



Private Investments in India's Nuclear Energy

For Prelims: [Nuclear Energy](#), [India's Energy Goals](#), [Department of Atomic Energy \(DAE\)](#), [National Thermal Power Corporation \(NTPC\)](#), [Atomic Energy Regulatory Board \(AERB\)](#)

For Mains: Developments Related to India's Nuclear Energy, Ways to Enhance India's Nuclear Power Capacity.

[Source: TH](#)

Why in News?

India is set to revolutionise its [nuclear energy sector](#) by **inviting private companies to invest approximately USD 26 billion**, marking a significant shift in its energy policy.

- This move aims to boost **electricity generation from non-carbon-emitting sources** and aligns with India's ambitious targets for [renewable energy adoption](#).

How does Private Investment Initiative Align with India's Energy Goals?

- India aims to increase its **non-fossil fuels-based electric generation capacity to 50% by 2030, up from the current 42%**.
- The infusion of private investment in nuclear power generation will contribute significantly to achieving this target, bolstering the country's transition to **cleaner energy sources**.
 - The government is negotiating with leading firms such as Reliance Industries, Tata Power, Adani Power, and Vedanta Ltd. for investments of about Rs 440 billion (\$5.3 billion) each in the nuclear energy sector.
- The government aims to add **11,000 megawatts (MW) of new nuclear power generation capacity by 2040** through this investment.
- This initiative is expected to **diversify India's energy mix**, reduce dependence on fossil fuels, and enhance energy security in the long run.

India's Energy Goals

- **Net zero emissions:** India aims to achieve net zero emissions by **2070**.
- **Renewable energy:** India aims to get 50% of its electricity from renewable energy sources by 2030.
- **Non-fossil fuel energy:** India aims to achieve a non-fossil fuel energy capacity of 500 GW by 2030.
- **Green hydrogen:** India aims to produce 5 million tonnes of [green hydrogen](#) by 2030.
- **CO2 emissions:** India aims to reduce [CO2 emissions](#) by 1 billion tons by 2030.

How will the Investment Plan be Implemented?

- Private companies will be responsible for making investments in nuclear plants, acquiring land, and water, and undertaking construction activities.
- However, the rights to build, operate, and manage the nuclear stations, as well as fuel management, will remain with the **state-run Nuclear Power Corporation of India Ltd. (NPCIL)** as per legal provisions.
- Private companies are anticipated to **generate revenue from electricity sales, while NPCIL will operate the projects for a fee.**

Note:

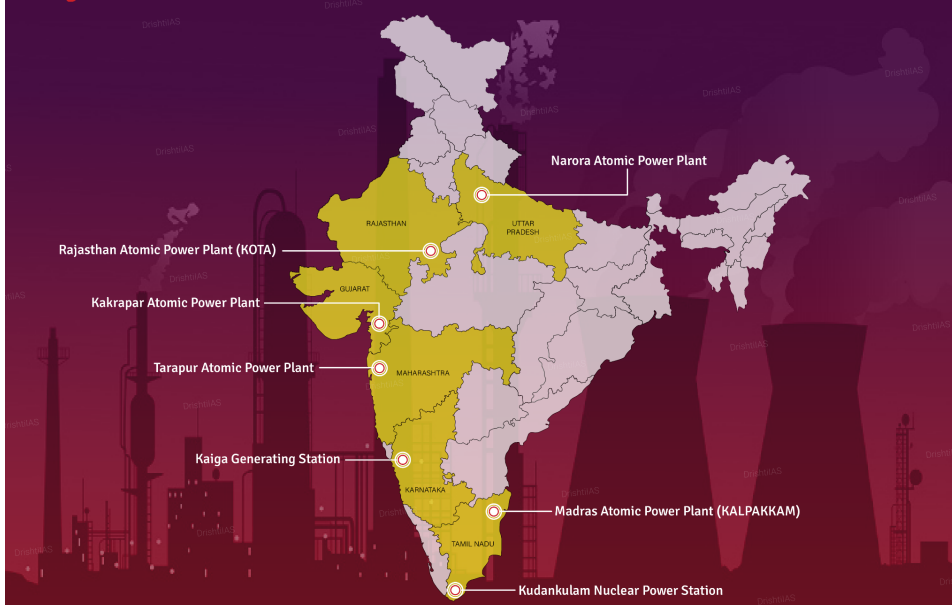
- The Consolidated [Foreign Direct Investment \(FDI\) policy](#) of India **prohibits foreign investment in the atomic energy sector.**
 - In contrast, there is **no restriction on FDI in the industry for manufacturing nuclear equipment and parts for nuclear power plants and other related facilities.**
- The subject of '**nuclear energy**' is governed by [India's Atomic Energy Act 1962](#), and the Government of India plays a pivotal role in the development, operation, and decommissioning of nuclear facilities.
- Recently, a [NITI Aayog \(National Institution for Transforming India\)](#) panel recommended to the Government of India to allow FDI into India's atomic sector.

What are the Key Highlights of India's Nuclear Power Sector?

- **Current Energy Landscape:**
 - India's total installed power capacity presently stands at 428 GW, expected to double to 810 GW by 2030.
 - Nuclear power contributes approx 3% to India's energy mix.
- **Current Nuclear Power Scenario:**
 - India operates **22 nuclear power reactors** with a total capacity of 6.8 GW, contributing approximately 3% to the nation's energy mix.
 - An additional 11 nuclear power plants are under construction, aiming to add 8,700 MW of capacity.
 - This includes a [Prototype Fast Breeder Reactor \(PFBR\)](#) and four [Pressurized Water Reactors \(PWRs\)](#) based on Russian technology.
 - The government has also sanctioned ten **indigenous Pressurized Heavy Water Reactors (PHWRs)** of 700 MW each, aiming for significant capacity expansion by 2031.

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Operational Nuclear Power Plants in India



FACTS

- Presently, India has 22 nuclear power reactors operating in 6 states, with an installed capacity of 6780 MegaWatt electric (MWe).
- Activities concerning the establishment and utilization of nuclear facilities and use of radioactive sources are carried out in India in accordance with the Atomic Energy Act, 1962.
- Atomic Energy Regulatory Board (AERB) regulates nuclear & radiation facilities and activities.
- Newest & Largest Nuclear Power Plant: Kudankulam Power Plant, Tamil Nadu.
- First & Oldest Nuclear Power Plant: Tarapur Power Plant, Maharashtra.



▪ Key Players and Regulatory Environment:

○ Key Players:

- The [Department of Atomic Energy \(DAE\)](#), the **Nuclear Power Corporation of India (NPCIL)**, and the [National Thermal Power Corporation \(NTPC\)](#) are the key organizations that play a pivotal role in the nuclear energy sector in India.
 - All three are under the control of the Union government.
 - NPCIL is the owner and operator of all nuclear power plants (except the **PFBR variants**, owned by The **Indira Gandhi Centre for Atomic Research (IGCAR), DEA**) and the primary contact for all nuclear business in India.
 - **NTPC is a major producer of electricity from coal and accounts for 70GW capacity** and is seeking to adopt nuclear reactors as part of its strategy to phase out old coal plants.

○ Regulatory Oversight:

- The [Atomic Energy Regulatory Board \(AERB\)](#) oversees **nuclear safety and regulatory processes**, including site selection, construction, operation, and decommissioning.
 - AERB's responsibilities extend to nuclear applications in various sectors.

▪ Nuclear Liability and Insurance:

- India ratified the Convention on **Supplementary Compensation for Nuclear Damage (CSC) in 2016**, establishing a global compensation regime for nuclear accidents.
- The **Civil Liability for Nuclear Damage Act (CLND), 2010**, sets liabilities for operators and mandates insurance to cover potential damages.
- The **Indian Nuclear Insurance Pool (INIP)**, backed by [General Insurance Corporation of India \(GIC-Re\)](#) and other insurers, provides USD 15 billion in coverage to protect suppliers against liability claims.

▪ Challenges:

○ Safety and Security Standards:

- India's nuclear power plants have been criticized for their **low safety and security standards**, especially in the **event of natural or man-made disasters**.

- They have also been **accused of radioactive contamination, climate change and leakage**, which affected the health of the workers, and environment.
 - For example, the **Kudankulam Nuclear Power Plant in Tamil Nadu** and the **Kaiga Nuclear Power Plant in Karnataka** faced these issues.
- **Nuclear Waste Management:**
 - India has not developed a **comprehensive and long-term plan for managing and disposing of its nuclear waste**. It also lacks adequate storage and transportation facilities for its radioactive materials.
- **Land Acquisition:**
 - Securing land for nuclear power plants poses significant hurdles, leading to delays in projects such as Kudankulam (Tamil Nadu) and Kovvada (Andhra Pradesh).
- **Lack of Public Funding:**
 - Unlike **fossil fuels and renewables**, nuclear power has not received substantial subsidies, making it less competitive in the energy market.
- **Opportunities for Expansion:**
 - India aims to increase nuclear power's share from 3% to 9-10% of its energy mix.
 - The nuclear sector offers opportunities for **foreign and private companies, especially** in non-nuclear parts of power plants and in the construction and services sector.
 - [Small Modular Reactors \(SMRs\)](#) present a promising avenue for cost-saving and reducing construction time, with the potential for technology sharing and partnerships.
 - Nuclear energy could support the production of [green hydrogen](#) and the **decarbonization** of the transportation sector, providing a clean power source for electric vehicles and hydrogen fuel cells.
 - With the phasing out of old coal plants, nuclear power will play a crucial role in meeting India's rising energy demands and achieving its clean energy goals.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. In India, why are some nuclear reactors kept under “IAEA safeguards” while others are not? (2020)

- (a) Some use uranium and others use thorium
- (b) Some use imported uranium and others use domestic supplies
- (c) Some are operated by foreign enterprises and others are operated by domestic enterprises
- (d) Some are State-owned and others are privately owned

Ans: (b)

Explanation:

- The nuclear facilities are kept under International Atomic Energy Agency (IAEA) safeguards if the source of Uranium, which is the fissile material for a nuclear reactor is from outside the territory of India or if the new reactor plants are established with foreign collaboration.
- This is to ensure that imported uranium was not diverted for military use and assure that the imported uranium is used to generate nuclear energy for civilian purposes.
- There are at present 22 operational reactors, of which 14 are under the International Atomic Energy Agency (IAEA) safeguards as these use imported fuel.
- Under safeguards agreement, the International Atomic Energy Agency (IAEA) has the right and obligation to ensure that safeguards are applied on all nuclear material in the territory, jurisdiction or control of the State for the exclusive purpose.
- **Therefore, option (b) is the correct answer**

Mains:

Q. With growing energy needs should India keep on expanding its nuclear energy programme? Discuss the facts and fears associated with nuclear energy. **(2018)**

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