GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY
RAJYA SABHA
UNSTARRED QUESTION NO. 4004
TO BE ANSWERED ON 07.04.2022

EFFORTS TO INCREASE NUCLEAR ENERGY

4004 SHRI PRAKASH JAVADEKAR:

Will the PRIME MINISTER be pleased to state:

(a) the new invention to produce more nuclear energy;

(b) whether India is a part of this invention; and

(c) the efforts which India is making to increase Nuclear Energy?

ANSWER

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

(a to c) Department of Atomic Energy (DAE) is pursuing research & development in line with Indian three stage nuclear power programme to produce more nuclear energy. Three-stage nuclear power programme, which is based on a closed nuclear fuel cycle, has been chalked out to use Thorium as a viable and sustainable option at the inception of India's nuclear power programme. On account of physics characteristics of Thorium, it is not possible to build a nuclear reactor using Thorium alone. It has to be converted to Uranium-233 in a reactor before it can be used as fuel.

The three-stage nuclear power programme aims to multiply the domestically available fissile resource through the use of natural uranium in Pressurised Heavy Water Reactors, followed by use of plutonium obtained from the spent fuel of Pressurised Heavy Water Reactors in Fast Breeder Reactors. Large scale use of Thorium will subsequently follow making use of the Uranium-233 that will be bred in Fast Breeder Reactors.

Bhabha Atomic Research Centre (BARC) and other research organisations attached with DAE, are engaged in various R&D activities to address the utilisation of Thorium in different types of reactors. Some important highlights of these activities are the following:

(i) Thorium Oxide (Thoria) pellets contained in bundles are used in the initial cores of operating Pressurised Heavy Water Reactors (PHWRs) and valuable experience has been generated in operation and re-use of this irradiated thorium fuel. Thoria based fuels have also been irradiated in the research reactors of BARC. After such irradiation these fuel elements have been examined in the laboratories at BARC, yielding excellent results.

(ii) The irradiated thoria pins of research reactors have been reprocessed to obtain Uranium 233. The recovered Uranium-233 has been fabricated as fuel for the 30 kW (thermal) KAMINI reactor, which is in operation at Indira Indira Gandhi Centre for Atomic Research (IGCAR) at Kalpakkam.

(iii) IGCAR is involved in development of indigenous technology towards Fast Breeder Reactors with closed fuel cycle facility. A 500 MWe Prototype Fast Breeder Reactor is in an advanced stage of construction by BHAVINI.

(iv) Technologies for fabrication of Thoria based fuel pellets, carrying Uranium-233, have been established. Studies have also been carried out to use Thorium in different types of reactors with regard to fuel management, reactor control and fuel utilisation.

(v) A Critical Facility for Advanced Heavy Water Reactor was commissioned at BARC and is used for carrying out experiments to further validate the physics design features of Advanced Heavy Water Reactor (AHWR).

(vi) BARC designed Advanced Heavy Water Reactor (AHWR, 300 MWe). This 300 MWe reactor using thorium-based fuel will serve as a technology demonstrator not only for the thorium fuel cycle technologies, but also for several advanced passive safety features. In order to facilitate an early scrutiny of the innovative features of the design from the safety considerations, a Pre-Licensing Design Safety

appraisal of the reactor has been completed by the Atomic Energy Regulatory Board.

Indian participation in international project “ITER France”:

India is participating in building of the world's largest tokamak, a magnetic fusion device to prove the feasibility of fusion as a large-scale and carbon-free source of energy. It is located in southern France. Indian contribution is in the form of supply of equipments, monetary support and participation of trained Indian scientific personnel, in ITER.

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