GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY
RAJYA SABHA
UNSTARRED QUESTION NO - 482
ANSWERED ON 23/07/2026

NUCLEAR POWERED HYDROGEN PRODUCTION FACILITY

482. SHRI ASHOKRAO SHANKARRAO CHAVAN

Will the PRIME MINISTER be pleased to state:-

(a) whether Government has inaugurated the world's first hydrogen production facility using the Copper–Chlorine (Cu-Cl) thermochemical cycle powered by nuclear heat from the Fast Breeder Test Reactor (FBTR) at the Indira Gandhi Centre for Atomic Research in Kalpakkam;
(b) if so, the details thereof and the salient features thereof;
(c) the manner in which the said project is expected to contribute to India's clean hydrogen mission, energy security and decarbonization goals; and
(d) whether Government proposes to replicate or scale up this technology at other nuclear facilities in the country and if so, the details thereof?

ANSWER

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

(a) Yes, in alignment with the national clean energy goals, the world's first hydrogen production facility powered by nuclear heat was successfully commissioned and demonstrated at Fast Breeder Test Reactor (FBTR), IGCAR on 26th June, 2026.

(b) This facility is based on the indigenously developed Copper-Chlorine (Cu-Cl) thermochemical cycle developed by Bhabha Atomic Research Centre (BARC) and integrated with the secondary sodium heat loop of Fast Breeder test Reactor (FBTR). This cycle mainly involves hydrolysis, thermolysis and electrolysis stages. Hydrolysis converts copper chloride compounds into oxychlorides and hydrochloric acid, while thermolysis releases oxygen through thermal decomposition at elevated temperature. The electrolysis stage regenerates copper chloride and produces hydrogen. The overall

process enables carbon-free hydrogen generation with significantly lower electricity consumption.

The integrated facility incorporates advanced engineering and indigenous technologies including hydrogen sensors for safe and reliable operation. Critical components have been fabricated using materials that can withstand high-temperature, corrosive environments.

(c) 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 Copper-Chlorine (Cu-Cl) thermochemical cycle is particularly compatible with sodium-cooled Fast Breeder Reactors (FBRs) due to its moderate operating temperature requirement of about 450–530°C. The future sodium-cooled Fast Breeder Reactors including FBTR-2 is proposed to have facility for co-generation of hydrogen. BARC is developing High Temperature Gas Cooled Reactor (HTGCR) of capacity up to 5 MWth, a heat source for hydrogen production at BARC Vizag, to scale up the hydrogen production.

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