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**EDITORIAL ANALYSIS**

# Transforming India's Nuclear Power Landscape — SHANTI Act and Private Sector Entry

 **THE HINDU**5 April 2026 · **GS3**

CURATED &amp; WRITTEN BY

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# Transforming India's Nuclear Power Landscape — SHANTI Act and Private Sector Entry

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## CONTEXT

India's **SHANTI Act** (Strategic and Holistic Advancement of Nuclear Technologies in India) enables **private sector participation** in nuclear power generation for the first time, targeting an ambitious expansion from the current installed nuclear capacity of **8,180 MW to 100 GW by 2047**. The Hindu editorial argues that while the legislative framework is a welcome step, success depends on implementing transparent regulatory frameworks covering tariffs, fuel ownership, waste management, and establishing an **independent nuclear regulatory body** separate from the Department of Atomic Energy (DAE).

## THE EDITORIAL ARGUMENT

- 1 **India's nuclear capacity is minuscule** — at 8,180 MW, nuclear contributes only ~3% of India's total electricity generation, compared to 70%+ in France and 20% in the US
- 2 **Private sector entry is essential** — the public sector alone (NPCIL) cannot deliver the 100 GW target; private investment, technology, and management efficiency are needed
- 3 **Regulatory independence is non-negotiable** — currently, the **Atomic Energy Regulatory Board (AERB)** reports to the **DAE Chairman** who also oversees NPCIL (the operator) — this is a conflict of interest. An independent regulator (like the US NRC) must be established
- 4 **Tariff framework** must be transparent — nuclear power requires massive upfront capital but has low running costs; tariff structures must incentivise long-term investment
- 5 **Fuel and waste** — who owns the fuel? Who manages spent fuel and radioactive waste? Private operators cannot be expected to handle these without clear government frameworks



## INDIA'S CURRENT NUCLEAR POWER PROGRAMME

PARAMETER	DETAILS
Installed capacity	8,180 MW (as of March 2026)
Operating reactors	24 (across 7 sites)
Under construction	8 reactors (~6,000 MW)
Operator	Nuclear Power Corporation of India Ltd (NPCIL)
Regulator	Atomic Energy Regulatory Board (AERB)
Parent body	Department of Atomic Energy (DAE)
Target (2047)	100 GW under SHANTI Act

### Nuclear Power Plants in India

SITE	STATE	REACTOR TYPE
Tarapur	Maharashtra	BWR + PHWR
Rawatbhata	Rajasthan	PHWR
Kalpakkam	Tamil Nadu	PHWR + PFBR
Narora	Uttar Pradesh	PHWR
Kakrapar	Gujarat	PHWR (includes KAPP-3, India's first 700 MWe)
Kudankulam	Tamil Nadu	VVER (Russian, 1000 MWe)
Kaiga	Karnataka	PHWR

## INDIA'S THREE-STAGE NUCLEAR PROGRAMME

Envisioned by **Dr. Homi J. Bhabha** in the 1950s to utilise India's vast thorium reserves:



STAGE	FUEL	REACTOR TYPE	STATUS
Stage 1	Natural uranium	Pressurised Heavy Water Reactors (PHWRs)	Operational (majority of current fleet)
Stage 2	Plutonium (from Stage 1)	Fast Breeder Reactors (FBRs)	PFBR at Kalpakkam (500 MWe, commissioning stage)
Stage 3	Thorium (Th-232 → U-233)	Advanced Heavy Water Reactors (AHWRs)	R&D stage

India has the **world's largest thorium reserves** (~25% of global deposits, concentrated in monazite sands of Kerala and Odisha). Stage 3 would make India energy-independent for centuries.

## SHANTI ACT — KEY PROVISIONS

PROVISION	DETAILS
Private participation	Allowed in nuclear power generation (not weapons)
FDI	Framework to allow foreign investment in nuclear power
Fuel management	Government retains ownership of nuclear fuel
Waste management	Shared responsibility framework between operator and government
Liability	Civil Liability for Nuclear Damage Act, 2010 applies; supplier liability provisions retained
Regulatory reform	Provision for establishing independent Nuclear Safety Authority

## THE REGULATORY CHALLENGE

The editorial's central argument is about **regulatory independence**:

CURRENT STRUCTURE	PROPOSED (EDITORIAL)
AERB reports to DAE Chairman	Independent Nuclear Safety Authority (like US NRC)
DAE Chairman oversees NPCIL (operator)	Regulator separated from operator
Single authority for promotion + regulation	Distinct bodies for promotion (DAE) and safety regulation



This mirrors the global best practice: in the US, the **Nuclear Regulatory Commission (NRC)** is independent of the **Department of Energy (DOE)**. In France, **ASN** (Autorité de Sûreté Nucléaire) is independent of **EDF** (the operator).

## UPSC RELEVANCE

### GS Paper 3 — Science & Technology, Economy

- India's three-stage nuclear programme: design, current status
- SHANTI Act: private sector in nuclear power
- Nuclear safety: AERB, regulatory independence
- Civil Liability for Nuclear Damage Act, 2010
- Thorium reserves and energy security

### Prelims Fast Facts:

- India's nuclear capacity: **8,180 MW** (24 reactors, 7 sites)
- Target under SHANTI Act: **100 GW by 2047**
- Three-stage programme designed by: **Dr. Homi J. Bhabha**
- PFBR location: **Kalpakkam, Tamil Nadu** (500 MWe)
- India's first 700 MWe PHWR: **KAPP-3, Kakrapar, Gujarat**
- AERB reports to: **DAE Chairman** (conflict of interest)
- India's thorium reserves: **~25% of global deposits**

## FACTS CORNER

- India's **Civil Liability for Nuclear Damage Act, 2010** uniquely includes **supplier liability** (Section 17(b) and 46) — making equipment suppliers partially liable for accidents, unlike the global CSC (Convention on Supplementary Compensation) norm. This has deterred Western nuclear vendors (GE, Westinghouse) from building reactors in India
- The **Prototype Fast Breeder Reactor (PFBR)** at Kalpakkam, if successful, would be a landmark — proving India can close the nuclear fuel cycle and breed plutonium from uranium, unlocking Stage 2
- India is **not a member of the NPT** (Non-Proliferation Treaty) but received an **NSG waiver** in 2008 that allows it to engage in civilian nuclear trade with NSG member states



- **Kudankulam** (Tamil Nadu) houses India's largest nuclear reactors — two 1,000 MWe VVER units built with Russian (Rosatom) technology, with Units 3-6 under construction
- The **Atomic Energy Act, 1962** currently restricts nuclear power to the public sector — the SHANTI Act effectively amends this decades-old restriction for the first time

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