GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY

RAJYASABHA
STARRED QUESTION NO. 40
ANSWERED ON 06.02.2025

NEW PROJECTS AND COLLABORATIONS BY DAE

*40. SHRI RAJIB BHATTACHARJEE

Will the PRIME MINISTER be pleased to state?

(a) whether any new projects and collaborations are planned/envisaged by the Department of Atomic Energy (DAE) in the field of science and technology; and

(b) if so, the details thereof?

ANSWER

THE MINISTER OF STATE FOR PERSONNEL, PUBLIC GRIEVANCES & PENSIONS AND PRIME MINISTER'S OFFICE (DR. JITENDRA SINGH)

(a) & (b): A statement is laid on the Table of the House.

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STATEMENT REFERRED TO IN REPLY TO PARTS (A) & (B) IN RESPECT OF RAJYA SABHA STARRED QUESTION NO. 40 FOR REPLY ON 06.02.2025 REGARDING NEW PROJECTS AND COLLABORATIONS BY DAE ASKED BY SHRI RAJIB BHATTACHARJEE.

(a) & (b):

Department of Atomic Energy (DAE) is having excellent infrastructure for advanced Research and Development with expertise covering the entire spectrum of Nuclear Science and Engineering and related areas. The areas of research and development include Nuclear Reactor Technologies, nuclear fuel cycle (front-end and back-end), Accelerator and Laser Technologies, material research, Advanced Electronics and Instrumentation, Nuclear Agriculture, Food Preservation, Water Desalination, Water Purification, waste management etc. The vision of the Department of Atomic Energy is to empower India through technology, creation of more wealth and providing better quality of life to its citizens. To this end, several cutting-edge research programmes have been envisaged as part of an exercise for Amrit Kaal for DAE in 2047 in the thematic areas described in Annexure-I.

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Annexure-I

Reactor Programmes

The design, development, installation, commissioning and operationalization of (i) new research reactors for reactor physics experiments, material characterization, radio-isotope production, development of new fuel, irradiation studies, (ii) high temperature demonstration reactors for green hydrogen production, (iii) thorium utilisation after breeding into uranium and (iv) demonstration of small reactors for captive power generation and off-grid power generation at remote locations. The nuclear power reactor programme emphasizes on indigenous technology development for Indian Pressurised Water Reactor and Fast Breeder Reactor for 1st & 2nd Stage of Indian nuclear power programme as well as development of demonstration reactor design for realization of 3rd stage for long term energy security and for achieving net-zero carbon emission.

Nuclear Fuel Cycle

The nuclear fuel cycle will cover front-end as well as back-end of fuel cycle and will include (i) exploration & augmentation of uranium, thorium and other rare earth (RE) materials, (ii) expansion of fuel fabrication capabilities for sustained operation of existing and future reactors, (iii) development of advanced fuel for future reactors and (iv) construction & commissioning of integrated fuel recycle plants for pressurised heavy water reactor (PHWR) and fast breeder reactor (FBR) fuels.

Accelerators and Laser Programmes

Indian accelerator programme is aimed at long term energy security in a sustained manner through phase-wise indigenous development of high energy accelerators for Accelerator Driven Sub-critical Systems (ADSS). This deployment will facilitate thorium utilisation and incineration of nuclear waste to reduce the environmental burden. The programme also emphasizes on development of indigenous medical cyclotron, heavy ion and rare isotope beam accelerator for medical isotope production, research and industrial applications. Development of Lasers will be pursued for a wide range of applications in the field of basic science, medical diagnostics, machine vision-based inspection systems and advanced additive manufacturing technologies for nuclear and industrial applications.

Advanced Technology Development

This majorly comprises the technologies to support the reactor programme, nuclear fuel cycle programme, accelerator programmes and technologies for societal applications. Some of the technologies envisaged are technologies for reactor safety, hydrogen production, cryogenic technology, indigenous development of detectors & instruments and development of advanced metal joining techniques.

Societal Applications

These programmes are directed towards development of radiopharmaceuticals for diagnostics and treatment of cancer, development & deployment of technology of large capacity food / grain irradiators. The programme also covers development of new crop varieties through radiation induced mutagenesis, seed breeding for food security, solid waste management and waste water management for reducing the human load on environment.

Frontiers in Basic Research

The basic and applied R&D in fields of gamma-ray and radio astronomy, gravitational wave research, physical sciences, chemical sciences, biological sciences, material sciences and health physics.

Human Resource Development, Capacity Building, Skill Development and Collaborations

The theme envisages capacity building and augmentation of human resources to meet the requirement of future plans during the Amritkaal.

DAE contributes to the enrichment of knowledge domain by way of support to basic research in nuclear energy and related frontier areas of science; interaction with universities and academic institutions; support to research and development projects having a bearing in DAE's programmes, and international collaborations in related advanced areas of research. Details of some important International Collaborations are listed below:

(i) Laser Interferometer Gravitational – Wave Observatory-India (LIGO-India): The LIGO-India Project proposal is for the setting up of an interferometric gravitational-wave detector in India called LIGO-India as the third LIGO detector under an

international collaboration with the LIGO-Laboratory, USA. The project is a joint project between the Department of Atomic Energy (DAE), the Department of Science and Technology (DST) from India, and the National Science Foundation (NSF) of the USA. This project is proposed under the Mega Science Consortium of DAE and DST set-up for funding large science projects. Of the various projects being pursued under the Consortium LIGO-India is the only Mega Science Project being set-up on India soil.

(ii) Square Kilometre Array (SKA): The Square Kilometre Array is an Intergovernmental Radio Telescope Project being planned to be built in Australia and South Africa. SKA is the next generation Radio Telescope, has almost completed the design stage for phase-I. Early science is expected to be possible from around 2025 or so. The SKA is a truly international telescope, with India being one of the member countries in the SKA organization and hence involved in the design and operation of SKA-I. The astronomers in India too have started working on a long-term strategy towards the use of the SKA in the Country.

(iii) DAE has signed MoUs with 16 International partners viz. USA, Russia, IAEA, France, UK and Northern Ireland, Bangladesh, Vietnam, Bulgaria, Republic of Malawi, Argentina, Uzbekistan, Peru, Ghana, Kazakhstan, AFCONE and ASEAN, for collaborative research and training programme.

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