centre has also recently established a Computer Centre, an Electronics Proto-type Engineering Laboratory and a Reliability Evaluation Laboratory to enable it to carry out its complex research activities. The Computer facility which was started with a Honeywell Computer will be considerably expanded during the IV Plan period to meet the growing requirements of computer work at the Centre.

.. 3/-

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3. In addition to the Bhabha Atomic Research Centre, pure research is also carried out at various scientific institutions such as the Tata Institute of Fundamental Research, Saha Institute of Nuclear Physics, Physical Research Laboratory, etc., which receive substantial financial support from Government. The details of the Research programmes of the Institutions are given in the Annexure - II.

4. With a view to provide adequate facilities for post-graduate research in various disciplines in nuclear science, the Department is establishing the following facilities:-

- i) Radio-telescope Station at Ootacamund which will provide upto-date facilities for carrying out studies in the field of Radio-astronomy. The Radio-telescope to be installed in the Station, which will be the largest in Asia, is being fabricated indigenously.
- ii) A Variable Energy Cyclotron Centre at Calcutta which will provide facilities for high quality work in nuclear physics and for controlled direct irradiation of biology and agriculture productivities. Because of its high energy intensity, the Cyclotron will be able to produce a variety of Isotopes which cannot be produced in nuclear reactors. The Centre will be set up by the scientists/engineers of the Bhabha Atomic Research Centre in close collaboration with other scientific institutions like Saha Institute of Nuclear Physics, Tata Institute of Fundamental Research and assistance from a number of public sector undertakings like, Heavy Engineering Corporation and Heavy Electricals, Ltd.

5. The Department is also responsible for the 'Peaceful uses of Outer Space'. The projects and programmes to be undertaken in this connection during the Fourth Plan period are detailed in Annexure - III.

6. O u t l a y s : The total estimated outlay on Research and Development programme of the Department of Atomic Energy (including Space Research) during the IV Plan period is Rs. 75.00 crores. Of this Rs. 35.00 crores is for outlay on spill over projects and balance of Rs. 40.00 crores only for new projects/programmes as detailed overleaf.

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	<u>Rs. in crores.</u>
i) Bhabha Atomic Research Centre.	17.00
ii) Aided Institutions.	10.00
iii) Space Research Projects.	13.00

The above figures are indicating only the order of magnitude and subject to modifications after the proposals of the various units are examined in detail.

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