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Accelerating India's Nuclear Power Expansion: Making the Regulatory Framework Facilitative and Investor-Friendly

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For the last five years, the India Energy Forum has consistently highlighted the need to bring nuclear power out of the margins of India's power sector. Through more than half a dozen webinars and national conferences, the Forum has emphasized that nuclear power is a non-fossil-fuel source of electricity generation and, from an environmental perspective, has an important role to play in India's long-term energy transition. Despite its strategic importance, nuclear power has continued to account for only about 2–2.5 per cent of India's electricity generation, with a similarly modest share in the country's total installed generation capacity. This situation calls for an urgent and substantial push to expand nuclear capacity. The need for appropriate legislation, rules and regulations to facilitate faster development of nuclear power has consequently been voiced by the India Energy Forum, as well as by several other institutions and individuals. The issue has now received attention at the highest level of the Government of India, including at the level of the Prime Minister. It was recognized that the legislative framework governing the sector, which had its origins more than six decades ago, needed to be replaced by a modern framework capable of supporting a rapid expansion of nuclear power.

Following the legislation passed in December 2025, the Department of Atomic Energy has now come out with a draft of the rules and regulations, notified on August 14, 2026, for public comments. The draft is comprehensive and addresses a wide range of issues connected with the development and expansion of nuclear power capacity. Against this background, the India Energy Forum organized a webinar and debate on the proposed framework, attended by more than 75 professionals. The discussion provided an opportunity to examine whether the provisions of the new legislation and the proposed rules and regulations are fully aligned with the objective of achieving rapid growth in nuclear power.

Learning from the Expansion of India's Power Sector

One of the fundamental issues raised during the discussion was the provision for licensing under the new legislation and whether this is consistent with the spirit and experience of the Electricity Act. It is useful to recall the historical evolution of the Indian power sector. For many years, the sector was governed by the Electricity Act, 1910 and the Electricity Supply Act, 1948. Even during the first five decades after Independence, India could not cross the 100,000 MW mark in installed generation capacity. Several states faced enormous power shortages, often in the range of 25–30 per cent. A limited amendment to the Electricity Supply Act in 1991 attempted to facilitate private-sector participation. However, this initiative did not produce the desired results during the 1990s.

The Electricity Act, 2003 represented a fundamental change in approach. Among its many facilitative provisions, one of the most important was the de-licensing of power generation. The underlying reasoning was straightforward: at a time when the country was suffering from severe power shortages, there was little justification for continuing to subject generation capacity to licensing requirements. Removing this constraint was expected to encourage investment, accelerate capacity creation and facilitate the entry of new developers. The experience of the subsequent two decades provides strong support for that approach. While India had been unable to cross even 100,000 MW of capacity during the first 50 years after Independence, its total installed generation capacity has now crossed 550,000 MW.

The lesson is particularly relevant for nuclear power. If nuclear generation is to become a meaningful part of the overall power sector, the regulatory framework should similarly seek to facilitate, rather than unnecessarily constrain, capacity development. The

present legislation does contain a licensing requirement for nuclear activities. While this provision may have to be accepted for the time being, it could perhaps be reconsidered through a future amendment. In the meantime, the rules and regulations should ensure that the licensing framework is as facilitative as possible and is designed to be investor-friendly, developer-friendly and conducive to capacity creation.

Avoiding an Excessively Complex Licensing Structure

A major concern raised during the discussion was the requirement for multiple levels of licensing for different activities, including construction, site-related activities, operations and fuel-related matters. While appropriate procedures, scrutiny and regulatory oversight are obviously necessary in the nuclear sector, the creation of multiple layers of licensing could make the development process cumbersome and time-consuming. If every stage requires a separate licence, the overall objective of accelerating nuclear capacity addition could be compromised. The rules and regulations should therefore distinguish between necessary regulatory oversight and unnecessary procedural complexity. The objective should be to maintain the highest standards of safety and regulatory discipline while ensuring that the process remains efficient and predictable.

The success of the nuclear programme will depend substantially on the response of two critical groups of stakeholders: developers and financiers. Developers will invest only after carefully assessing the various risks associated with nuclear projects, while financiers will similarly evaluate the regulatory, financial and commercial risks before committing capital. These considerations are particularly important because nuclear power involves significantly higher capital investment per megawatt than many other forms of generation. The resultant tariff may also be higher. This could create concerns for distribution companies, which will ultimately be among the principal buyers of electricity. Consequently, if the regulatory framework becomes excessively complicated or difficult to navigate, it could adversely affect the very objectives for which the new legislation and regulations are being introduced.

Making In-Principle Approval Truly Facilitative

One of the positive provisions in the draft is the concept of in-principle approval. This can potentially allow developers to undertake initial preparatory activities and move the project forward. However, the scope of in-principle approval should be clearly elaborated. It should facilitate important initial activities such as technology selection and site identification and enable developers to proceed with activities including land acquisition and environmental and forest clearances. As progress is made on these initial activities, the process should facilitate engagement with the Atomic Energy Regulatory Board on matters relating to technology, operational philosophy, safety, capacity building, operational strategy and the development of the necessary skills and manpower. The objective should be to ensure that the in-principle approval is not merely an additional procedural milestone but becomes a genuine enabling mechanism for project development.

Simplifying the Post-Approval Process

Once in-principle approval has been granted by the Department of Atomic Energy, the detailed technical and regulatory investigations should, to the extent possible, be handled through the Atomic Energy Regulatory Board. Once the regulator is satisfied with the relevant technical, safety and operational aspects, this should ideally lead to the final licence, if licensing is to remain under the regulatory framework, or by DAE if they want to keep this authority with them. There is a clear need to avoid a situation in which the developer has to obtain multiple licences from different authorities for each component of the same project. Necessary consultations and approvals from concerned agencies can certainly remain part of the process, but they should not unnecessarily translate into multiple layers of licensing. A streamlined process would significantly reduce the time and uncertainty associated with project development without compromising regulatory oversight.

The Question of State Government Approval for Land

Another important issue concerns the provision in the draft requiring state government approval relating to land.

Experience from the 1990s provides an important lesson. At that time, requirements involving Memoranda of Understanding with state governments contributed to delays and did not result in the healthy growth that had been expected from private-sector participation. The same approach should not be allowed to become an established procedural requirement for nuclear power projects. Clearly, where land is to be acquired, all applicable land acquisition procedures must be followed. However, a separate state government approval as a prerequisite for the development of the project does not appear necessary. Power projects and other industrial projects are already being developed under established legal and administrative processes. Nuclear projects should similarly be able to proceed through a clearly defined framework without introducing another layer of approval that could delay development.

A More Flexible Approach to Site Selection

Several sites have already been identified by the Nuclear Power Corporation of India Limited (NPCIL). The new subsidiary company being established by NPCIL could continue this work while also supporting developers on technology-related issues. The process of identifying suitable nuclear sites should certainly continue. However, the selection of a particular site should not necessarily become a prerequisite for even approaching the authorities for in-principle approval. A better approach would be to establish comprehensive guidelines specifying the essential characteristics and requirements of a suitable nuclear power plant site. These guidelines should be sufficiently robust to address safety and other essential requirements, but should not be so restrictive that they unnecessarily limit the availability of potential sites. The responsibility for identifying and selecting a suitable site should ultimately rest with the developer, within the framework of clearly defined regulatory requirements.

This approach is not unprecedented. A large number of power projects have already been developed in the country, and the site-selection guidelines followed by NPCIL could provide a useful framework for guiding developers. The objective should be to provide clear rules rather than require separate approvals from multiple government authorities for every stage of site selection. Excessive involvement of different government functionaries could ultimately become an impediment to the rapid expansion of nuclear power.

Preparing Projects in Advance: The Shell Company Approach

Given the considerable time that has already been lost in expanding nuclear capacity, an innovative approach could be considered whereby the Department of Atomic Energy establishes suitable shell companies or project-preparation entities. These entities could undertake the initial preparatory work, including site identification, preliminary investigations and other basic project-development activities. Once the sites are adequately prepared, they could be offered to private-sector developers, NPCIL and other public-sector companies. Such an approach could substantially reduce the time required for developers to move from conceptualization to project execution.

There is an important precedent from the period surrounding the implementation of the Electricity Act, 2003. By that time, the Ministry of Power had prepared initiatives involving approximately 100,000 MW of thermal capacity and 50,000 MW of hydro capacity. Basic requirements, including site-related preparations and pre-feasibility work, had already been undertaken. This preparatory exercise helped developers and investors come forward and take projects forward more quickly. The experience proved highly rewarding. A similar, but more refined approach could be adopted for nuclear power. Advance preparation of projects and sites could create a pipeline of viable opportunities and significantly accelerate the expansion of nuclear capacity.

Technology: A Pragmatic and Phased Approach

Technology selection is another important issue that requires careful consideration. Technologies that have been proven in India, as well as technologies that have demonstrated successful and sustained operation elsewhere in the world, should be given due consideration. Technologies with a long and successful operational record can provide a greater degree of confidence during the initial phase of expansion. The manufacturers of such proven technologies should also be identified, and their capabilities and supplies could form the basis for their assimilation into India's nuclear power programme.

For the first phase of expansion, technologies that have already been proven in India could receive preferential consideration. This would provide a higher degree of confidence as the country begins to accelerate nuclear capacity addition. At a later stage, the alternative approach currently being considered could also be developed further - namely, identifying manufacturers of nuclear power generation technologies and allowing developers to directly access such manufacturers for technology and equipment supply. Such an approach could be beneficial, but it should preferably be introduced in a phased and structured manner.

Towards a Faster and More Facilitative Nuclear Expansion

The objective of the new legislative and regulatory framework should ultimately be to create an ecosystem in which nuclear power can expand rapidly while maintaining the highest standards of safety and regulatory oversight. The experience of the broader electricity sector demonstrates that removing unnecessary licensing barriers, creating greater certainty for investors and developers, and preparing projects in advance can significantly accelerate capacity creation. The nuclear sector has its own unique characteristics and cannot simply replicate the regulatory framework applicable to conventional power generation. Nevertheless, the underlying principle remains relevant: **regulation should enable responsible development rather than inadvertently become an obstacle to it.** The draft rules and regulations therefore provide an important opportunity to establish a framework that balances safety, security and regulatory discipline with efficiency, investment confidence and timely project execution.

The issues raised in the India Energy Forum's Webinar, by way of **setting the context** by the Author, point towards a number of practical measures: making in-principle approval genuinely facilitative; reducing multiple layers of licensing; avoiding unnecessary state-level approval requirements; providing clear and flexible site-selection guidelines; undertaking advance site and project preparation through suitable government entities; and adopting a pragmatic, phased approach to proven nuclear technologies. These measures could help create the confidence required among developers, financiers and power purchasers and, in turn, contribute to a substantial acceleration of India's nuclear power programme.

The detailed presentations and addresses by eminent personalities from across the power sector, including the CMD of NTPC, the Managing Director of Adani Power, a former Power Secretary, senior executive from Tata Power, a former Director of NPCIL, and other experts covered a number of issues. The perspectives of leading experts from the nuclear sector added another important dimension to the debate. These presentations, responses and the observations of the participants will provide the basis for the **second part of this paper**, which will examine the views expressed by the eminent Panelists and nuclear-sector experts in greater detail and summarize the key conclusions emerging from the discussion.

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Dear Reader,

The global power demand is expected to grow by 3.5% in 2026 and 3.8% in 2027 strongly driven by industry, electrical vehicles, cooling appliances and data centers. Comparatively, Indian electricity demand is estimated to grow by 7% in 2026. Globally renewable generation is expected to grow by more than 8% in 2026 raising its share of global electricity generation from 33% in 2025 to 37% by 2027. Renewable generation in India's has marginally overtaken thermal and progressing towards 500 GW by 2030-31 as projected.

Globally, the Nuclear Power Generation is also rising with new Reactors coming up in India, China, USA, France etc. India has already set up a target of 100 GW by 2047. This trend of non-fossil energy sources increasing contribution to power generation will continue as we race towards net-zero emission target. Greater challenges seem to be Energy Storage for RE sources to face challenges of grid stability and over reliance on imports specially for advanced technologies and critical raw materials. Innovation is no large optional. It is key to powering India's growth.

The SHANTI (Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India) Act Is intended to enhance participation of private sector in setting up nuclear power plants in the country to strengthen the indigenous capabilities and capacity so far done by the Govt sector only. Deptt of Atomic Energy has now framed Rules and Regulations for this and put in public domain for suggestions. IEF organized a highly useful webinar on 31st August 2026 in which distinguished top management executives of NTPC, ADANI Power, TATA Power, NPCIL along with former Secretary (Power) expressed their expert's views. The participant also included many senior executives of the power industry. Detailed Report and Recommendations will be generated by IEF and shared with DAE.

It is also reported that NPCIL is planning a subsidiary company for consultancy helping the new entrants in establishing them in the Nuclear Power field. All these developments auger well for Nuclear Power emerging as base load power to meet growing electricity demand.

IEF will organize following physical conference during balance period of 2026-27:

- Nuclear Energy: Mid November 2026
- Oil & Gas & Petroleum: End November 2026
- Power including Transmission: 9th December 2026
- Energy Technology and Research: 17th January 2027
- Renewable Energy: Mid-February 2027

We solicit informative articles on any field of energy for publication in the monthly issue of TOTAL Energy e-publication.

S M Mahajan

India's Energy Journey: Expanding Capacity, Strengthening Security

India's Energy Landscape
India's energy landscape is evolving to meet rising demand while strengthening energy security and supporting a cleaner future. The transformation spans renewable energy, nuclear power, petroleum, natural gas, coal and emerging technologies.

Policy support, infrastructure development, domestic production, manufacturing expansion and wider energy access are shaping this transformation. India is simultaneously expanding non-fossil energy capacity, strengthening domestic energy resources and developing new technologies for the future.

Numbers at a Glance:
- Total installed power capacity: Around 552 GW in July 2026, up from 249 GW in 2014.
- Non-fossil capacity: 300.50 GW as of 31 July 2026, accounting for over 54% of total installed capacity.
- India ranks third globally in renewable energy installed capacity.

Powering Energy Security with Coal

Coal continues to play a major role in India's energy security and electricity supply. It meets nearly 55 per cent of the country's primary energy needs and supports over 70 per cent of its electricity generation. India has about 4,00,715 million tonnes (MT) of coal reserves and is the world's second-largest coal producer and consumer.

- India produced 1,047.52 MT of coal in FY2024-25 and 1,040.08 MT in FY2025-26, compared with 609.18 MT in FY2014-15.

- Captive and commercial mining: Production from captive and commercial mines reached 210.46 MT in FY2025-26, registering 10.22% growth over the previous year.

- Reducing import dependence: Coal imports by thermal power plants fell to 45.4 MT in FY2025-26, from 62.5 MT in FY2024-25, a decline of about 27.4%.

Promotion of Surface Coal/Lignite Gasification Projects (2026)
The Government approved a ₹37,500 crore scheme in May 2026 to promote surface coal/lignite gasification.

- Expected to utilise approximately **75 MTPA of coal**, contributing to the national target of **100 MT of coal/lignite gasification by 2030**.
- Expected to mobilise **₹2.5–3 lakh crore** in investment.
- Projected to generate around **50,000 direct and indirect jobs** across 25 projects.

Solar Power: Scaling Up, Reaching More People
India's installed solar capacity has reached 164.59 GW (as of 31 July 2026), rising from 2.8 GW in 2014. Solar is now the largest component of India's renewable energy capacity. India became the world's second-largest solar growth market in 2025, adding more than 37 GW of solar capacity, compared with 34 GW added by the United States.

PM-Surya Ghar: Muft Bijli Yojana
- Launched with a total outlay of ₹75,021 crore for 1 crore households in February 2024.
- 51.58 lakh households are now benefiting from rooftop solar installations across the country (As of 12.08.2026).
- Approximately ₹28,024 crore in subsidy has been transferred to the beneficiaries.
- Nearly 19 lakh households are now receiving zero electricity bills.
- Cumulatively, 14.8 GW of rooftop solar capacity has been commissioned under the scheme so far.

Pradhan Mantri Surya Sarovar Yojana
The government approved the Pradhan Mantri Surya Sarovar Yojana (PM-SSY) on 31 July 2026 with an

outlay of ₹5,070 crore. It adds a new dimension to India's solar expansion with the development of Floating Solar Photovoltaic Projects with Energy Storage Systems.

Target: 5,000 MW of Floating Solar PV projects.
Co-located storage with a minimum two-hour duration, equivalent to 10,000 MWh.
Projects to be sanctioned from FY 2026–27 to FY 2030–31.

Wind Energy
Wind energy continues to be an important pillar of India's renewable energy expansion. India ranks fourth globally in installed wind power capacity. The sector is also seeing stronger annual additions and growing domestic manufacturing

- Installed capacity: 58.14 GW as of 31 July 2026.
- India added 6.05 GW in FY 2025–26, its highest-ever annual wind capacity addition and 46% higher than FY 2024–25.
- Around 28 GW of additional wind capacity is under implementation.
- Wind turbine manufacturing capacity reached about 24 GW (March 2026), up from 10 GW in 2014. The sector has achieved 70–80% indigenisation across key components.
- The Union Cabinet approved a ₹7,453 crore VGF scheme on 19 June 2024 for 1 GW of offshore wind projects.

Bio-Energy
Bio-power capacity stands at 11.75 GW as of 31 July 2026. The CBG ecosystem has also expanded, with 1,929 CBG/Bio-CNG plants registered as of 13 August 2026. Of these, 217 have been commissioned and 357 are under construction.

- Biomass cogeneration: 9821.32 MW of bagasse-based and 1048.84 MW of non-bagasse capacity as of 31 July 2026.
- Waste-to-Energy: As of 31 July 2026, grid-connected waste-to-energy capacity stood at 324.24 MW. Off-grid plants contributed another 554.16 MW.
- National Bioenergy Programme: The programme supports Waste-to-Energy, Biomass and Biogas projects through financial assistance. Phase-I covered FY 2021–22 to FY 2025–26, with an outlay of ₹858 crore.

GOBARdhan: Turning Waste into Energy Growth

- Galvanizing Organic Bio-Agro Resources Dhan (GOBARdhan)– National Circular Bioenergy Scheme: Approved by the government on 6 August 2026, with an outlay of ₹23,731 crore for FY 2026–27 to FY 2035–36.
- The scheme aims to nearly ten-fold domestic CBG production and create a national circular bioeconomy. Lobal Solar Cooperation

Hydro
Hydropower remains an important source of renewable electricity, providing reliable and flexible power generation. It also supports grid stability as solar and wind capacity expand. Cumulative capacity of hydro power is 57.24 GW (as of 31 July 2026), including large and small hydro.

Small Hydro Power Development Scheme
- The government has approved the **Small Hydro Power (SHP) Development Scheme** in March 2026 for **FY 2026–27 to FY 2030–31**, with an outlay of **₹2,584.60 crore**.
- The scheme aims to add approximately **1,500 MW** of small hydro capacity through projects of **1–25 MW**. It particularly supports projects in **hilly and North-Eastern regions**.

Green Hydrogen
Green hydrogen has emerged as a clean fuel option for hard-to-abate sectors. It can also support energy security and industrial growth.

National Green Hydrogen Mission:
The government launched **the National Green Hydrogen Mission (NGHM)** in 2023 as an umbrella programme to establish a Green Hydrogen ecosystem and catalyse a systemic response to the opportunities and challenges in this sector.

- Approved in January 2023 with an outlay of **₹19,744 crore**, targeting **5 MMT (Million Metric Tonne)** of green hydrogen production by 2030.
- **Production capacity:** Around **8,000 tonnes per annum** of green hydrogen production capacity had been commissioned by **February 2026**.

- **Transport:** In July 2026, the Government launched **12 pilot projects** under the Mission for **70 hydrogen-powered vehicles across 21 routes**.
- India's first indigenous **hydrogen fuel cell-powered train** began operations on the Jind–Sonipat section in July 2026.

Nuclear Energy

India's nuclear energy sector has witnessed significant expansion and modernisation over the past decade. With a focus on clean energy, indigenous technology, and performance excellence, the country has scaled up both its operational capacity and future potential.

- Installed capacity: 8.78 GW of nuclear power capacity as of 31 July 2026.
- Nuclear Energy Mission: India aims to increase nuclear power capacity to 100 GW by 2047.
- Planned Expansion: With the indigenous 700 MW and 1000 MW reactors being developed through international cooperation, the capacity is projected to rise to 22.38 GW by 2031–32.
- Small Modular Reactors: The Nuclear Energy Mission provides ₹20,000 crore for the design, development and deployment of Small Modular Reactors, with a target of at least five indigenous SMRs by 2033.
- Fast Breeder Reactor: The 500 MWe Prototype Fast Breeder Reactor at Kalpakkam achieved first criticality on 6 April 2026, marking an important milestone in India's three-stage nuclear power programme.

SHANTI Act, 2025

The Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Act, 2025 enables private-sector participation for setting up a nuclear facility, or to carry out activities for the production, use and disposal of nuclear energy under a license.

Civil liability: The maximum liability for each nuclear incident is the rupee equivalent of 300 million Special Drawing Rights (SDR) or an amount specified by the Central Government.

The Act gives the Atomic Energy Regulatory Board (AERB) statutory status, strengthening its regulatory and safety functions.

Geo Thermal

Geothermal energy offers a reliable renewable source that can complement variable sources such as solar and wind. Geothermal energy uses heat stored within the Earth to generate electricity or provide direct heat.

National Policy on Geothermal Energy (notified on 15 September 2025)

The policy provides a framework for the exploration, development and utilisation of geothermal resources. The Geological Survey of India has estimated India's geothermal potential at around 10,600 MW, based on exploration across 381 hot springs, with 42 geothermal manifestations identified as promising areas.

The policy promotes technology partnerships, knowledge transfers and joint R&D. India has cooperation mechanisms with Australia, Iceland, Saudi Arabia and the United States for geothermal energy.

Five projects sanctioned during July–August 2025, including a pilot production plant, resource assessment projects and a solar–geothermal hybrid plant. These aim to establish the techno-economic viability of geothermal applications.

India's Evolving Fuel Landscape

Clean cooking has moved from being an access challenge to a widely available household energy option. The expansion of LPG connections and rising consumption reflect its growing reach across Indian households.

- National LPG coverage increased from 55.9% in 2014 to 107.2% in 2026.
- LPG consumers increased from 14.51 crore to 33.18 crore from 2014 to 2026.
- Under Pradhan Mantri Ujjwala Yojana, refill delivery reached around 49.21 crore cylinders in FY2025–26.
- 25 lakh additional LPG connections approved under PMUY in FY2025–26, of which 24.84 lakh

connections have been released as on 5 August 2026.
- India is the world's fourth largest crude refiner, with an installed capacity of 258.1 million tonnes per annum across 22 operational refineries.

'Samudra Manthan' – National Offshore Exploration Scheme
Approved on 31 July 2026 with an outlay of ₹84,084 crore to boost offshore oil and gas exploration and strengthen energy security, covering seismic surveys, deepwater exploratory drilling, and offshore production/evacuation infrastructure.

Looking Ahead: Building India's Energy Future
India is building an energy system that combines security, sustainability and innovation. Expanding non-fossil capacity is being supported by stronger domestic resources, infrastructure, manufacturing and emerging technologies.

As energy demand grows, India's diversified energy mix will support reliable power, greater energy security and a cleaner future. Continued policy support and technological progress will help build an energy system that is resilient, self-reliant and future-ready.

Centre aims to cut foreign reliance in key power systems by 2029

The government plans to develop home grown control systems and equipment for critical power infrastructure, including the national grid, as the government seeks to end reliance on foreign technology and strengthen energy security by 2029.

The Central Electricity Authority (CEA) has laid out a roadmap to localise the production of systems that enable real-time monitoring and supervisory control of the electricity network. The plan covers both the software and hardware used in Supervisory Control and Data Acquisition, or SCADA, systems.

In a report published recently, the power ministry body proposed a phased trajectory for developing indigenous SCADA capabilities, with the bulk of the identified software and hardware modules targeted for development by 2028-29. The broader objective is to eliminate import dependence, with the Ministry of Power having decided that SCADA systems should not be imported beyond 2030.

SCADA systems collect and transmit critical data from power plants and substations to control centres, giving grid operators real-time visibility over equipment and enabling supervisory control of the electricity network. They form the front end for Energy Management Systems used in generation and transmission, as well as Distribution Management Systems.

The initiative is part of New Delhi's broader self-reliance push, but the report also flags strategic concerns around dependence on foreign original equipment manufacturers.

National grid at the centre of the push The CEA described SCADA systems as the "central nervous system of the National Power Grid", enabling the "One Nation, One Grid, One Frequency" framework through real-time monitoring and control.

It said dependence on foreign OEMs and proprietary technologies has created interoperability constraints, delayed customisation and system upgrades, and increased reliance on external support services.

"In an increasingly complex geo-political landscape, such dependence poses potential risks to national energy security," the report said.

"Reliance on foreign technologies for critical infrastructure may expose utilities to supply chain disruptions, technology access constraints, delayed availability of upgrades and support, and limited transparency associated with proprietary or 'black box' systems," it added.

The current systems also suffer from vendor lock-in. The CEA said proprietary database architectures and engineering tools can make modifications dependent on OEM intervention, while differences in implementation can limit interoperability and complicate the integration of thirdparty applications.

Local content remains below 20%
The power ministry had earlier prescribed a minimum local content requirement of 50% for SCADA systems. However, the CEA's assessment found that actual local content in grid SCADA remains below 20%, with exemptions having been granted in the past.

The report noted that software accounts for about 25% of the cost of a SCADA system, while hardware accounts for the remaining 75%, making the localisation of equipment a more gradual and challenging process. The committee's mandate, however, goes beyond meeting minimum local-content thresholds. It has recommended a phased approach aimed at eventually eliminating import dependence and ensuring that SCADA systems are available from Indian entities.

Software and hardware roadmap
The CEA finalised a timeline covering 38 software modules and 25 hardware components identified by Grid India.

The software roadmap includes core SCADA applications, communication systems, historian and data storage platforms, Energy Management System functions such as state estimation and contingency analysis, automatic generation control, cybersecurity applications, load forecasting and network management systems.

The committee found that 36 of the 38 software modules could be developed in the short term, although real-time testing and validation through digital twins and parallel operation at State Load Despatch Centres would remain key challenges.

The report also said 16 of the 25 identified hardware components were expected to be ready within two years. These include equipment such as servers, routers, switches, storage systems, cybersecurity appliances, workstations and other control-centre infrastructure. For telecom and general IT networking equipment, the power sector will follow the indigenisation trajectory laid down by the Ministry of Electronics and Information Technology and the Department of Telecommunications under their respective Make in India frameworks.

Testing, pilots and funding support
Besides manufacturing and development, the roadmap calls for a dedicated ecosystem to test and certify indigenous SCADA systems.

The committee recommended establishing a testing platform within two years, with government funding, to simulate operating conditions and validate cybersecurity requirements. It also called for pilot projects under State, regional and national load despatch centres to test indigenous software and hardware in real-world conditions alongside existing systems.

SLDC Odisha has volunteered to provide a testing environment for pilot implementation. The report said institutions including STQC and CPRI have capabilities in cybersecurity assessment, certification and equipment testing, but a more comprehensive platform would be needed for end-to-end validation of indigenous SCADA modules. Government financial support will also be necessary, the committee said, with the Power System Development Fund, or PSDF, identified as a possible source.

National SCADA Mission proposed
To drive implementation, the CEA has proposed formalising an institutional mechanism, either through a National SCADA Mission or a specialised working group under the Ministry of Power and the CEA.

For development and integration, the report suggested two possible models. Under one, a government PSU or institution with SCADA experience, such as CDAC, could be nominated. The alternative is a collaboration or consortium model, under which Power Grid or Grid India could invite expressions of interest from capable entities.

The final choice of the institutional and development models has been left to the power ministry. The report makes clear, however, that meeting the proposed timeline will depend on adequate funding, a testing ecosystem and coordinated implementation support.

CEA Proposes New 2026 Grid Connectivity Technical Standards for Power Sector Entities

The Central Electricity Authority (CEA) has issued the Draft Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2026, proposing a comprehensive update to India's technical framework for connecting power sector entities to the electricity grid. The draft was issued on July 31, 2026, under Section 177 of the Electricity Act, 2003. Stakeholders and members of the public can submit comments and objections until September 2, 2026.

The proposed regulations seek to replace the existing 2007 connectivity standards and subsequent amendments. They will apply to entities connecting to the grid at voltage levels of 33 kV and above, covering generating stations, energy storage systems, bulk consumers, distribution licensees, transmission entities, HVDC systems and FACTS devices.

Under the draft framework, applicants and grid users will be responsible for ensuring that their facilities are properly planned, designed, protected and operated without affecting grid security, reliability or power quality. Entities will have to register on the CEA e-GEN portal and submit required technical documents, including single-line diagrams. They will also need to comply with applicable cybersecurity requirements issued by CERT-In, NSCS and NCIIPC.

The draft introduces detailed technical requirements for synchronous and asynchronous generators and Energy Storage Systems. Generating units must maintain required active and reactive power capabilities across specified voltage and frequency ranges. They will also need to meet Low Voltage Ride Through, High Voltage Ride Through, and Multiple Fault Ride Through requirements to remain connected during grid disturbances.

Asynchronous generating units will be required to provide fast reactive current support within 30 milliseconds. The draft also addresses emerging technologies, with standalone Battery Energy Storage Systems of 50 MW and above required to provide Black Start capability. Grid Forming controls are also covered to strengthen rapid frequency and voltage support.

For HVDC and FACTS systems, the proposed standards specify requirements related to reactive power, active power control, power reversal and damping of sub-synchronous torsional interactions. Bulk consumers using inverter-based technologies will also face requirements covering power factor, fault ride-through and power quality.

The draft proposes a voltage unbalance limit of 3% at 33 kV and above, harmonic distortion limits aligned with IEEE 519, repetitive step voltage fluctuations capped at 1.5%, and DC current injection below 0.5%.

The connectivity process will follow stages from Stage A to Stage H, covering application, technical model submissions, connectivity agreements, First Time Energisation and trial operations before the Commercial Operation Date. Compliance will include annual power quality measurements and dynamic model validation every five years. Non-compliance may result in grid disconnection or penalties under Section 146 of the Electricity Act.

RDSS Sanctions ₹1.53 Lakh Crore for Power Loss Reduction

The government has sanctioned ₹1.53 lakh crore under the Revamped Distribution Sector Scheme (RDSS) for power distribution loss reduction and ₹1.31 lakh crore for smart metering. The scheme covers 19.79 crore consumers, 2.05 lakh feeders and 52.53 lakh distribution transformers, alongside digitalisation and distribution modernisation. This information was given by Minister of State for Power, Shripad Naik in Rajya Sabha recently.

Key Highlights

- ₹1.53 lakh crore sanctioned for RDSS loss reduction infrastructure.
- ₹1.31 lakh crore sanctioned for smart metering works.
- Smart metering covers 19.79 crore consumers and 2.05 lakh feeders.
- ₹47,124 crore released under RDSS since FY2023.

RDSS Drives Power Distribution Modernisation
The government has sanctioned ₹1.53 lakh crore under the Revamped Distribution Sector Scheme (RDSS) for loss reduction infrastructure, while another ₹1.31 lakh crore has been sanctioned for smart metering works. Minister of State for Power Shripad Naik provided the information in a written reply in the Rajya Sabha.

The financial assistance covers smart meters for 19.79 crore consumers, 2.05 lakh feeders and 52.53 lakh Distribution Transformers (DTs). The initiative is aimed at strengthening distribution infrastructure, reducing losses and accelerating digital transformation across electricity distribution utilities.

Smart Metering and Digitalisation
Under RDSS, SCADA/DMS works for 394 towns have been sanctioned at a cost of ₹2,627 crore. IT/OT projects covering enterprise resource planning, unified billing, GIS and real-time data acquisition systems have received ₹3,999 crore. Smart distribution projects worth ₹8,608 crore have also been sanctioned for seven cities, covering SCADA, GIS substations, transformer health management, undergrounding of HT/LT lines and system modernisation.

The government has released ₹47,124 crore under RDSS since FY2023, including ₹2,733 crore for smart metering. The India Energy Stack (IES) has also been initiated to support digital data exchange and wider digitalisation across the power sector. For capacity building, ₹100.9 crore was allocated under RDSS, with ₹23.36 crore utilised up to July 2026 and 14,853 DISCOM personnel trained.

RDSS is providing substantial financial support for smart metering, loss reduction and digital power distribution, with the broader objective of improving the efficiency and reliability of India's electricity distribution system.

India incurs $22.5 billion additional fossil fuel import costs in March-August 2026; CREA

India incurred $22.5 billion in additional fossil fuel import costs between March and August 2026, ranking second globally behind China, as geopolitical disruptions following the Hormuz crisis triggered the sharpest sustained energy shock since the 1990 Gulf War, according to a report by the Centre for Research on Energy and Clean Air (CREA) released on Wednesday.

It said that the six-month disruption to seaborne energy trade, sparked by attacks on Iran in late February 2026, added over $330 billion to global fossil fuel import bills, requiring importing nations to pay an extra $55 billion every month.

China topped the global expenditure table with an additional cost of $35.5 billion, followed by India at $22.5 billion and the United States at $16.5 billion. European and Asian economies also faced substantial increases, with the Netherlands spending an additional $13.5 billion, South Korea $13.2 billion, Italy $12.7 billion, and Japan $12.0 billion.

Crude oil accounted for $164 billion of the worldwide surcharge at an average premium of 35 per cent over pre-crisis market expectations. However, refined fuels used directly across key economic sectors recorded even steeper price escalations.

Global expenditures for diesel and gasoil jumped 59 per cent, adding $74 billion to import bills, while gasoline costs rose 43 per cent to add $36 billion.

Liquefied natural gas import bills expanded by $38 billion, surging 60 per cent in the Atlantic basin and 75 per cent in the Pacific basin, while jet fuel rose 59 per cent, adding $20 billion.

The spike in diesel prices has exerted widespread inflationary pressure across manufacturing, freight transport, and agriculture, with 134 of the 170 evaluated countries paying more than pre-war futures had indicated.

India and Bhutan Reaffirm Commitment to Strengthen Bilateral Power Sector Cooperation

The meeting reaffirmed the special and enduring partnership between India and Bhutan in the power sector, which has been a cornerstone of the close bilateral relationship between the two countries. The Ministers reviewed the progress of ongoing

cooperation and discussed avenues for further strengthening collaboration across the energy sector.

The two Ministers held wide-ranging discussions on hydropower development, cross-border electricity trade, transmission connectivity, renewable energy, institutional cooperation and capacity building. They also reviewed the progress made under the bilateral institutional mechanisms established to facilitate regular engagement and enhance cooperation in the power sector. Among the key hydropower projects discussed were Punatsangchhu-I, Punatsangchhu-II, Sankosh and Chukha.

Recognizing the importance of energy cooperation in promoting sustainable development and regional energy security, both sides reiterated their commitment to further deepen collaboration through continued dialogue, close coordination and timely implementation of mutually beneficial initiatives.
Shri Manohar Lal reiterated India's steadfast commitment to supporting the long-standing India-Bhutan partnership in the power sector. H.E. Lyonpo Gem Tshering appreciated India's continued support and conveyed Bhutan's commitment to further expanding the energy partnership.

The meeting concluded on a positive note, with both Ministers expressing satisfaction over the progress achieved in bilateral energy cooperation and reaffirming their shared resolve to further strengthen the India–Bhutan partnership for the benefit of both countries.

India, Sri Lanka Discuss Deepening Cooperation in Power Sector

India and Sri Lanka today reviewed bilateral cooperation in the power sector at a meeting in New Delhi. The Indian delegation was led by Union Minister of Power and Housing & Urban Affairs, Shri Manohar Lal, while the Sri Lankan delegation was led by Shri Anura Karunathilake, Minister of Ports and Civil Aviation and Minister of Energy of Sri Lanka.

The Ministers reviewed the progress of ongoing bilateral initiatives, including the proposed India–Sri Lanka HVDC interconnection and the Sampur Solar Power Project. They also discussed opportunities to deepen cooperation in cross-border electricity trade, renewable energy, transmission infrastructure, and capacity building, with a view to enhancing energy security and supporting the clean energy transition in the region. The Indian side also shared its experience in transmission system development through the Tariff-Based Competitive Bidding (TBCB) framework as a Public-Private Partnership (PPP) model.

Both sides reviewed progress under existing bilateral mechanisms and reaffirmed their commitment to further strengthen cooperation in the power sector for sustainable development and regional energy security.

Shri Manohar Lal reiterated India's commitment to the long-standing India-Sri Lanka energy partnership. Hon. Anura Karunathilake appreciated India's continued support and conveyed Sri Lanka's commitment to further expand bilateral energy cooperation.

The meeting was attended by Shri Pankaj Agarwal, Secretary, Ministry of Power, and senior officials from the Government of India. The Sri Lankan delegation included H.E. Mahishini Colonne, High Commissioner of Sri Lanka to India, and other senior officials.

Nepal may import electricity from India

In a possible reversal of the usual power flow between the two neighbours, India may have to export electricity to Nepal during the season when it typically imports hydropower from the land-locked country to meet high domestic demand. The move may be needed to bridge the power shortage in Nepal caused by damage to hydropower projects in recent flash floods.

India typically imports hydropower from Nepal during summer and exports electricity in the dry winter to the Himalayan nation, when rivers freeze and generation is impacted. Hydropower accounts for more than 90 per cent of Nepal’s roughly 4,300MW generation capacity. While power ministry did not respond to queries, a senior official said India could look into Nepal’s request, if made, as the current domestic power demand is between 245-250GW, much lower than its capacity to meet a peak demand of 280GW.

India's energy demand expected to grow 2.5 times by 2047: Hardeep Puri

Petroleum and Natural Gas Minister Hardeep Singh Puri today said that country is not merely a participant in the global energy landscape but is increasingly shaping it as the world's third-largest consumer of energy and oil. The Minister said that India is the third-largest refiner and fourth-largest LNG importer. He said this while interacting with senior officers of the Indian Foreign Service.

In a social media post, Mr Puri said that the country's energy demand is expected to grow 2.5 times by 2047, accounting for around 25 percent of incremental global demand. The Minister underlined that transformative reforms have strengthened domestic capabilities, diversified energy sources, deepened strategic partnerships and accelerated country's transition towards cleaner energy over the past decade under the leadership of Prime Minister Narendra Modi.

Govt plans to start recovery 7 years after deepwater explorers begin production

The government plans to start recovering its financial support for deepwater exploration seven years after explorers begin production or only after they recoup half of the development cost, under the Samudra Manthan mission, said people familiar with the matter.

The Cabinet recently approved a ₹84,000-crore scheme to support deepwater exploration through 2030- 31, with about ₹43,000 crore earmarked for drilling 60 deepwater and ultra-deepwater wells. The scheme provides financial support of up to 50 per cent of drilling costs, or ₹675 crore per well, whichever is lower.

If the scheme-supported drilling results in a commercially viable discovery, the government plans to recover its investment only after the explorer has made substantial recovery of its own funding. The oil ministry has proposed recovering the government's investment after seven years of a field starting production or only after the explorer recovers half of the development cost, the people said.

The ministry recently held consultations with industry on operationalising the scheme and shared its plans for investment recovery. Some industry members are learnt to have suggested that the recovery be made after five years of starting production. They didn't favour linking recovery to the point at which half of the development costs have been recovered, as this could become contentious later, the people said.

Some industry executives said the ₹10,000 crore allocation for shared production and evacuation facilities in some basins may also support bringing smaller discoveries into production.

Under the scheme, ₹28,500 crore has been earmarked for offshore data acquisition, including ₹12,500 crore for 3D seismic data. The Centre will likely appoint its own agencies for these data acquisitions, and the collected data will form part of the National Data Repository (NDR), which can then be accessed by all explorers.

Through the scheme, the government is seeking to intervene at key points across the value chain-from data acquisition and drilling support to the creation of common infrastructure. The broader aim is to reduce risks that have discouraged explorers from venturing into deepwater opportunities and attract global oil majors in India's upstream industry and reverse years of falling oil and gas output.

India's Energy Security Push Goes Beyond Oil Reserves as Government Expands Oil and Gas Plans

India is widening its energy security strategy beyond emergency measures, with policy changes spanning strategic oil reserves, domestic gas production, exploration and pipeline infrastructure.

The approach could increase capital spending by state-run oil companies, particularly ONGC, while supporting India's push to raise domestic production and reduce import dependence.

The government is also examining a third strategic petroleum reserve, alongside the existing 45-day oil

stock. Citi said India's cumulative LPG under-recoveries had crossed Rs590 billion as of July 2026, making inventory policy a key monitor for oil marketing companies.

Policy Push Extends Across Oil and Gas
ONGC has been directed to develop a 1.75 million tonne strategic oil reserve, with an estimated cost of Rs150 billion, Citi said. The government has also expanded deepwater exploration support and approved the Samudra Manthan scheme, which provides incentives for exploration and production.

In natural gas, the government has set targets for new LNG capacity, approved coal gasification incentives and introduced measures to accelerate city gas projects.

Citi said the policy package now goes beyond crisis response, describing it as a "multi-pronged energy security agenda" spanning strategic oil reserves, import substitution, domestic production, gas adoption and upstream exploration.

The brokerage said ONGC could see higher incremental capital deployment, while IOC, BPCL and GAIL could benefit from gas infrastructure and pipeline expansion.

Centre Reviews Progress on Samudra Manthan Offshore Exploration Scheme Worth ₹84,084 Crore

A high-level meeting was held with senior officials of the Ministry of Petroleum and Natural Gas and leaders of energy PSUs to review the progress of key decisions taken in recent brainstorming sessions aimed at strengthening India’s energy sector.

The meeting reviewed the action taken on decisions from the 11th Brainstorming Session held in Gurugram and the 12th Brainstorming Session held in Duliajan, Assam.

Focus on Samudra Manthan Scheme
A major point of discussion was the implementation of Samudra Manthan, the National Offshore Exploration Scheme, which has an outlay of ₹84,084 crore through FY 2030-31. The scheme aims to harness India’s offshore energy potential.

A year-wise roadmap is being finalised to accelerate drilling, seismic surveys and rig deployment across key basins, including:

- KG Basin
- Mahanadi Basin
- Andaman Basin
- Cauvery Basin

These activities will be driven by energy Maharatna companies ONGC Limited and Oil India Limited.

To address the shortage of drillship capacity, an ONGC-led joint venture is being set up. The JV will focus on shared investment and long-term chartering of drillships, removing a key infrastructure bottleneck in offshore exploration.

Other Key Updates
The Duliajan Feeder Line and the National Gas Grid link of Numaligarh Refinery Limited are helping unlock stranded gas reserves in the Northeast.

Work is also underway on feedstock mapping and cooperative clusters to strengthen Compressed Biogas (CBG) aggregation and improve market access.

The discussions reaffirmed the government’s focus on enhancing domestic energy production and reducing import dependence through coordinated efforts of the Ministry and energy PSUs.

Top 5 city gas distributors drive over half of CBG sales

Five of India's 33 city gas distributors accounted for 55 per cent of national compressed biogas (CBG) sales in 2025-26, with Torrent Gas and BPCL leading efforts to blend CBG with natural gas supplied to vehicles and homes.

The overall CBG blending ratio in compressed natural gas (CNG) and domestic piped natural gas (PNG) reached 0.92per cent in 2025-26, nearly meeting the government's 1per cent mandate, according to data published by the Petroleum and Natural Gas Regulatory Board (PNGRB).

In 2025-26, total CNG and domestic PNG sales stood at 12,033 million metric standard cubic meters (MMSCM), of which CBG sales were 111.5 MMSCM.

The government mandate for CBG blending began last fiscal year and will rise to 3per cent in the current year, 4per cent in 2027-28 and 5per cent in 2028-29. The government introduced the CBG mandate for city gas distributors to make use of local energy resources and help cut dependence on imported liquefied natural gas, which accounts for around 50per cent of India's needs.

Torrent Gas, Indraprastha Gas, BPCL, Gujarat Gas and Gail Gas were the top five sellers of CBG. Torrent alone sold 21.4 per cent of the total CBG sold by city gas distributors.

BPCL clocked the highest CBG blending ratio, at 4.15 per cent, in 2025-26 among 11 city gas distributors that sell more than 100 MMSCM of CNG and domestic PNG. AGP City Gas was second, with a blending ratio of 3.45 per cent, and Torrent Gas was third, with 3.41per cent blending. HPCL, Avantika, Gujarat Gas, GAIL Gas, GAIL (India) and Vadodara Gas all had blending ratios above 1per cent.

Indraprastha Gas, Adani Total, MGL, MNGL, IRM Energy and Bhagyanagar Gas had blending ratios of less than 1per cent.

India currently has 207 functional CBG plants. The government has been encouraging the setting up of more such plants to boost output. The Cabinet last week approved GOBARdhan, the National Circular Bioenergy Scheme, with a total outlay of ₹23,731 crore. The scheme aims to provide a strong framework to boost India's CBG programme through assured demand, remunerative and stable pricing, capital assistance, pipeline infrastructure, credit support and technology development.

Revised CBG pricing to support producers, consumer impact to remain negligible: Petroleum Ministry

The revised pricing framework for Compressed Biogas (CBG) under the GOBARdhan Scheme is aimed at providing a stable price to producers while keeping the impact on CNG and household PNG consumers negligible, the Ministry of Petroleum and Natural Gas said recently.

Ministry was rejecting a newspaper report which suggested that the revised price of Compressed Biogas (CBG) under the GOBARdhan Scheme could place a significant additional burden on CNG and household PNG consumers.

The ministry said the higher procurement price for CBG would not translate into a similar increase for consumers as the government is providing affordability support and the cost is being spread across a substantially larger domestic gas pool.

Under the existing system, the price paid to CBG producers is linked to 85 per cent of the retail selling price of CNG and currently works out to around Rs 1,478 per one million British thermal units (MMBtu), the ministry said.

Under the revised GOBARdhan framework, the CBG price has been fixed at Rs 2,110 per MMBtu, an increase of about 43 per cent. However, the ministry clarified that this is the procurement price paid to producers and is not the price directly paid by CNG or household PNG consumers.

The government will provide affordability support of Rs 10 per kg of CBG, equivalent to around Rs 215 per MMBtu for CBG with 95 per cent methane content. After accounting for this support, the effective CBG cost to be recovered through gas consumers would be around Rs 1,895 per MMBtu, or about 28 per cent higher than the prevailing price, it said.

The ministry said the full revised price would therefore not be recovered from consumers. Further, CBG is not sold to city gas distribution entities at its procurement price, but is pooled with other domestically produced natural gas.

Under the new framework, the net cost of CBG will be spread across a domestic gas base 2.5 to 3 times larger than the earlier base. Previously, the cost was spread only across the limited quantity of administered price mechanism (APM) gas allocated to the compressed natural gas (CNG) transport and domestic piped natural gas (PNG) segments.

"CBG producers receive a stable and viable price that enables plants to operate sustainably, while

Government-funded affordability support and a substantially wider gas pool protect consumers from any material price impact," the ministry said.

The ministry said the revised framework has been designed to balance the viability of CBG plants with consumer affordability, with the wider gas pool expected to ensure that the impact on individual gas consumers remains negligible.

ONGC to enter oil trading, build strategic reserves as upstream remains core

ONGC plans to enter crude and petroleum-product trading and build a new strategic petroleum reserve as it seeks to strengthen supply security and extract more value across its energy portfolio, while continuing to make upstream exploration its central focus. ONGC's new trading unit is expected to begin operations "end of this year", Chairman and CEO Arun Kumar Singh told reporters here. The will initially handle the group's own crude and product requirements, while also pursuing third-party business.

The unit, which ONGC is considering locating in Dubai or Singapore, could create opportunities worth about USD 1 billion a year through better crude sourcing, freight management and risk management, Singh said. "We are very close to it (setting up trading desk). Already 95 per cent work is done. We are waiting for one or two boxes to be ticked," he said. A partner and location of the desk is yet to be decided, he said. Hindustan Petroleum Corp Ltd (HPCL), Mangalore Refinery and Petrochemicals Ltd (MRPL), and an international trading partner that ONGC is currently selecting are expected to have stakes in the trading venture.

The unit would also coordinate with ONGC Videsh Ltd, the group's overseas investment arm, and ONGC Petro Additions Ltd. The move would give ONGC and its group companies a single commercial interface in global oil markets, replacing a fragmented model in which individual businesses source, sell and procure crude and feedstock separately. While ONGC produces the barrels, its subsidiaries HPCL and MRPL import crude independently. Its overseas arm OVL sells its own equity production, and OPaL sources its own feedstock. A single trading face gives one commercial interface, better bargaining power, and an end to value leakage.

STRATEGIC STORAGE

ONGC is also developing a 1.75 million tonnes strategic petroleum reserve in Mangalore at the request of the government. The project, already approved by ONGC's board, would increase India's dedicated emergency crude storage capacity by about one-third from its current 5.33 million tonnes. The facility will be built on ONGC's balance sheet, marking a shift from the conventional model of government-funded strategic storage, Singh said. "We already have land parcel at Mangalore SEZ. Business model is now being worked... we will shortly commence process of construction," he said. Half the capacity will be reserved for strategic use under the government's plan, while ONGC has sought permission to use the remainder commercially.

India's existing strategic reserves cover about 9.5 days of net oil imports, while crude and petroleum-product stocks held by state-run oil companies provide a further 64.5 days of coverage, according to petroleum ministry data.

DEEPWATER PUSH

Despite the expansion into trading and infrastructure, Singh said exploration and production will remain the foundation of ONGC's strategy. The company plans to spend Rs 1 lakh crore in drilling 87 wells in deepsea by 2031. The government's decision in July to provide Rs 84,000 crore over five years to support offshore exploration is expected to reduce the financial burden on ONGC as it pursues more expensive deepwater resources. The programme, announced under the National Offshore Exploration Scheme, is intended to support reserve additions of more than 600 million tonnes of oil equivalent by 2030-31, according to the petroleum ministry. ONGC's response is "Project DeepX" under which the company plans to double its deepwater drilling effort over two years. Much of India's domestic crude production comes from mature fields, prompting ONGC to deploy enhanced oil-recovery techniques and seek partnerships with international producers, including BP, Exxon Mobil, Chevron, TotalEnergies, Petrobras, Petronas, Equinor, and Shell.

NA-Allocated Talabira II & III Coal Mines Mark Record Production in FY 2025-26

The Government of India's efforts to strengthen domestic coal production and energy security are being reinforced through coal mines allocated and auctioned under the Nominated Authority (NA) framework. Talabira II & III Open Cast Coal Mine in Odisha, allocated to NLC India Ltd. on 2 May 2016 under Schedule III of the Coal Mines (Special Provisions) Act, 2015, is among the NA-allocated mines demonstrating strong performance across production, dispatch, technology adoption, safety, environmental management, employment and community development.

Located across Sambalpur and Jharsuguda districts, the mine has emerged as a significant contributor to domestic coal availability. In FY 2025-26, Talabira II & III achieved its highest-ever annual coal production of 19.14 MT, recording a year-on-year growth of 11.28% over the previous year. The mine also recorded its highest-ever daily production of 1,26,138.07 tonnes on 21 March 2026 and highest-ever monthly production of 3.39 MT in March 2026.

The production performance has been complemented by strong coal dispatch. In FY 2025-26, the mine achieved its highest-ever annual dispatch of 17.69 MT. Of this, approximately 10.72 MT was supplied to the power sector, while 6.97 MT was supplied to the non-regulated sector. Coal from Talabira II & III supports power-generating facilities across several States, including NTPC Darlipali, NTPC Gadarwara, NTPC Khargone, NTPC Kudgi and other power plants in Odisha, Chhattisgarh, Jharkhand, Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu and West Bengal.

The mine has maintained a sustained growth trajectory since commencement of production, with cumulative coal production reaching 72.23 MT and cumulative dispatch reaching 70.89 MT up to 14 August 2026. This performance illustrates the tangible outcomes possible through the operationalisation of coal resources allocated under the Government's coal-block allocation framework.

Technology has been a key enabler of operational efficiency at Talabira II & III. The Digital Logistics Management System (DLMS) enables end-to-end digital monitoring of coal transportation and dispatch through RFID-based vehicle verification, AI-enabled cameras and technology-enabled entry and exit gates. Following its implementation, average entry-gate processing time reduced from 1.42 minutes to 0.54 minutes per vehicle, while tare weighment time reduced from 1.34 minutes to 0.48 minutes. The mine also deploys surface miners with dust-suppression systems, GPS-based fleet management and geo-fencing, 3D Terrestrial Laser Scanning with GNSS receivers, drone-based surveying, mechanised truck loading, Continuous Ambient Air Quality Monitoring Stations and CCTV surveillance.

Coal Supply Position for Power Sector Remains Adequate; Production and Despatch Register Strong Growth in July 2026

The country's coal supply position for the power sector continues to remain adequate, backed by robust growth in production, despatch and receipts during July 2026. The overall coal production during July 2026 stood at 69.75 Million Tonnes (MT), as against 64.88 MT during the corresponding period last year, registering a growth of 7.51%. Overall coal despatch during the month stood even higher, at 86.85 MT compared to 73.58 MT in the same period last year, marking a robust growth of 18.03%.

The coal receipt at thermal power plants during July 2026 stood at 68.83 MT, as against 60.69 MT in July 2025, registering a growth of 13.41%. This sustained and healthy growth in supplies to the power sector underscores the Ministry's continued focus on ensuring uninterrupted coal availability to meet the nation's energy requirements, with the continued support of Indian Railways.

As on 04.08.2026, the coal stock at thermal power plants stood at 34.55 MT. In addition, about 113 MT of coal is available at pitheads and in transit, taking the total available stock to approximately 148 MT. This is adequate to meet about 62 days of the power sector's coal consumption requirement, providing a comfortable buffer.

The Ministry of Coal remains fully committed to ensuring uninterrupted and adequate coal supply to

all consumers, particularly the power sector, to support the nation's growing energy needs. This sustained performance reflects the Ministry's unwavering commitment to the vision of Aatmanirbhar Bharat and Viksit Bharat, ensuring energy security and self-reliance for the country. The Ministry continues to closely monitor the coal supply chain, to ensure that the power sector's requirements are met without disruption.

Consultative Committee of Ministry of Coal Discusses Commercial Coal Mining Reforms and Leveraging Private Sector Participation

The Consultative Committee of Members of Parliament attached to the Ministry of Coal met on recently to discuss 'Commercial Coal Mining Reforms and Leveraging Private Sector Participation'. The meeting was chaired by the Union Minister of Coal and Mines Shri G Kishan Reddy. It was also attended by the Secretary, Ministry of Coal Shri Vikram Dev Dutt, senior officials of the Ministry and coal PSUs apart from the Members of the Committee.

In his opening remarks, Union Minister of Coal and Mines, Shri G Kishan Reddy said that commercial coal mining is one of the shining examples of many reforms introduced under the leadership of Prime Minister Shri Narendra Modi in last 12 years. Shri Reddy informed the members that 14 rounds of commercial coal mine auctions have already been completed and the 15th round is currently under process. The Minister also said that commercial coal mining has made the coal sector more competitive and efficient. Shri Reddy said that transparent auction process has transformed India's Coal Sector by promoting competition and investment. Referring to the auction process, Shri Reddy said that the Ministry of Coal is actively engaging with industry bodies and private companies by organizing roadshows and stakeholder consultations, to ensure greater awareness and wider participation.

While welcoming the members, Secretary, Ministry of Coal, Shri Vikram Dev Dutt said the captive and commercial mines have played an important role in achieving 1 Billion Tonne coal production in last two financial years. Shri Dutt highlighted that captive and commercial coal mines have contributed around 20% of the countries coal production in last Financial Year. Secretary also informed that continuous reforms introduced in the coal sector have reduced timelines of operationalization for fully explored blocks from 51 months to 40 months and partially explored blocks from 66 months to 52 months.

Additional Secretary, Ministry of Coal, Smt Rupinder Brar gave a presentation on 'Commercial Coal Mining Reforms and leveraging Private Sector participation'. Members of the Committee appreciated the Ministry's efforts towards reforming the coal sector and offered valuable suggestions on further improving private sector participation and balancing commercial mining growth with environmental and community concerns.

Six Coal Blocks Successfully Auctioned in the 15th Round and 2nd attempt of 13th Round of Commercial Auctions

The Ministry of Coal have successfully auctioned six coal blocks under the 15th round and 2nd Attempt of 13th Round of commercial coal mine auctions. The ministry launched the said rounds of commercial coal block auctions on April 17, 2026. Following this, the forward auctions were conducted from August 03 to August 04, 2026, during which these six coal blocks were successfully auctioned. Out of 6, 4 are fully explored coal blocks and 2 are partially explored coal blocks. Together, these blocks hold geological reserves of approximately 1,503.93 million tonnes, with a cumulative Peak Rated Capacity (PRC) of 11.62 MTPA.

These six blocks are poised to generate annual revenue of approximately ~₹1,983.67 crore, and likely to attract capital investment of nearly ₹1,743 crore and create 15,710 employment opportunities. Since the inception of commercial coal mining in 2020, a total of 147 coal blocks has been auctioned successfully, with a production capacity of 377.974 Million Tonnes per year. Once operational, these blocks will substantially enhance domestic coal production and advance the nation's goal of becoming self-reliant in the coal sector. Collectively, these coal blocks are estimated to yield annual revenue of ₹48,215 crore, mobilize capital investment of ₹54,315 crore, and generate 4,89,552

employment opportunities across coal-bearing regions.
These achievements reaffirm Ministry of Coal's steadfast commitment to transforming the coal sector into a key driver of economic growth. By addressing the country's rising energy demand while fostering economic stability and generating employment opportunities the Ministry continues to drive the vision of a stronger, more resilient, and truly Atmanirbhar Bharat.

Commercial Coal Mining: Fuelling India's Journey Towards Aatmanirbhar Bharat

Coal meets the larger part of India's energy requirement. It accounts for close to 55 per cent of the country's primary energy needs and fuels more than 70 per cent of the electricity generated. India holds the world's fifth largest coal resource, assessed at about 4,00,715 Million Tonnes (MT), and ranks as the second largest producer and consumer of coal. Around five lakh mine workers produce this coal across more than 350 mines.

Domestic coal production has crossed one billion tonnes for two consecutive years, at 1047.52 MT in FY 2024-25 and 1040.08 MT in FY 2025-26, compared with 609.18 MT in FY 2014-15. A substantial part of this growth has come from captive and commercial blocks, whose share of national production has risen from 10.9 per cent in FY 2021-22 to 20.2 per cent in FY 2025-26.

In 2014, the Supreme Court of India cancelled 204 of the 218 blocks allocated between 1993 and 2012, finding the process arbitrary for want of consistent and objective criteria, and made clear the need for a transparent, auction-based framework.

In response, the Coal Mines (Special Provisions) Act, 2015 placed re-allocation on a firm statutory footing, and the first auction tranche was launched in December 2014. Between 2015 and 2020, ten tranches of auction and nine of allotment restored 76 coal mines to productive use.

On 18 June 2020, under the vision of the Prime Minister Shri Narendra Modi and the Aatmanirbhar Bharat mission, commercial coal mining was formally launched, permitting the sale of coal on a competitive basis and extending participation beyond the public sector. A successful bidder may now sell coal to any consumer in any sector at market-determined prices, with no captive-use restriction and no bar on how the coal is utilised.

The erstwhile fixed charge per tonne was replaced by a revenue-sharing model, under which the bidder quotes a percentage of revenue payable to the Government. That share is indexed to the National Coal Index, so that the nation's return moves with the real value of the coal. Eligibility norms were broadened considerably. Prior mining experience is no longer required, joint ventures and consortia may participate, and 100 per cent foreign direct investment is permitted through the automatic route. Since June 2020, 141 coal mines have been auctioned commercially across 14 rounds, with a combined peak rated capacity of 366.35 MT per annum. The average revenue share discovered is 24.17 per cent, six times the 4 per cent floor. Of these, 123 have gone to private players, and 44 of the successful bidders were entities that had not mined coal before.

Captive and commercial blocks together produced about 210.46 MT in FY 2025-26, crossing the 200 million tonne mark for the first time. A decade earlier the figure stood at 28.83 MT, a compound annual growth of about 22 per cent over the period. Within this, commercial mines have contributed about 26.12 MT in FY 2025-26, with 23 mines operational (obtained Mine Opening Permission). At full production, the blocks auctioned so far are expected to yield annual revenue of about Rs. 47,000 crore, draw capital expenditure of about Rs. 48,756 crore, and generate employment of about 4,75,000.

Returns to the exchequer have grown on a similar scale. Revenue from premium generation has risen from Rs. 461 crore in FY 2014-15 to Rs. 5,553 crore in FY 2025-26, a compound annual growth of about 26 per cent, accruing to the exchequer and to the producing States.

The present focus is on ensuring that every auctioned mine is brought into production. Through sustained efforts for ease of doing business, the clearances required for blocks operationalization have been reduced and simplified, thereby

scheduled operationalization timelines have been shortened, from 51 months to 40 for fully explored blocks and from 66 to 52 for partially explored ones (effective from the 15th round now under way).

Every commercial coal block since June 2020 has been awarded through open auction. These reforms rest on transparency, competition and a level playing field between public and private players, strengthening the country's energy security, supporting its power and steel industries, and carrying India further towards the goal of Aatmanirbhar Bharat.

Reforms in coal sector
Over the last five years, the Government has carried out a series of structural and procedural reforms to make coal allocation and mining more transparent, efficient, and scientific. The key change has been the shift from allotment to allocation through open competitive auction, alongside the opening of commercial coal mining in 2020 with no restriction on the sale or end-use of coal.

1. Key Reforms for Transparency and Market-Based Allocation:
Commercial Coal Mining: Opened with no technical or financial eligibility conditions, and 100% Foreign Direct Investment (FDI) has been allowed under the automatic route.

Revenue-Share Model: Auctions have migrated to a percentage revenue-share model, supported by the introduction of the National Coal Index for transparent, market-linked pricing.

Single Window Mode Agnostic (SWMA) Auction: Introduced to sell all non-linkage coal of Coal India Limited (CIL) through a single window, removing market distortions and enhancing fair competition amongst buyers.

SHAKTI Policy Simplification: Coal linkage allocation has been simplified into two windows—Window I at Notified Price and Window II at a Premium above Notified Price, enabling existing linkage consumers to procure up to 100% PLF requirement.

CoalSETU Window: Introduced under the Non-Regulated Sector (NRS) Linkage Auction Policy to provide auction-based linkages without end-use restrictions, allowing full flexibility for self-consumption, coal washing, or export.

2. Reforms for Efficiency and Ease of Doing Business:
Single Window Clearance System: Introduced through the PARIVESH 2.0 portal for faster mine operationalization.

Exploration: 44 private entities have been notified as Accredited Prospecting Agencies (APA), removing the need for a prospecting license. The Geological Reports approval mechanism has also been simplified.

Statutory Amendments: The Colliery Control Rules have been amended to empower coal company boards to accord Mine Opening Permissions. Furthermore, Coking Coal has been notified as a Critical and Strategic Mineral under the MMDR Act, 1957, thereby, expediting Environment Clearance and Forest Clearance process for Coking Coal Projects

Mine Developer and Operator (MDO) Mode: The Government has introduced the Mine Developer and Operator mode for coal mining and has also offered closed/abandoned mines under a revenue-sharing model to maximize resource extraction.

Insurance Surety Bond has been included as an acceptable instrument for furnishing Performance Security in the Coal Block Development and Production Agreements. This will reduce dependence on Bank Guarantees, release blocked working capital and widen participation.

The Government has taken several initiatives to modernise the coal ecosystem through technology adoption and clean coal initiatives:

Coal Washing: Under 'Mission Coking Coal', the Government aims to enhance the country's coal washery capacity to 58 MT by FY 2030.

Digital Mine Monitoring: The Ministry of Coal has launched the Koyla Shakti Dashboard for real-time monitoring of coal production, dispatch, stocks, and transportation. Additionally, the Khanan Prahari

mobile app and CMSMS web app have been deployed nationally for citizen-based reporting of unauthorized mining activities. CIL has also deployed Integrated Command and Control Centres (ICCC) with AI-based video analytics, RFID-enabled weighbridges, GPS-based vehicle tracking, and drone/satellite-based mapping for scientific mine planning.

Coal Gasification & UCG: To promote surface coal/lignite gasification, the Government has approved two major schemes with financial outlays of ₹8,500 crore (under which 8 projects are already approved) and ₹37,500 crore to meet the target of 100 MT gasification capacity by 2030.

Renewable Energy & Carbon Capture: CIL has adopted a phased renewable energy roadmap with a target of 3 GW of net-zero renewable capacity by FY 2027-28 and 9.5 GW by FY 2029-30, with 558 MW already installed across utility and captive projects.
Coal continues to play a vital role in meeting the country's energy needs and supporting industrial growth.

Further, the Government promotes environmental sustainability in coal mining through initiatives such as plantation/bio-reclamation, development of eco-parks, and mine water utilization. Blast-free mining technologies (like Surface Miners) are being aggressively adopted to replace conventional drilling. India’s domestic coal production has increased significantly from about 731 million tonnes in 2019-20 to cross 1 Billion Tonnes for two consecutive years, reaching 1047.52 MT in FY 2024-25 and 1039 MT in FY 2025-26.

The Government has launched an Integrated Coal Logistics Plan aiming to develop a technology-enabled, cost-effective multimodal logistics ecosystem through rail, road, coastal shipping, and inland waterways. A total of 139 First Mile Connectivity (FMC) projects with an aggregate capacity of about 1,319 million tonnes have been taken up, out of which 72 projects with a capacity of about 589 million tonnes have already been commissioned

To further streamline the sector, the Government has notified the Coal Exchange Rules, 2026 to establish a regulated online platform for trading coal and its processed forms. The Coal Exchange will enable captive/commercial miners and consumers to enter into delivery-based contracts.

This information was given by Union Minister of State for Coal and Mines Shri Satish Chandra Dubey in a written reply in Lok Sabha today.

Industry insists on assured offtake for coal gasification

The energy industry is seeking assured offtake commitments from the government for coal gasification projects, arguing that viability gap funding (VGF) alone may not be enough to unlock investments in capital-intensive plants.

The investment case remains weak even with government support, if project developers have to commit thousands of crores without certainty on demand, on who would buy the gasification output and at what volumes and prices, industry executives said.

"If you are putting in ₹10,000 crore and there is no assured place to sell the output, the arithmetic does not work," a senior industry executive told ET. Coal gasification is a process that converts solid coal into synthetic gas, which has multiple uses. The comments come as the government rolls out a ₹37,500 crore incentive scheme aimed at scaling up surface coal and lignite gasification and building a domestic coal-tochemicals ecosystem.

The industry is also seeking freight support or allocation of land near the mine head and ports for gasification projects supplying fertiliser and steel plants, saying logistics costs could further weaken the economics of these projects.

While the new scheme provides a financial incentive of up to 20 per cent of the cost of plant and machinery, industry executives said a capital subsidy alone would not address the demand and market risks associated with projects that require large upfront investments and have long gestation periods. The experience of the Talcher fertiliser project in Odisha has also highlighted some of the execution challenges associated with coal gasification.

Thermal power plants slash coal imports for blending by 71.5% in 3 years: Govt

Coal-based power plants in India have sharply reduced their reliance on imported coal for blending, with imports falling from 23.9 million tonnes in 2023–24 to 6.8 million tonnes in 2025–26, a decline of 71.5 per cent over three years, Satish Chandra Dubey, Minister of State, Coal and Mines, informed the Rajya Sabha recently.

The trend has continued in the current financial year, with imports at just 1.7 million tonnes during the April–June period of 2026-27, signalling a sustained reduction in reliance on imported coal for blending, as per the information shared in the Upper House.

“The imports are mainly for coking coal for the steel industry and high-grade thermal coal, the domestic availability of which remains limited due to scarce reserves or non-availability,” the minister said.

The minister was replying to the question raised by Rajya Sabha member, Niranjan Reddy, on why domestic coal-based power plants continue to rely on imports despite sufficient domestic production and Coal India Ltd holding a stockpile of 122.46 million tonnes as of March 12, 2026.

“Apart from this, imports continue in specific cases, including for Imported Coal-Based (ICB) power plants, which are designed to operate on imported coal, and for blending requirements by Domestic CoalBased (DCB) power plants, wherever technically or operationally necessary,” said the minister.

Coal blending in thermal power plants involves mixing different grades of coal such as lower-cost, lowgrade coal with higher-quality, more expensive coal to optimise fuel efficiency and reduce overall costs.

The ministry further noted that coal imports are allowed under the Open General Licence (OGL) policy, enabling power plants to source coal based on their technical and operational requirements.

The government has taken a number of steps to increase coking coal supply to the steel sector and reduce its imports, including the launch of Coking Coal Mission, and allowing coal linkages for coal washeries under the recently created CoalSETU window under the Non-Regulated Sector linkage auctions.

NTPC Targets 244 GW Capacity by 2037 With INR 16.86 Lakh Crore Investment Plan

NTPC Limited has announced an ambitious long-term expansion plan to increase its operational power generation capacity to 244 GW by 2037, excluding energy storage. The company has outlined a total capital expenditure of Rs 16.86 lakh crore through FY37 as it prepares to meet India’s rising electricity demand.

Speaking at NTPC’s 50th Annual General Meeting, Chairman and Managing Director Gurdeep Singh said the next decade will be an important period of growth for the company. NTPC currently has around 91 GW of total installed capacity. Under its revised roadmap, the company aims to increase this to 149 GW by 2032, including 60 GW of renewable energy capacity. The target is then to expand the overall operational capacity to 244 GW by 2037.

The planned investment will cover several areas of the energy sector, including thermal power, hydropower, pumped storage, renewable energy, battery storage, coal mining and nuclear power. This diversified approach is aimed at supporting India’s growing energy requirements while strengthening NTPC’s position across the power value chain.

Nuclear energy has emerged as a major focus of the company’s long-term strategy. NTPC plans to target a 30 percent share of India’s proposed 100 GW nuclear power capacity goal by 2047. The company is already working with Nuclear Power Corporation of India Limited (NPCIL) through a joint venture for a 2.8 GW nuclear power project in Rajasthan. NTPC is also evaluating 34 potential sites across 13 states for developing independent nuclear power projects.

The company is also progressing with its 5.75 lakh tonnes per annum coal gasification project, which is expected to produce synthetic natural gas and help reduce dependence on imported gas..

India's clean energy transition now central to economic resilience: Pralhad Joshi

India's clean energy transition is now central to the country's industrial competitiveness, trade positioning and long-term economic resilience, Union Minister for New and Renewable Energy Pralhad Joshi said recently.

Addressing the annual summit of Confederation of Indian Industry in New Delhi, the minister said India's push towards achieving 500 GW of non-fossil fuel capacity by 2030 is laying the foundation for a globally competitive and self-reliant energy ecosystem.

Joshi said the idea of Aatmanirbharta has evolved into a globally recognised model for resilient and sustainable growth. Referring to initiatives such as Vaccine Maitri, India's digital public infrastructure including UPI, and defence exports like the BrahMos and HAL Tejas, he said self-reliance is about "confidence, capability and global competitiveness" rather than isolation. He added that Prime Minister Narendra Modi had recently urged citizens to adopt more sustainable and self-reliant ways of living and working, reflecting the direction of future global growth.

The minister said energy policy has increasingly become linked with industrial and trade policy amid changing global regulations, including carbon-linked trade mechanisms. According to him, renewable energy adoption is now essential for Indian industries to remain export competitive and manage future cost pressures.

Highlighting India's progress in the renewable energy sector, Joshi said non-fossil fuel capacity has risen from 81 GW in 2014 to 288 GW at present, while solar energy capacity has expanded from 2.8 GW to 155 GW. Wind energy capacity has also increased from 21 GW to 56.4 GW. He noted that renewable sources contributed nearly one-third of India's record peak power demand of 256 GW.

Joshi said India continued to attract strong investments in renewable energy despite a decline in global renewable investments, underscoring growing international confidence in the country's clean energy roadmap. He credited the progress to strong collaboration between the government and industry.

The minister also outlined a series of policy measures aimed at strengthening the sector, including Renewable Consumption Obligation trajectories, Carbon Credit Certificate Regulations 2026, green ammonia procurement agreements, solar PV module warranty standards and reforms to support domestic manufacturing. He said emerging sectors such as green hydrogen, battery storage, offshore wind and pumped hydro will drive the next phase of India's energy growth.

Calling for deeper integration of generation, storage and transmission systems, Joshi said continued collaboration between industry and government would be crucial in building a technologically advanced and inclusive energy system. He also invited investors and industry stakeholders to participate in the Renewable Energy Global Investors Meet scheduled later this year.

MNRE mulls incentive scheme to boost polysilicon manufacturing

The Renewable Energy Ministry is mulling an incentive scheme to boost polysilicon manufacturing in the country to reduce dependence on imports, especially from China.

Speaking at the 7th CII International Energy Conference & Exhibition here in the capital, Union New and Renewable Energy Secretary Santosh Kumar Sarangi said that today, India stands as the third-largest renewable energy market in the world.

India has crossed 300 GW of (non-fossil fuel-based power generation capacity) installations by the end of July (this year) and is on course to meet the target of 500 GW of non-fossil fuel energy installation by 2030, he added.

"We are coming up with a support scheme for manufacturing of polysilicon in the country, and we should be able to come up with something which will support our manufacturers to dive deeper into polysilicon manufacturing," the secretary said.

He noted that India is the second largest solar module manufacturer in the World, with more than 213 GW of installed capacity.

In solar cells, the country has achieved 32 GW of installed capacity, he stated. "We are looking at 100 GW of solar cell manufacturing capacity to come up by another one year. We are expecting at least 80 GW of ingot wafer manufacturing capacity by June 2028," he said.

In wind energy manufacturing, almost 85 per cent of manufacturing is indigenised today, he said, adding that India has 24 GW of manufacturing capacity in the country.

He announced that recently, SECI did an RE RTC (round-the-clock) bid with 90 per cent assured power availability in each time block.

He noted that the discovered price was Rs 5.25 per unit for RE RTC.

"If you look at this RTC bid, it almost matches the nuclear power. Yet, I must commend our developers who have designed their system in a way in which they have the confidence that Rs 5.25 is an inflation proof price; they will be able to supply for the next 25 years," he added.

The latest round-the-clock renewable energy bid provides for 90 per cent assured power availability in each time block, with solar accounting for only 50 per cent of supply during the daytime.

Sarangi said the tariff demonstrates the growing competitiveness of renewable energy and the ability of developers to integrate solar, wind and storage technologies to provide reliable power.

Turning to cross-border energy cooperation, the secretary stressed that regional energy integration requires physical infrastructure and compatible regulatory systems.

"When we talk of cross-border energy trade, we are not talking merely of the hardware of putting wires, putting transformers, substations, or undersea cables; it is equally important to talk of the software relating to cross-border energy transmission," he said.

He highlighted the potential of the One Sun, One World, One Grid vision to enable countries across different time zones to complement one another by sharing renewable energy.

Sarangi also highlighted India's cooperation with neighbouring countries, including Bhutan, and said India remains committed to sharing its renewable energy experience across the region.

He also stated that the average power procurement cost for discoms can go down from the current level of ₹5.20 per unit to ₹4.80 per unit, with the infusion of more renewable energy and round-the-clock RE capacity.

Growing gap between RE, transmission capacity a key credit risk: Ind-Ra

India Ratings and Research (Ind-Ra) recently said the growing gap between renewable energy (RE) commissioning and transmission readiness is emerging as a key credit risk for the sector.

Around 112 GW of the planned 196 GW RE pipeline till FY32 remains aligned with transmission schedules, about 84 GW of capacity faces delays in general network access (GNA) operationalisation, highlighting a persistent transmission execution gap, it said in a statement.

Ind-Ra projects a 32 GW mismatch between generation and transmission for projects to be commissioned by H2, FY27.

This gap may widen to 40 GW, if interstate transmission system (ISTS) commissioning is delayed by three more months beyond the current commissioning timelines.

If a project operates ahead of transmission readiness, it must use temporary general network

access (T-GNA), which can lead to curtailment due to grid constraints.

Ind-Ra-rated renewable projects have not witnessed material rating pressure from transmission delays so far, supported by repayment moratoriums, liquidity buffers, and sponsor support mechanisms.

However, prolonged transmission bottlenecks could weaken capital structure and lead to sustained reliance on sponsors.

Utility-backed projects benefit from partial protection, as the scheduled commercial operation date (SCOD) under power purchase agreements (PPA) is allowed till 30-60 days post-receipt of the final GNA.

For commercial & industrial projects, risks could arise if consumers have the option to exit the project as per respective PPA terms due to prolonged delays in final GNA and consequent supply being lower than committed level during T-GNA period.

Ind-Ra believes the challenge is no longer transmission planning, but its timely execution.

While around 57 per cent of the RE pipeline remains synchronised with transmission commissioning timelines, nearly 84 GW continues to face delays ranging from a few months to over a year.

"Risks are increasingly concentrated in a handful of large RE hubs, where evacuation infrastructure continues to lag generation capacity additions, with an average delay exceeding six months. Key RE hubs contribute significantly to the 84GW capacity associated with GNA delays, accounting for nearly 42GW of the total.

"This indicates execution slippages at a limited number of substations could materially influence RE integration across India", says Peeush Middha, Associate Director, Infrastructure, Ind-Ra.

India adds record 3 GW of solar open access in Q2 2026: Report

India added 3 GW of solar open access capacity in Q2 2026, marking its highest-ever quarterly addition, according to Mercom India's Q2 & H1 2026 India Solar Open Access Market Report. The addition rose 10 per cent quarter-on-quarter (QoQ) and 0.2 per cent year-on-year (YoY), the report said.

"The record installations and a large pipeline demonstrate the strength of underlying demand from commercial and industrial consumers. However, rising project costs, transmission constraints, changing banking and open access regulations, and domestic sourcing requirements are putting pressure on project economics, said Priya Sanjay, Managing Director at Mercom India.

The opportunity remains significant, but growth will increasingly depend on states providing predictable regulations and developers being able to deliver projects at tariffs that continue to offer meaningful savings to consumers," she added.

As per the report, in the first half (H1) of 2026, solar open access installations reached nearly 6 gigawatts (GW), up 42 per cent year-over-year (YoY) compared to 4 GW in 1H 2025.

Rajasthan led solar open access capacity additions in Q2 2026, accounting for 25 per cent of the total, while the top five states contributed 91 per cent of quarterly installations.

India's solar growth cuts midday coal generation by 10 GW in 3 years: Ember report

India's rapid solar capacity addition has reduced midday fossil fuel generation by 10 GW over the past three years, equivalent to the output of around 15 modern coal-fired power units, but rising electricity demand after sunset is increasing reliance on coal, according to a new analysis by global energy think tank Ember.

The report said fossil generation at 1 pm fell from 135 GW in the first half (H1) of 2023 to 125 GW in H1 2026, reflecting the growing contribution of solar power during daylight hours.

However, fossil generation between 5 pm and 7 am averaged 168 GW in H1 2026, up 22 GW compared to three years earlier, as coal-fired power plants

ramped up output to meet evening electricity demand.

According to Ember, the findings highlight the growing importance of battery energy storage systems, which can store surplus daytime solar power and discharge it during evening peak demand, reducing dependence on coal while improving utilisation of renewable energy.

The report also noted that solar generated a record 10 per cent of global electricity in H1 2026, making it the fastest-growing source of electricity worldwide. While solar is supplying an increasing share of electricity during the day, its contribution falls to near zero after sunset, leaving evening demand largely dependent on fossil fuels.

“The next step is extending those benefits beyond sunset. Battery storage allows cheap daytime solar to meet evening demand, reducing pressure on coal-fired generation while making better use of renewable electricity that would otherwise go unused,” she added.

Global battery deployment going up
The report said global battery deployment is accelerating, with battery installations expected in 2026 capable of theoretically shifting 34 per cent of new daily solar generation into evening hours, nearly double the share in 2025 and significantly higher than the 4 per cent recorded in 2021.

It cited examples such as California, where solar and batteries now meet more than a quarter of evening electricity demand, and Bulgaria, which has rapidly expanded battery deployment to extend solar generation beyond daylight hours.

For India, Ember said battery storage will become increasingly important as solar capacity continues to grow. Besides reducing dependence on evening coal generation, batteries can help limit renewable energy curtailment, improve utilisation of existing solar assets and enhance grid flexibility.

The report added that realising these benefits would require not only faster battery deployment but also electricity market reforms enabling storage to participate fully in energy and ancillary service markets.

India’s renewable power milestone needs closer clean energy ties with China

India's renewable energy expansion has reached a new milestone. Indian news agency PTI reported recently that India's installed non-fossil fuel power capacity has crossed the 300-gigawatt mark, accounting for more than 54 percent of its total installed electricity generation capacity.

This is a positive development. India has already come a long way toward its 2030 target of 500 gigawatts. But the next phase of the journey will require more than simply adding new capacity. It will depend on a stronger power system - one that can store and use renewable electricity more effectively. One important part of that effort will be battery storage.

The issue is drawing increasing attention. Bloomberg recently highlighted the challenge in an article headlined "India Needs Batteries to Keep Its Solar Boom Going."

The importance of battery storage is straightforward. Large-scale storage acts like a giant "power bank" for renewable energy. When solar and wind generation is abundant, it can capture excess electricity that cannot be used immediately. When sunlight fades, winds weaken or demand rises, it can release that stored power back into the grid. This flexibility is what makes large-scale renewable energy possible.

India's renewable energy expansion is creating rising demand for energy storage. A report by JMK Research and Analytics and Institute for Energy Economics and Financial Analysis said that India's cumulative tendered energy storage capacity rose from 6.8 gigawatts in 2018 to 90.7 gigawatts in 2025.

This trend is likely to continue. As India continues to expand its non-fossil fuel capacity toward 2030, the need for storage will continue to grow. Storage is becoming an indispensable part of India's clean energy transition.

India has recognized the importance of developing its battery manufacturing industry. But this does not necessarily mean building the industry in isolation. Battery manufacturing depends on a broad ecosystem, from raw materials and processing to links with global supply chains.

Building a battery industry is not simply about setting up factories. It requires an ecosystem covering materials, equipment, manufacturing and system integration. This is where China has developed strong capabilities. China has built a broad industrial base across the battery storage supply chain. These capabilities have helped Chinese companies achieve scale and improve cost competitiveness in the global storage market.

For India, building domestic battery manufacturing capacity and working with international partners do not have to be seen as mutually conflicting goals. The two can reinforce each other as the country strengthens its energy storage industry. This creates room for broader cooperation between China and India in the storage sector. Such cooperation can take multiple forms across the supply chain, from trade to broader industrial cooperation.

Some Indian officials have expressed optimism about the growth potential of sodium-ion battery technology. But some industry participants have taken a more cautious view. The concern is that India's storage demand is running well ahead of what domestic manufacturing can supply, and that gap is a matter of years, not a few quarters.

However, India's 2030 target cannot wait for its storage industry to fully mature. Reaching the 300-gigawatt milestone is a positive development, but it also marks the start of a new phase, where deeper parts of the power system, including storage, will become increasingly important. If domestic capacity cannot meet demand, imports should be encouraged to fill the gap.

China's strengths in battery materials, manufacturing and related supply chains create opportunities for deeper cooperation with India. Closer links in these areas could help India accelerate the development of its clean energy capabilities and support the country as it moves through the next stage of its journey toward the 2030 target.

Tata Power Renewables commissions 100 MW group captive solar project in Tamil Nadu

Tata Power Renewable Energy Ltd (TPREL), a subsidiary of The Tata Power Co. Ltd (Tata Power), has successfully commissioned its 100 MW group captive solar project at Vellalankottai and Nalandhula villages in Kayathar, Tamil Nadu.

The project will supply clean power to TP Solar (40.625 MW), Tata Power's solar cell and module manufacturing arm; Tata Electronics (53.125 MW), an electronics manufacturing company focused on semiconductors, precision engineering and advanced electronics; and Tata Realty Infrastructure Ltd (6.25 MW), Tata Group's real estate and infrastructure development arm, supporting the decarbonization of their operations.

With this commissioning, TPREL's utility-scale renewable energy portfolio has grown to 12.3 GW, including 7 GW of operational capacity comprising 5.7 GW of solar and 1.3 GW of wind. The remaining 5.3 GW is under various stages of development, comprising 2.2 GW of solar and 3.1 GW of wind capacity, with projects scheduled for phased commissioning over the next 6 to 24 months.

The project is expected to generate 240.63 million units (MUs) of clean electricity annually and help offset around 1.5 lakh tonnes of CO_2 emissions per annum.

TPREL said the project uses flexible terrain compatible (FTC) single-axis tracker technology and 261,660 monocrystalline PERC bifacial solar modules to maximize energy generation and improve operational efficiency across varying terrain conditions.

PM Modi Sets 100 GW Nuclear Target, Rs 85,000 Crore Offshore Push

Prime Minister Narendra Modi highlighted energy security, critical minerals and domestic resource exploration as key priorities for India's future growth during his Independence Day address from the Red Fort. He said the country is targeting 100 GW of nuclear power capacity by 2047 to meet rising electricity demand.

PM Modi said critical minerals are essential for advanced technologies, including artificial intelligence, semiconductors and data centres. He highlighted the National Critical Minerals Mission and Critical Minerals Corridor, along with agreements being pursued with several countries to secure supplies and strengthen India's position in the sector.

PM Modi's energy roadmap combines nuclear expansion, offshore exploration, critical mineral security and renewable energy growth to strengthen India's long-term energy security.

5 indigenous small modular reactors targeted by 2033, Jitendra Singh tells LS

A key objective of the govt under the Nuclear Energy Mission is to develop and operationalise at least five indigenous small modular reactors by 2033, minister for department of atomic energy Jitendra Singh said in a written reply in the Lok Sabha recently.

Bhabha Atomic Research Centre (BARC) is undertaking the design and development of indigenous SMR technologies, including the 220 MWe Bharat Small Modular Reactor (BSMR-200) and 55 MWe SMR-55 for power generation. BARC is also developing a high temperature gas cooled reactor (HTGCR) of up to 5 MW capacity, which can be coupled with a suitable thermochemical cycle for hydrogen production.

Singh said India is steadily strengthening its indigenous nuclear energy ecosystem with a focus on advanced reactor technologies, SMRs, domestic manufacturing capabilities, private-sector participation and long-term utilisation of the country's abundant thorium resources. The govt has adopted a twopronged approach to accelerate nuclear capacity addition.

This includes deployment of large indigenous reactors such as 700 MWe pressurised heavy water reactors (PHWRs) and advanced reactor designs at greenfield sites, alongside development and deployment of SMRs at brownfield locations, including retiring fossil-fuel-based power plants, captive plants for energyintensive industries and off-grid applications in remote areas.

The minister also highlighted continuing work of the Indira Gandhi Centre for Atomic Research (IGCAR) in advancing the second stage of India's nuclear power programme. IGCAR is pursuing multidisciplinary scientific research and advanced engineering development for sodium cooled fast breeder reactors and associated closed fuel-cycle facilities, technologies that remain a cornerstone of India's long-term nuclear strategy.

On thorium, Singh said India is pursuing its three-stage nuclear power programme, based on a closed fuel cycle, to optimise utilisation of its uranium resources and progressively harness its abundant thorium reserves. Thorium, being a fertile material, needs to be converted into fissile uranium-233 in a nuclear reactor before it can be used for energy generation.

India has already undertaken sustained R&D towards thorium utilisation. Thorium Oxide (Thoria) pellets have been used in the initial cores of operating PHWRs, while Thoria-based fuels have also been irradiated in BARC research reactors. The irradiated Thoria pins have been reprocessed to obtain uranium-233, which has subsequently been fabricated as fuel for the KAMINI reactor at IGCAR, Kalpakkam.

Singh said the Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Act, 2025 has been enacted to enable wider participation of both public and private entities in the nuclear sector.

A New Chapter in India's Nuclear Journey Indigenously built 500 MWe fast breeder reactor attains first criticality

India has marked a major milestone in its nuclear energy programme. The indigenously designed and built Prototype Fast Breeder Reactor (PFBR) at Kalpakkam in Tamil Nadu successfully attained its first criticality on 6th April 2026, marking the initiation of a sustained nuclear chain reaction. This PFBR is a 500 MWe (MegaWatt electrical) reactor built by Bharatiya Nabhikiya Vidyut Nigam Limited (BHAVINI) at the Kalpakkam Nuclear Complex.

With this achievement, India has officially entered the second stage of its three-stage nuclear power programme, a vision first conceived by Dr. Homi Jehangir Bhabha, the architect of India's nuclear programme. The milestone carries substantial global significance. Once fully operational, India will become only the second country in the world after Russia to operate a commercial fast breeder reactor. This achievement is a testament to the decades of scientific effort led by the Department of Atomic Energy. It also marks a significant step in India's clean energy journey, reinforcing the country's commitment to reliable, low-carbon power. Additionally, it brings India closer to its goal of achieving net zero emissions by 2070, as announced by Prime Minister Narendra Modi.

Overview of India's Three-Stage Nuclear Power Programme
India holds limited uranium reserves but one of the largest thorium reserves in the world. To make the most of these resources, the Department of Atomic Energy designed a three-stage nuclear power programme built on a closed nuclear fuel cycle. The goal is to progressively multiply domestic fissile resources and secure long-term energy independence.

Stage 1: Pressurised Heavy Water Reactors (PHWRs)
Natural uranium is used as fuel in PHWRs to generate power. The spent fuel from these reactors produces plutonium, which becomes the primary input for the next stage.

Stage 2: Fast Breeder Reactors (FBRs)
The plutonium obtained from Stage 1 is used as fuel in Fast Breeder Reactors, which generate more fuel than they consume. The PFBR at Kalpakkam marks India's entry into this stage. These reactors will be used to breed Uranium-233 from thorium, laying the groundwork for Stage 3.

Stage 3: Thorium-Based Reactors
This stage will harness India's vast thorium reserves at scale, using the Uranium-233 bred in Stage 2 as fuel. Thorium is considered a practically vast energy source and this stage holds the key to India's long-term energy security.

Each stage feeds into the next, making India's nuclear programme one of the most forward-looking energy strategies in the world.

PFBR: An Overview
The PFBR represents decades of indigenous research, design, and engineering. Its technology was developed by the Indira Gandhi Centre for Atomic Research (IGCAR), an R&D centre under the Department of Atomic Energy.

- Fuel and Design: Unlike conventional thermal reactors, the PFBR uses Uranium-Plutonium Mixed Oxide (MOX) fuel. The fissile material used is recovered from the reprocessing of spent fuel from Pressurised Heavy Water Reactors, closing the loop on Stage 1.
- Breeds More Than It Burns: The core of the PFBR is surrounded by a blanket of Uranium-238. Fast neutrons convert this fertile material into fissile Plutonium-239, enabling the reactor to produce more fuel than it consumes.
- Bridge to Stage 3: The reactor is designed to eventually use Thorium-232 in the blanket. Through transmutation, Thorium-232 will be converted into Uranium-233, the fuel that will power India's third stage of nuclear energy based on thorium.

- Closed Fuel Cycle: The spent fuel generated by the PFBR will be reprocessed and recycled back into the reactor. This closes the second-stage fuel cycle and paves the way for large-scale use of India's abundant thorium reserves in Stage 3.

Current Nuclear Power Landscape in India

India's nuclear energy programme has maintained a steady presence in the country's electricity mix. It now stands at a pivotal moment, with significant expansion planned over the coming years.

- Installed Capacity: India's current nuclear capacity is 8.78 Gigawatt (GW). In 2024–25, nuclear power plants generated 56,681 Million Units of electricity across the country.
- Stable Contribution: Nuclear power has consistently accounted for around 3% of India's total electricity generation. In 2024–25, its share stood at 3.1%.
- Planned Expansion: India's nuclear capacity is set to grow nearly 3x in the coming years. With indigenous 700 Megawatt (MW) reactors and 1,000 MW reactors being developed through international cooperation, the installed capacity is projected to reach 22.38 GW by 2031–32.
- International Cooperation: India has signed Inter-Governmental Agreements (IGAs) on Civil Nuclear Cooperation for peaceful purposes with 18 countries, reflecting the growing global confidence in India's nuclear programme.

Taken together, these numbers tell a clear story. Nuclear energy is no longer just a supplementary source of power in India. It is fast becoming a cornerstone of the country's clean energy future.

Long-Term Mission

India has set its sights on a significantly larger role for nuclear energy in its overall power mix. The Government has announced the Nuclear Energy Mission, outlined in the Union Budget 2025–26, with the aim of achieving 100 GW of nuclear power generation capacity by 2047. The mission also supports India's broader goal of achieving net zero carbon emissions by 2070.

Following measures have been put in place to drive this vision forward:

- **Financial Commitment:** The Nuclear Energy Mission allocates **Rs 20,000 crore** towards the design, development, and deployment of Small Modular Reactors (SMRs), signalling a serious long-term investment in indigenous nuclear technology.

- **SMR Target:** At least five indigenously designed **SMRs are to be operational by 2033**, strengthening India's clean and reliable energy roadmap.
- **BARC Initiatives:** The Bhabha Atomic Research Centre (BARC) is leading the development of next-generation reactor designs, including the 200 MWe Bharat Small Modular Reactor (BSMR-200), the 55 MWe SMR-55, and a High-Temperature Gas-Cooled Reactor of up to 5 MWth (Megawatt thermal) designed for hydrogen generation.
- **SHANTI Act, 2025:** To support the mission, the Government has enacted the **'The Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Act, 2025.'** The Act consolidates and modernises India's nuclear legal framework. It enables limited private participation in the nuclear sector under regulatory oversight, opening new avenues for collaboration and investment.

India's long-term nuclear vision is ambitious by design. With policy backing, dedicated funding, and indigenous research at its core, the country is building a nuclear future that is both self-reliant and globally significant.

Conclusion

The attainment of criticality at the Prototype Fast Breeder Reactor marks more than a technological milestone. It reflects the maturity of India's long standing nuclear vision and the strength of its indigenous capabilities. From limited uranium resources to a future powered by thorium, India's three stage programme is now moving steadily from design to delivery. The progress at Kalpakkam Nuclear Complex signals confidence in advanced reactor technologies and reinforces the role of institutions such as Department of Atomic Energy in

driving this transformation. As capacity expands and new technologies take shape, nuclear energy is set to play a far more central role in India's energy mix. This moment therefore stands as both an achievement and a turning point, strengthening the country's pathway towards energy security, technological self-reliance, and its net zero commitment for 2070.

SHANTI Draft Rules and Regulations: Single licence regime and technology from self-reliant countries proposed

The keenly awaited draft rules and regulations for the SHANTI Act, promising to open the tightly held nuclear power sector, are finally out. A single composite licence regime for building, owning, operating and decommissioning of nuclear power plants, besides opening pathways for private players and foreign technology from countries that are 'self-reliant' in nuclear reactor design and supply chain, has been announced.

Private applicants, however, must come with a mandatory insurance policy and/or financial security that will continue right up to the decommissioning of the plant and waste management cycles, as per the draft rules put out by the Department of Atomic Energy for public comment until September 4. The draft details that a foreign design reactor will only be permitted if it is operational and certified by the regulatory body in its 'country of origin' or any other foreign country. The 'country of origin' will mean those countries which are 'self-reliant in nuclear reactor design and supply chain ecosystem, whose regulatory approvals are trusted globally' - essentially restricting the participation to a handful of nations.

India-Russia nuclear energy cooperation highlighted at Humanitarian Atom Fest

The Humanitarian Atom Fest, organised by Consulate of Russia in Thiruvananthapuram in association with International Russophile Movement, concluded with a series of programmes highlighting IndiaRussia cooperation in the peaceful use of nuclear energy.

The event was organised to mark the 55th anniversary of Indo-Soviet Treaty of Peace, Friendship and Cooperation, with a focus on the partnership between India and Russia in the civil nuclear energy sector.

The festival was inaugurated with a seminar titled Nuclear Energy for a Sustainable and Green Future. A photo exhibition tracing the history and development of the Russian nuclear industry, a quiz and a roundtable discussion were also held.

Former diplomat T P Sreenivasan inaugurated the closing ceremony. He described the Indo-Soviet Treaty as a milestone in the history of relations between India and the Soviet Union.

M G Rajamanickam, Chairperson and MD of KSEB, said nuclear energy would continue to be a dependable and sustainable source of power.

He noted that the rapid expansion of AI and other emerging technologies would significantly increase global energy requirements, making reliable and sustainable sources of energy increasingly important.

Small modular reactors: How they differ from conventional nuclear plants

India plans to develop and operationalise at least five indigenous small modular reactors (SMRs) by 2033 as part of its Nuclear Energy Mission, the government told the Lok Sabha recently. The mission aims to raise the country's nuclear power capacity to 100 GWe by 2047.

But what exactly are SMRs, how much electricity can they generate, and how do they differ from conventional nuclear reactors?

What are small modular reactors?
SMRs are nuclear reactors with a smaller power output than conventional reactors. The International Atomic Energy Agency (IAEA) defines them as advanced nuclear reactors with a capacity of up to 300 MWe per unit.

Rank	Country	SMR siting announcements
1	United States	28
2	Canada	9
3	United Kingdom	7
4	Russia	5
5	China	4
6	Finland	4
7	France	4
8	Poland	4
9	Indonesia	3
10	Sweden	3

The IAEA describes them as "small" because they are physically smaller than conventional reactors, and "modular" because their components can be manufactured or assembled in factories and transported to the site. Like conventional nuclear reactors, they also use nuclear fission to generate heat and produce energy.

The European Commission (EC) puts the typical capacity range at about 20 MWe to 300 MWe. It has estimated that an SMR can produce up to 7.2 million kWh of electricity a day.

The smallest reactors, generally below 20 MWe, are sometimes classified as microreactors, according to the World Nuclear Association (WNA).

How are SMRs different from conventional reactors?

The main difference is scale and the way the reactor is designed and built.

Conventional nuclear reactors generally produce around 1,000 MWe or more per unit. SMRs have a much lower electrical output, generally up to 300 MWe. This smaller size allows them to be considered for locations where a large nuclear plant may not be practical, including smaller electricity grids, industrial sites and remote areas.

The "modular" element also relates to construction. SMR components, and in some cases complete reactor modules, can be manufactured in factories and transported to the site for assembly. The WNA says the approach is intended to support serial production and reduce on-site construction requirements.

SMRs can also be deployed incrementally. Additional modules can be added as electricity demand increases, depending on the reactor design.

How much power can an SMR produce?
The IAEA's upper limit for an SMR is 300 MWe per unit. This is roughly one-third of the generating capacity of a traditional nuclear reactor, according to the agency.

According to the European Commission, SMRs typically have a capacity of around 20 MWe to 300 Mwe. It said a 300-MWe SMR can produce up to 7.2 million kWh per day, compared with up to 24 million kWh a day for a large nuclear power plant with an output of more than 1,000 MWe.

There is no single reactor design for SMRs. The technology includes light-water reactors, fast neutron reactors, graphite-moderated high-temperature reactors and molten salt reactors, according to WNA.

Where are SMRs being developed?
The global SMR pipeline includes designs at different stages, from early development to construction and operation.

The OECD Nuclear Energy Agency's (NEA) digital dashboard currently tracks 129 SMR designs worldwide, although 79 are included in the dashboard's detailed assessments. The remaining designs include projects that have asked not to be included for now, as well as technologies that are not under active development or have been cancelled or paused.

The NEA's 2025 dashboard assessment covered 74 SMR designs. Seven designs were either operating or under construction at the time of that assessment.

The United States has the largest number of SMR siting announcements, with 28, according to data sourced from the NEA. Canada had nine and the United Kingdom seven.

Which countries have operating SMRs?
Russia and China are among the countries furthest ahead in deploying SMRs.

Russia's KLT-40S units are used at the Akademik Lomonosov floating nuclear power plant, which began commercial operation in 2020. The two units have a combined electrical capacity of 70 MWe.

China's HTR-PM is another operating SMR project. The NEA's 2025 dashboard also listed China's HTR-PM, Japan's HTTR and Russia's KLT-40S among three SMR designs already in operation, while several other designs were under construction.

Why are countries developing SMRs?
The smaller size of SMRs allows them to be considered for applications beyond conventional large-scale nuclear power plants.

The IAEA lists industrial applications, remote locations and areas with limited grid capacity among other potential uses. SMRs can also be used for electricity generation, heating, desalination and industrial steam, depending on the design.

India is considering SMRs for three specific applications. According to the government, they could be used to repurpose retiring fossil-fuel power plants, supply captive power to energy-intensive industries and provide electricity to remote, off-grid locations.

What is India's SMR plan?
India's Nuclear Energy Mission was announced in the Union Budget 2025-26. The government is pursuing large nuclear reactors at greenfield sites alongside SMRs for brownfield locations and specialised applications.

The Bhabha Atomic Research Centre is developing three indigenous designs: the 220-MWe Bharat Small Modular Reactor, the 55-MWe SMR-55 and a high-temperature gas-cooled reactor of up to 5 MWth. The government has set a target of at least five indigenous SMRs by 2033.
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