GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY
RAJYA SABHA
STARRED QUESTION NO. 46
ANSWERED ON 23/07/2026

DEVELOPMENT IN NUCLEAR TECHNOLOGIES

*46. DR. MEDHA VISHRAM KULKARNI

Will the PRIME MINISTER be pleased to state:-

(a) whether Government is undertaking research and development in advanced nuclear technologies, including Small Modular Reactors (SMRs) and nuclear energy-based green hydrogen production;

(b) if so, the major achievements, pilot projects and technological advancements made, so far;

(c) the estimated contribution of these technologies towards enhancing India's energy security, reducing carbon emissions and achieving the country's net-zero commitments; and

(d) the details of roadmap for their deployment and the benefits likely to accrue to States, including Maharashtra, in terms of clean energy, industrial growth and employment generation?

ANSWER

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

(a) to (d): A statement is laid on the Table of the House.

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STATEMENT REFERRED TO IN REPLY TO PART (A) TO (D) IN RESPECT OF RAJYA SABHA STARRED QUESTION NO.46 FOR REPLY ON 23.07.2026 REGARDING DEVELOPMENT IN NUCLEAR TECHNOLOGIES ASKED BY DR. MEDHA VISHRAM KULKARNI

(a) & (b) Yes. The Nuclear Energy Mission announced in the Union Budget 2025–26, aims to develop and operationalize at least five indigenously designed Small Modular Reactors (SMRs) by 2033 besides achieving a target of 100 GWe nuclear power generation capacity by year 2047.

In this regard, Bhabha Atomic Research Center (BARC), a constituent unit of Department of Atomic Energy (DAE) has undertaken design and development of SMRs namely;

- 220 MWe Bharat Small Modular Reactor (BSMR-200);
- 55 MWe Small Modular Reactor (SMR-55); and
- Up to 5 MWth High Temperature Gas Cooled Reactor (HTGCR).

It is planned to establish the lead units of these SMRs at DAE site for technology demonstration.

I. The BSMR 200 is an indigenous Pressurized Water Reactor (PWR) based power reactor. The current status of the BSMR-200 is mentioned below;

a) In-principle approval for engineering and construction of BSMR-200 has been received.

b) Proposal for Administrative & Financial sanction is cleared by Atomic Energy Commission (AEC) and the approval of Empowered Technology Group (ETG) has been obtained.

c) Atomic Energy Commission has approved Tarapur, Maharashtra as site for BSMR-200.

d) Nuclear design detailing works is in progress.

II. The 55 MWe SMR is based on Pressurised Water Reactor design. The current status of the SMR-55 is mentioned below:

a) In-principle approval for engineering and construction of SMR-55 has been received.

b) Atomic Energy Commission has approved Tarapur, Maharashtra as site for SMR-55

c) Nuclear design detailing works is in progress.

III. Upto 5 MWth HTGCR is being designed and developed by BARC as nuclear heat source and to be coupled with a suitable thermochemical cycle, such as copper-chlorine cycle for hydrogen production

The current status of the HTGCR is mentioned below:

a) In-principle approval for engineering and construction of HTGCR has been received.

b) The proposed site for the reactor is BARC, Vizag. Siting consent has been received.

c) Terms of Reference (ToR) for obtaining environmental clearances has been received from MoEF&CC.

d) Nuclear design detailing works is in progress.

BARC has also designed and developed copper-chlorine thermochemical process cycle for hydrogen production utilizing heat from nuclear reactor. Copper Chlorine thermochemical cycle has been successfully coupled with Fast Breeder Test Reactor and Commissioned at Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam for technology demonstration.

At IGCAR, the Copper-Chlorine (Cu-Cl) Thermochemical Cycle developed by BARC was integrated with the secondary sodium heat loop of Fast Breeder Test Reactor (FBTR) for the production of clean hydrogen using nuclear heat, successfully commissioned and demonstrated.

The Copper-Chlorine (Cu-Cl) Thermochemical Cycle based facility demonstrated hydrogen production utilizing nuclear heat, marking the first successful production of clean hydrogen from a nuclear reactor in the world on 26th June, 2026. This achievement marks a pioneering technological breakthrough and opens a promising pathway for large-scale, carbon-free hydrogen production using advanced nuclear reactors. The programme also strengthens indigenous technological capability and aligns with the vision of Atmanirbhar Bharat through development of advanced clean energy systems.

(c) Nuclear power is considered one of the most promising clean energy options for reliable base-load power generation that can reduce reliance on fossil fuels.

The deployment of Small Modular Reactors is envisaged for;

- Captive power generation for energy-intensive industries such as steel, aluminium, cement and other metal industries;
- Repurposing retiring fossil fuel-based thermal power plants;
- Supplying reliable electricity to remote and off-grid locations; and
- HTGCR can be coupled with suitable thermochemical cycle for producing green hydrogen for the transport sector and process industries.

Gradual replacement of fossil fuel-based energy sources with nuclear reactors is expected to decarbonise the industrial, power and transport sectors and will be instrumental in achieving the country's net zero carbon emission goal by 2070.

Hydrogen is emerging as an important clean energy carrier for industrial, transportation and future energy applications. Conventional hydrogen production through fossil fuel routes results in significant carbon emissions, while direct electrolysis demands large electrical power input. In this context, nuclear-assisted hydrogen production offers an attractive low-carbon alternative.

Nuclear-assisted Copper–Chlorine (Cu–Cl) thermochemical cycle based hydrogen production offers a stable base-load alternative to renewable-powered electrolysis and supports co-generation of electricity and hydrogen within nuclear infrastructure. This technology has significant relevance for decarbonisation of sectors such as fertilizers, refineries, transport and steel production, while supporting India’s National Green Hydrogen Mission and Net Zero targets. This programme also strengthens indigenous technological capability and aligns with the vision of Atmanirbhar Bharat through development of advanced clean energy systems.

(d) The lead units of BSMR-200 and SMR-55 are planned to be established at DAE site at Tarapur, Maharashtra for technology demonstration and the lead unit of HTGCR is planned at Vizag. The expected construction period for these reactors is 60 to 72 months after receipt of project sanction. Deployment of these SMRs is expected to supply clean and reliable electricity in nearby areas including industries, contributing towards decarbonisation goals. Clean hydrogen produced from HTGCR can be used for the transport sector and process industries.

Further, construction commissioning and operations of these reactors are expected to generate employment opportunities. Therefore, enhancing the economic activities in the surrounding region.

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