India’s First Prototype Fast Breeder Reactor (PFBR)

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India’s First Prototype Fast Breeder Reactor Latest News

India’s first Prototype Fast Breeder Reactor (PFBR) in Kalpakkam, Tamil Nadu is likely to be commissioned next year, marking the second stage of India’s three-stage nuclear programme.

About India’s First Prototype Fast Breeder Reactor

- It is a **500 MWe sodium-cooled reactor** located in **Kalpakkam, Tamil Nadu.**
- The PFBR was **developed by BHAVINI (Bharatiya Nabhikiya Vidyut Nigam Limited),** a **government enterprise** set up in 2003 **under the Department of Atomic Energy (DAE)** to **focus on fast breeder reactors.**
- Construction began in 2004 and the reactor was originally expected to be completed in September 2010, but faced a series of delays.
- Unlike traditional nuclear reactors, the **PFBR uses fast neutrons for energy generation** and **employs liquid sodium as a coolant** instead of water.

- The innovative design **enables the reactor to breed more fuel than it consumes,** offering a **sustainable solution** to India’s growing energy demands.
- The PFBR is **powered by plutonium and uranium-based mixed oxide fuel (MOX)**, which ensures **high efficiency** in power generation.
- Its **advanced sodium cooling system allows operation at higher temperatures,** enhancing overall efficiency.
- Additionally, the reactor incorporates **robust safety features,** including a **strong containment structure and passive cooling systems** that prevent overheating.

India’s Three-Stage Nuclear Programme

- India has adopted a three-stage nuclear power programme, with the **long-term goal of deploying a thorium-based closed nuclear fuel cycle.**
- The **first stage** involves the **use of pressurised heavy water reactors (PHWRs), fuelled by natural uranium,** and **light water reactors.**
- The **second stage** involves r**eprocessing used fuel from the first stage to recover the plutonium to fuel FBRs.**
- **In stage 3, Advanced Heavy Water Reactors (AHWRs)** will **burn thorium-plutonium fuels** and **breed fissile uranium-233.**

Source: TOI
