



Prototype Fast Breeder Reactor at Kalpakkam, Tamil Nadu attains First Criticality

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In a landmark achievement for India's nuclear energy programme, the 500 MWe Prototype Fast Breeder Reactor (PFBR) has successfully attained first criticality (start of controlled fission chain reaction) on 6th April 2026 at 08:25 PM marking a historic step in providing long-term energy security and advancing indigenous nuclear technology capabilities.

The criticality was achieved in the presence of Dr Ajit Kumar Mohanty, Secretary, DAE & Chairman, AEC, Shri Sreekumar. G. Pillai, Director, IGCAR, Shri Allu Ananth, CMD-In-Charge, BHAVINI and Shri K.V. Suresh Kumar, Former CMD, BHAVINI & Homi Sethna Chair after meeting all the stipulations of the Atomic Energy Regulatory Board (AERB), which had issued clearance after a rigorous review of safety of the plant systems.

The technology development & design of PFBR was indigenously done by Indira Gandhi Centre for Atomic Research (IGCAR), an R&D Centre of the Department of Atomic Energy, and was built & commissioned by Bharatiya Nabhikiya Vidyut Nigam Ltd (BHAVINI), a PSU under the Department of Atomic Energy.

Fast Breeder Reactors are a cornerstone of India's long-term nuclear strategy. Unlike conventional thermal reactors, the PFBR uses Uranium-Plutonium Mixed Oxide (MOX) fuel. The core of PFBR is surrounded by a blanket of Uranium-238. Fast neutrons convert fertile Uranium-238 into fissile Plutonium-239, enabling the reactor to produce more fuel than it consumes. The reactor is designed to eventually use Thorium-232 in the blanket. Through transmutation, Thorium-232 will be converted into Uranium-233, which will fuel the third stage of India's nuclear power programme.

This unique capability significantly enhances the utilization of nuclear fuel resources and enables the country to extract far greater energy from its limited uranium reserves while also preparing for large-scale use of thorium in the future.

With the achievement of first criticality, India moves closer to realizing the full potential of its three-stage nuclear power programme. Fast breeder technology forms the vital bridge between the current fleet of pressurized heavy water reactors and the future deployment of thorium-based reactors, leveraging the country's abundant thorium resources for long-term clean energy generation.

Achieving this milestone demonstrates the strength of India's indigenous design, engineering and manufacturing ecosystem. The reactor incorporates advanced safety systems, high-temperature liquid sodium coolant technology and a closed fuel cycle approach that enables recycling of nuclear materials, thereby improving sustainability and reducing waste.

The project also reflects the dedication of significant number of scientists, engineers, technicians and industry partners who have contributed to the design, fabrication and construction of the reactor using predominantly indigenous technologies and components. Their efforts highlight the nation's growing

capability in advanced nuclear engineering and reinforce India's commitment to technological self-reliance complying with Atmanirbhar Bharat.

Beyond energy generation, the fast breeder programme strengthens strategic capabilities in nuclear fuel cycle technologies, advanced materials, reactor physics and large-scale engineering. The knowledge and infrastructure developed through this programme will support future reactor designs and next-generation nuclear technologies.

As India continues to expand its clean energy portfolio, fast breeder reactors will play a crucial role in delivering reliable, low-carbon, base-load power with higher thermal efficiency. The attainment of first criticality represents not only a technological milestone but also a major step towards a sustainable and self-reliant energy future for Viksit Bharat.





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