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EDITORIAL ANALYSIS

At Long Last — Kalpakkam's Criticality and the Unresolved Question of Nuclear Regulatory Accountability

THE HINDU

9 April 2026 · GS3 GS2

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The Hindu 9 April 2026 GS3 GS2

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CONTEXT

The **Hindu editorial** responds to the **Prototype Fast Breeder Reactor (PFBR) at Kalpakkam, Tamil Nadu, achieving first criticality** — marking Stage 2 of India's three-stage nuclear programme operational. While the editorial welcomes this as a historic scientific achievement, it argues the milestone must be evaluated honestly against India's nuclear project governance record and raises structural questions about regulatory independence.

THE EDITORIAL ARGUMENT

1. The Achievement and Its Significance

First criticality — the point at which a controlled, self-sustaining chain reaction is achieved — represents PFBR crossing the critical threshold from construction to operational demonstration. India becomes only the **second country after Russia** to have a commercial-scale fast breeder reactor at this stage. The editorial acknowledges this is a genuine milestone in India's three-stage programme, which has thorium utilisation as its ultimate goal.

2. The Governance Failure the Timeline Represents

PFBR was originally projected for completion in **2010**. First criticality was achieved in **2026** — approximately **16 years behind schedule**. The initial project cost was approximately **₹3,500 crore**; the final cost exceeded **₹8,000 crore** — more than double. The editorial argues these overruns represent a governance failure requiring honest accounting, not celebration without scrutiny.

3. The Regulatory Independence Gap

The editorial raises a structural concern: India's **AERB (Atomic Energy Regulatory Board)** is established under the **Atomic Energy Act, 1962**, and its chairman is appointed by the **Department of Atomic Energy (DAE)**. The regulator and the regulated entity (NPCIL, BHAVINI) share the same governmental parent — a structural conflict of interest that independent nuclear regulators in other countries avoid.

4. What Must Happen Next

The editorial calls for:

- **Transparent reporting** on PFBR's commercial operation timeline
- **Independent regulatory status** for AERB — insulated from DAE's promotional mandate
- **Public cost-benefit analysis** of the three-stage programme vs. accelerated solar + nuclear (SMRs) mix
- **Full operational testing** before announcing commercial power delivery dates

THREE-STAGE NUCLEAR PROGRAMME: CONTEXT

STAGE	REACTOR TYPE	FUEL	STATUS
Stage 1	PHWR (Pressurised Heavy Water Reactor)	Natural uranium	Operational (15+ reactors)
Stage 2	FBR (Fast Breeder Reactor)	Plutonium + depleted uranium; breeds more fuel	PFBR achieved first criticality
Stage 3	Thorium breeder	Thorium + U-233 produced in Stage 2	Not yet operational

India holds approximately **25% of the world's known thorium reserves** — making Stage 3 particularly valuable for long-term energy security.

UPSC RELEVANCE

GS Paper 3 — Science & Technology / Energy

- Three-stage nuclear programme — Homi Bhabha's design, BARC, IGCAR, BHAVINI, NPCIL
- PFBR — 500 MWe, liquid sodium coolant, Kalpakkam Tamil Nadu, BHAVINI

- Nuclear regulatory framework — AERB, Atomic Energy Act 1962, SHANTI Act 2025

GS Paper 2 — Polity & Governance

- Regulatory independence — structural conflict when regulator is under the same ministry as operator
- Project governance — cost overruns, schedule slippage, accountability mechanisms

Mains Angle

"India's PFBR achieving first criticality is a landmark in the three-stage nuclear programme, but it also exposes chronic weaknesses in nuclear project governance. Critically examine." (GS3 + GS2)

FACTS CORNER

ITEM	FACT
PFBR capacity	500 MWe
Location	Kalpakkam, Tamil Nadu
Builder	BHAVINI (Bharatiya Nabhikiya Vidyut Nigam Ltd)
Parent ministry	Department of Atomic Energy (DAE)
First criticality	April 6, 2026
Original completion target	~2010
Schedule delay	~16 years
Original cost estimate	~₹3,500 crore
Final cost (approx.)	>₹8,000 crore
Coolant	Liquid sodium
Fuel utilisation	FBR uses ~10% vs. 1% in conventional PHWRs
India's thorium reserves	~25% of world's known thorium
Regulatory body	AERB (Atomic Energy Regulatory Board)
2nd country with commercial-scale FBR	India (after Russia)
Stage 2 objective	Produce plutonium fuel for Stage 3 thorium cycle

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