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EDITORIAL ANALYSIS

Powering 2047: The Right Road to a Nuclear India

 THE HINDU

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SCIENCE & TECH

GS3

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THE LIFT LINE

A nation cannot decarbonise its economy on sunlight alone. Solar and wind are indispensable, but they are intermittent, and an industrial power that means to run steel mills, data centres and electric transport around the clock needs firm, low-carbon baseload. Nuclear energy is the obvious candidate, and India has now declared its ambition: **100 GW by 2047**, a more than tenfold leap from today. The gap between that number and the roughly **8 to 9 GW** now installed is not a rounding error; it is a challenge to the entire architecture of how India builds atoms. Closing it will require the country to reform a law written in 1962, to invite private capital into a sector it has guarded for six decades, and to embrace a new class of reactor. It must do all this while keeping the one thing that makes civilian nuclear power politically survivable: an uncompromising commitment to safety and to responsible stewardship.

WHY THIS EDITORIAL MATTERS FOR YOUR EXAM

Energy security is a permanent theme in GS3, and nuclear power sits where it meets science and technology, climate policy and infrastructure financing. This editorial lets an aspirant connect a hard capacity target to the specific reforms that make it feasible, which is exactly the analytical bridge examiners reward.

The topic also carries an international dimension, because India's nuclear posture and its access to fuel and technology are shaped by treaties and waivers that a well-prepared candidate can cite with confidence.

GS Paper 3: Infrastructure and energy, achievements of Indians in science and technology, and indigenisation of technology and developing new technology.

GS Paper 3 (Environment): Low-carbon baseload power as a pillar of India's climate and net-zero-by-2070 strategy.

For **Prelims**, hold the specifics: India's installed nuclear capacity is about **8 to 9 GW**, with a target of **100 GW by 2047** under the **Nuclear Energy Mission**, announced in the **2025-26 Union Budget** with about **Rs 20,000 crore** for **Bharat Small Reactors** and SMR research. The **three-stage nuclear programme** was conceived by **Homi Bhabha**, moving from pressurised heavy water reactors to fast breeder reactors to a thorium-based cycle. The sector runs under the **Atomic Energy Act, 1962**, which currently reserves nuclear power for the state, and the **Civil Liability for Nuclear Damage Act, 2010**,

which channels liability and includes a supplier-recourse clause. **Nuclear Power Corporation of India Limited (NPCIL)** is the primary operator. **Small Modular Reactors (SMRs)** are factory-built reactors typically under 300 MW. India's access to global fuel and technology followed the **2008 Nuclear Suppliers Group (NSG) waiver**.

For **Mains**, the argument is that a target of this scale is a systems problem, and the binding constraints are legal and financial as much as they are technical.

BACKGROUND AND CONTEXT

India's civilian nuclear journey began with Homi Bhabha's **three-stage programme**, a closed-fuel-cycle strategy designed around the country's modest uranium and vast thorium reserves. For decades it advanced slowly, constrained by isolation after the 1974 and 1998 tests and by a domestic monopoly structure. The **2008 NSG waiver** ended the isolation, opening imported fuel and reactors, yet capacity still crept upward rather than surging.

Two statutes define the current landscape. The **Atomic Energy Act, 1962** vests nuclear power generation in the central government, effectively barring private ownership of reactors. The **Civil Liability for Nuclear Damage Act, 2010**, enacted after Bhopal shaped the national conscience, channels operator liability and, controversially for foreign suppliers, preserves a right of recourse against suppliers for defective equipment. Both laws served their era, but both are now cited as brakes on the capital and technology a 100 GW build-out demands. The **2025-26 Budget** answered with the **Nuclear Energy Mission** and dedicated funding for indigenous small reactors, signalling that the government intends to change the rules of the game, not merely the pace of the existing one.

THE CORE ARGUMENT / ISSUE

Legal reform is the gateway

No amount of ambition survives contact with a statute that forbids the actors you need. Amending the **Atomic Energy Act, 1962** to permit **calibrated** private and foreign participation, alongside a revisit of the supplier-recourse provision in the **2010 liability law**, is the **precondition** for private capital. The reform must be careful: liability caps cannot become a licence for negligence, and state oversight of fissile material and safety must remain absolute. The goal is participation in financing and construction, not a surrender of regulatory control.

SMRs change the economics

Conventional gigawatt-scale reactors are capital-heavy, slow to build and hard to site. **Small Modular Reactors**, factory-fabricated and typically under 300 MW, promise shorter build times, lower upfront cost, and siting flexibility that lets them replace retiring coal plants or power industrial clusters and data centres.

The **Bharat Small Reactor** programme aims to indigenise this class. SMRs are not a silver bullet, and their per-unit economics are still being proven globally, but they fit India's need for modular, distributed, financeable capacity.

Fuel security and safety underwrite it all

A 100 GW fleet multiplies fuel demand. Sustained access under the post-**2008 NSG** framework, expanded domestic mining, and long-term progress on the thorium stage all matter. None of it is worth pursuing if safety slips. India's record is strong, and it must stay that way, because a single serious incident would end public consent for the entire programme.

LEVER	CURRENT CONSTRAINT	REFORM NEEDED
Ownership	Atomic Energy Act, 1962 reserves nuclear power to the state	Amend to allow regulated private and foreign participation
Liability	2010 Act's supplier recourse deters foreign vendors	Recalibrate recourse while protecting victims and safety
Reactor type	Large reactors are costly and slow	Scale SMRs and Bharat Small Reactors for speed and siting
Capital	Public financing alone cannot fund 100 GW	Mobilise private equity and long-tenor debt
Fuel	Limited domestic uranium	Sustain NSG-enabled imports, advance thorium cycle

HOW TO THINK ABOUT THIS (ANALYTICAL FRAME)

Use an **energy trilemma** frame: any power system must balance security, affordability and sustainability. Nuclear scores high on security and sustainability but has historically struggled on cost and build speed. The reform agenda, legal opening plus SMRs plus private capital, is essentially an attempt to fix the affordability and speed corner without sacrificing the other two.

Layer on a **capacity-versus-capability** distinction. Announcing 100 GW is easy; building the regulatory bandwidth, the supply chain, the skilled workforce and the financing instruments to deliver it is the real test. India's history shows that targets without institutional depth slip. The mark of seriousness is not the headline number but the boring machinery of licensing, standardisation and vendor development that sits beneath it. Throughout, India's posture remains that of a **responsible nuclear power** committed to **No First Use** and to civilian, safeguarded expansion.

THE DIAGRAM IN WORDS

Target 100 GW by 2047 -> Amend Atomic Energy Act 1962 + recalibrate 2010 liability law -> Invite private and foreign capital -> Deploy SMRs / Bharat Small Reactors -> Secure fuel via NSG framework and thorium stage -> Keep safety and No First Use posture non-negotiable -> Firm low-carbon baseload for net zero

WAY FORWARD

- 1 **Amend the enabling laws first.** Reform the **Atomic Energy Act, 1962** to allow regulated private participation and recalibrate the supplier-recourse clause of the **2010 liability law**, while keeping victim protection and state control of **fissile** material intact.
- 2 **Industrialise the SMR programme.** Fund, standardise and licence the **Bharat Small Reactor** design for series production, and site early units at retiring thermal plants to reuse grid and land.
- 3 **Build a financing architecture.** Create long-tenor debt, viability support and risk-sharing instruments so private and foreign capital can enter a sector with long gestation and high upfront cost.
- 4 **Guard fuel and safety in parallel.** Secure uranium supply under the post-**2008 NSG** framework, accelerate the thorium stage, and strengthen the independent regulator so expansion never outruns oversight.

PYQ LINKAGE AND PRACTICE

This connects to past GS3 questions on India's energy security, on the three-stage nuclear programme and thorium, and on the trade-offs between energy needs and environmental or safety concerns. UPSC frequently pairs a technology with its policy and financing context, which is the structure this editorial models.

Practice question: India aims for 100 GW of nuclear capacity by 2047 against a current base of about 8 to 9 GW. Discuss the legal, financial and technological reforms required to bridge this gap, and explain why safety and liability safeguards must not be diluted in the process. (15 marks, 250 words)

Sources: The Hindu, Department of Atomic Energy, PIB: Nuclear Energy Mission

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