

Historic Milestone: India's 500 MWe Prototype Fast Breeder Reactor Achieves First Criticality

Prototype Fast Breeder Reactor Attains First Criticality, Boosting India's Energy Security and Indigenous Capabilities

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In a landmark achievement for India's nuclear energy programme, the 500 MWe Prototype Fast Breeder Reactor (PFBR) successfully attained first criticality, the initiation of a controlled nuclear fission chain reaction on April 6, 2026, at 08:25 PM. This milestone marks a significant step toward strengthening India's long-term energy security and advancing its indigenous nuclear technology capabilities.

The criticality was achieved in the presence of Dr. Ajit Kumar Mohanty, Secretary, Department of Atomic Energy (DAE) and Chairman, Atomic Energy Commission (AEC); Shri Sreekumar G. Pillai, Director, Indira Gandhi Centre for Atomic Research (IGCAR); Shri Allu Ananth, CMD-in-Charge, Bharatiya Nabhikiya Vidyut Nigam Ltd (BHAVINI); and Shri K.V. Suresh Kumar, Former CMD, BHAVINI and Homi Sethna Chair. The achievement follows the successful completion of all stipulated safety requirements, with clearance granted by the Atomic Energy Regulatory Board (AERB) after rigorous review.



The PFBR has been indigenously designed and developed by the Indira Gandhi Centre for Atomic Research (IGCAR), a premier R&D institution under the Department of Atomic Energy. The reactor has been constructed and commissioned by Bharatiya Nabhikiya Vidyut Nigam Ltd (BHAVINI), a public sector enterprise under the Department of Atomic Energy.

Fast Breeder Reactors form a cornerstone of India's long-term nuclear strategy. Unlike conventional thermal reactors, the PFBR uses Uranium-Plutonium Mixed Oxide (MOX) fuel. It is surrounded by a blanket of Uranium-238, which, through neutron absorption, is converted into fissile Plutonium-239. This enables the reactor to generate more fuel than it consumes. The reactor is also designed for future utilization of Thorium-232, which can be transmuted into Uranium-233 to support the third stage of India's nuclear power programme.

This capability significantly enhances fuel utilization and enables India to extract greater energy from its limited uranium reserves, while paving the way for large-scale deployment of thorium-based reactors.

With the attainment of first criticality, India moves closer to realizing the full potential of its three-stage nuclear power programme. Fast breeder technology serves as a vital bridge between the current fleet of Pressurized Heavy Water Reactors (PHWRs) and future thorium-based systems, leveraging the country's abundant thorium resources for sustainable and long-term clean energy generation.



The PFBR incorporates advanced safety systems, high-temperature liquid sodium coolant technology, and a closed fuel cycle approach, enabling efficient recycling of nuclear materials, improved sustainability, and reduction in radioactive waste.

This milestone reflects the dedicated efforts of a large number of scientists, engineers, technicians, and industry partners who contributed to the design, fabrication, and construction of the reactor using predominantly indigenous

technologies and components. It underscores India's growing expertise in advanced nuclear engineering and its commitment to technological self-reliance under the vision of Atmanirbhar Bharat.

Beyond energy production, the fast breeder programme enhances India's 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 are expected to play a crucial role in delivering reliable, low-carbon, base-load power with higher thermal efficiency. The successful achievement of first criticality represents not only a technological milestone but also a major step toward a sustainable and self-reliant energy future for a Viksit Bharat.

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