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Private Sector to Get Opportunities in India's Nuclear Energy Sector: PM

INDIA ENERGY FORUM 908 Chiranjiv Tower, 43 Nehru Place, New Delhi 110 019, India

Developing Sustaining and Strengthening Safety Culture in Nuclear Power Plants

R.V. Shahi

An unexpected pace of growth of Renewable Power, all over the world, has led to emergence of a number of other energy options in order to avail of the tremendous advantages, not only in terms of economy of power generation but also of a powerful impact on addressing climate change concerns. Nuclear Power, being a carbon free energy, along with many other options, have got the deserving boost in a matter of over last ten years. The latest International Energy Agency Report 2025 has noted

"Nuclear Power is making a comeback

Another common element across scenarios is the revival of fortunes for Nuclear Energy, with investments rising in both traditional large-scale plants and new designs, including small and Modular Reactors. More than forty countries now include Nuclear Energy in their strategies and are taking steps to develop new projects. In addition to Reactors that are restarting operation in Japan, there are more than 70 GW of new capacity under construction, one of the highest levels in thirty years……. With these developments, after more than two decades of stagnation, global Nuclear Power capacity is set to increase at least one third to 2035." This indeed is a very remarkable observation based on detailed analysis and it reflects global recognition of the fact that all options of energy sources which provide carbon less or carbon free power need to be embraced in the management of energy transition. Even though Solar Energy has emerged as the least expensive source of power and its growth has been phenomenal, and continues to be so, the limitation of its non-availability during nights makes it essential for searching solutions to this challenge. And, it is in this context that Nuclear Power has received renewed attention, as rightly observed by IEA "Nuclear Power is making a comeback".

In Indian context, the growth of Nuclear Power capacity has, in fact, been slow through several decades. India Energy Forum, a truly independent Think Tank {The Author is the President of IEF} has been organising Discussions, Debates, and Conferences with very senior level participation, focusing on **"why is it that Nuclear Power, despite being carbon free source of energy, has remained in the margin of Indian Power sector profile?**" These discussions, particularly over last three years, besides policy advocacies by several other organisations, have led to a very positive response by the Government of India. The recent decision of the Government to enhance the installed capacity of Nuclear Power from 8 GW as at present to 100 GW by the year 2047 is one of the most important and powerful initiatives toward energy transition in India.

There are three important steps to ensure implementation of this ambitious target. First, Nuclear Power Corporation of India, which has been in existence for about forty years and has already installed capacity of Nuclear Power Plant of the order of over 8,000 MW is being advised to upscale their targets considerably. Considering its track record of the operational performance and the support being provided by the Government, it should be possible for NPCIL to considerably enhance their annual generation capacity. Second, the existing Atomic Energy Act does provide scope for Nuclear Power Plant to be set up by other Government Companies. Under this provision, a beginning has been made with NTPC in JV with Nuclear Power Corporation. NTPC should be advised to have

its own plan of action and set up a chain of power plants for which they could engage experienced Consultants and employ trained Nuclear Engineers and Scientists. A few other public sector companies may also be allowed under the existing provision of the Act to contribute toward the Nuclear Power capacity build up. Third, the amendment to the legislation to open up the Nuclear Power generation to private sector may be put on fast track, so that public sector companies together with private sector organisations contribute toward augmenting the capacity at a fast pace and make serious efforts to ensure achieving the 100 GW capacity as per the targeted deadline.

In continuation of these efforts, IEF in association with Atomic Energy Regulatory Board of India and Indian Society of Nuclear Scientists, organised a Seminar focused on Safety Culture in Nuclear Power Plants right in the premises of Atomic Energy Regulatory Board with the Lead Presentation by none other than the Chairman of AERB. The Author had an opportunity to address this Seminar. India's track record of operating Nuclear Reactors and running the power plants has been highly satisfying. This should definitely give confidence to all concerned that the expansion plans with due regard to safety requirements will succeed. The Presentation made by the Chairman of the Atomic Energy Regulatory Board was so comprehensive and the performance of the past delivered through the systems, processes and procedures so well documented, that the country should feel proud that Indian Nuclear Engineers and Scientists have demonstrated not only complete adherence to the systems and processes but have also succeeded in their efforts through proper audit In securing the compliance as required. Nevertheless when the country is embarking upon multi fold expansions, it would be essential to ensure that all the systems, processes, and procedures, are re-visited in the light of any technology changes that may happen, in view of numbers, any locational weaknesses from the safety point of view that might get overlooked, the deployment of safety experts with suitable experience and training again in view of the number of projects which are concurrently taken up, all leading to possibility of enhancement of risk factors. The number and size of Nuclear Power Plants in the country as being projected would definitely require creation of a reviewed and renewed Safety Culture – A Culture in which not only safety personnel become a part of the process but also the entire team of personnel engaged in operations, maintenance and other related responsibilities provide their needed response in inculcating and maintaining such a Safety Culture. Experiences of incidences all over the world should be guiding the formulation and regular updating of all SOP's and, more importantly, disseminating these SOP's among the personnel followed by regular capacity building, so that performance in the matter of safety leads to a zero error outcome.

It is often misunderstood that safety is relevant mostly to operating the plant. The fact of the matter is that safety requirements commence from conception of the plant – the location being the most important factor. It is known that Nuclear Power Plants accidents do not affect only the personnel working in the plant, but these incidences affect extensively much larger areas around the plant. Therefore, safety considerations do have a bearing right from locations, going through the quality of Design and Engineering, quality of manufacturing (bad quality manufacturing will obviously enhance the possibility of mishaps), quality of operations, maintenance, overhauls, the transportation and logistics system – all these contribute toward the safe working of the Nuclear establishment. It might appear obvious that most of these factors are equally relevant to most of the industrial activities. Yet, what is important to note is that the very severity of the Nuclear Plant accidents and the consequences that follow require that exceptionally extraordinary care are taken at

every stage from concept to commissioning, and, thereafter to safely operate the plant.

The present structure of Atomic Energy Regulatory Board has eminently served the purpose has demonstrated its capability to comply with the strict requirements of safe operations of the plant. Its experiences over the years have facilitated re-assessment and consequent revision of the processes and SOP's. These will be extremely helpful in evolving a revised structure which will suit the requirement of the rapidly growing Nuclear Power capacity in different locations throughout the country. An internal Task Force with the support of some renowned International Experts/Consultants could help evolve the revised structure, systems, procedures, and SOP's. The most important requirement will be in the area of training and capacity building. And, it would be necessary that these reviews are dynamically carried out to match with the rapid expansion of a number of plants which will place additional burden on safety expectations. Personnel who are deployed in these plants have to be equally trained in respect of safety expectations, since safety cannot be left only to the safety experts, it has got to be the responsibility of every individual to create a safety culture in which the contribution by all will deliver the results. Safety appliance and safety gadgets are other important considerations where the knowledge gained on a global basis can provide more reliable insights into the nature of Personal Protective Equipment (PPE) which could be of relevance to different areas of working and different nature of equipment. In case of Nuclear Power Plant a concept of such PPE, in select cases can also be relevant for the neighbourhood.

Another important aspect that the Author emphasized in the colloquium, having over two hundred Scientists and Engineers, related to the narrative that often gets projected for and against Nuclear Power Plants, specially from the point of view of safety and health hazards. Quite often among Nuclear Scientists themselves different groups emerge countering the narrative of each other. India has experienced this on several occasions when initiatives launched could get considerably delayed or not proceeded with due to such controversial narratives which create confusions mainly against the large-scale expansions of power capacities. General public obviously get frightened and quite often this causes serious pockets of resistance including agitations against Nuclear Power Plants. The point has been made earlier in this paper that India's Scientists and Engineers have demonstrated highly satisfying track record of Nuclear Reactors. In this very Seminar the Chairman of Atomic Energy Regulatory Board made a very comprehensive presentation on systems and procedures including specific SOP's which have been designed and implemented, and these undergo regular reviews based on experiences. The Chairman also empathically suggested that once the Government decides to carry out expansions, setting up of new projects, whether in private sector or public sector, AERB was fully competent to respond to these requirements. Systems and procedures could be adapted to the needs considering the specific designs and operating procedures. Obviously, when the dimension of expansion is large, the AERB will need to be suitably strengthened. There could not be a better articulation of what India's Atomic Energy Regulatory Board is confident about and its support for the expansion plans being envisaged by the Government of India.

Besides a highly satisfying and positive assertion of the confidence that the AERB has in respect of the ambitious capacity building plans and its commitment to ensure their safe working, the Author has also tried to collect global experiences in this regard. The World Nuclear Association in its Report updated in February, 2025, (reference is being given in this paper for appreciating the whole Report) has very aptly

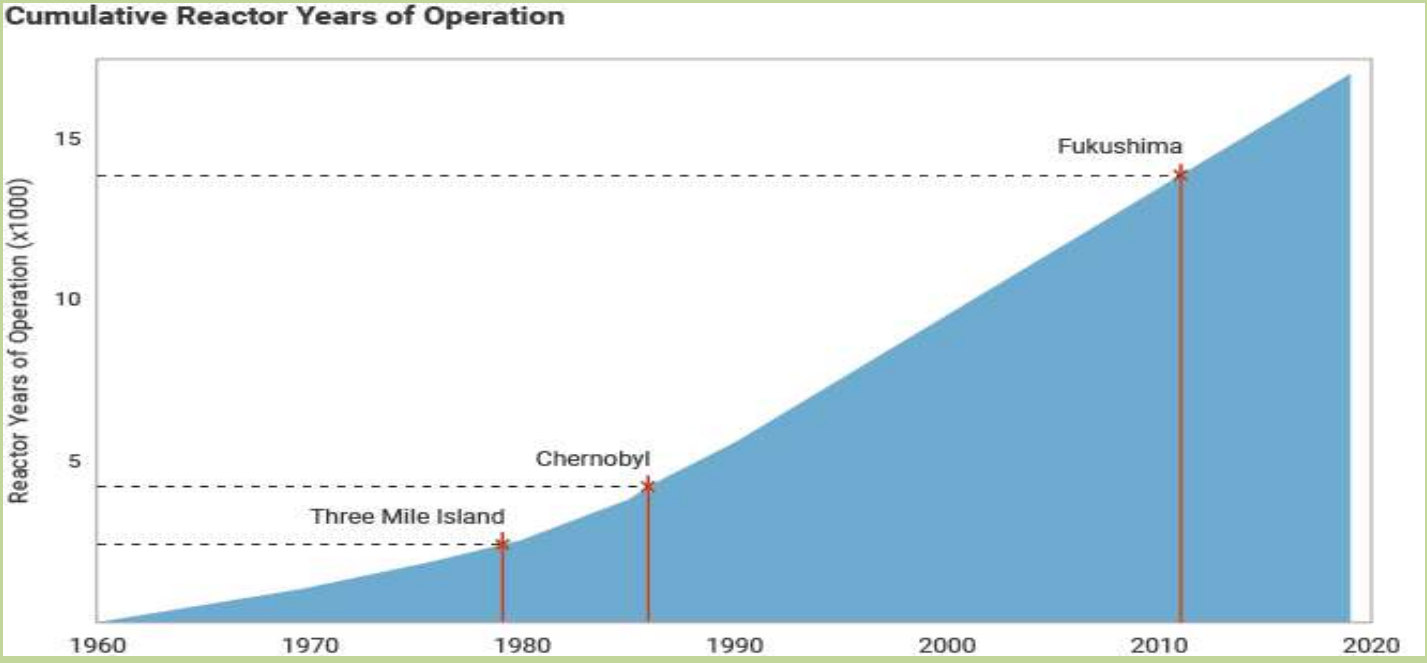
articulated about the apprehensions with regard to safety in Nuclear Power Stations. While the Report is large it is considered desirable to give a few extracts in this regard:

"Apart from Chernobyl, no nuclear workers or members of the public have ever died as a result of exposure to radiation due to a commercial nuclear reactor incident. Most of the serious radiological injuries and deaths that occur each year (2-4 deaths and many more exposures above regulatory limits) are the result of large uncontrolled radiation sources, such as abandoned medical or industrial equipment. (There have also been a number of accidents in experimental reactors and in one military plutonium-producing pile – at Windscale, UK, in 1957 – but none of these resulted in loss of life outside the actual plant, or long-term environmental contamination.) See also Table in Appendix 2: Serious Nuclear Reactor Accidents.

"The evidence over six decades shows nuclear power is a safe means of generating electricity The risk of accidents in nuclear power plants is low and declining. The consequences of an accident or terrorist attack are minimal compared with other commonly accepted risks. Radiological effects on people of any radioactive releases can be avoided"

"It should be emphasized that a commercial-type power reactor simply cannot under any circumstances explode like a nuclear bomb – the fuel is not enriched beyond about 5%, and much higher enrichment is needed for explosives."

This Report must set at rest the controversies and confusions that often over shadow the positive aspects of Nuclear Power Plants, and a few accidents, when over projected, portray more of the disadvantages compared to the advantages that the Nuclear Energy delivered power brings to the benefit of humanity, and more particularly provides a reliable solution to the challenge of having carbon free power.



(Source : https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors)

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Dear Reader,

The October 2025 issue of Total Energy is with you now.

During the month, IEF organized an interesting Webinar on "Challenges in implementation of CSP Technology-Role of R&D" on 28th Nov.2025. It was participated by speakers from CSIR, NTPC, BITS Pilani and SECI, besides President IEF and Chairperson of the newly formed Vertical on Research & Technology. Detailed Report is in this issue.

Preparation by IEF is also on by the Power Vertical for its 24th Power Conference on 23rd December, 2025 in Delhi. It will focus on the subject of "Reliability & Resilience in a high Renewable Power System". A theme paper on the subject is being written by BDO.

The Bill on allowing participation of private sector in building Nuclear Power Plants in the country is expected to be introduced in the forthcoming winter session of Parliament. If passed, it will pave the way for faster upscaling of Nuclear Power Generation capacity to achieve the 100 GW target by 2047

S M Mahajan

MNRE to launch new Small Hydro Policy to boost North East's renewable energy capacity: Joshi

The ministry of new and renewable energy (MNRE) will soon launch a new Small Hydro Policy to boost clean energy development in the North Eastern region, Union Minister for New and Renewable Energy Pralhad Joshi said recently.

Addressing the Regional Workshop on Renewable Energy for the North East Zone in Guwahati, Joshi said the policy would "immensely benefit the North East" by supporting projects in the region's hilly and riverine terrain, which is suitable for small hydro development.

The workshop, organised by MNRE, was attended by MNRE Secretary Santosh Sarangi, energy ministers from North Eastern States, and senior officials.

Joshi said the North East has a renewable energy potential of 122 GW, but only 5.1 GW has been installed so far. He urged states to accelerate the implementation of key central schemes such as PM-Surya Ghar: Muft Bijli Yojana and PM-KUSUM.

"Only about 54,545 households in the North East have benefitted under PM-Surya Ghar Yojana," Joshi said, calling on states to increase participation in the scheme.

The minister highlighted the region's potential in solar, small hydro, and biomass energy, adding that expanding local adoption will help the region contribute significantly to India's renewable energy targets.

He also commended Assam, under Chief Minister Himanta Biswa Sarma, for being among the first states to notify a comprehensive Integrated Clean Energy Policy.

Reaffirming MNRE's commitment to supporting the region, Joshi said the ministry will continue to provide

both policy and financial assistance to strengthen renewable energy development in the North East.

Energy ministers from Assam, Arunachal Pradesh, Nagaland, Sikkim, Meghalaya, and Tripura presented their progress and challenges in renewable implementation during the workshop.

The event also featured discussions on Green Hydrogen, decentralized renewable systems, and financing models to improve regional cooperation.

Joshi appreciated the performance of Tripura and Arunachal Pradesh under PM-KUSUM and Assam and Mizoram under PM-Surya Ghar, presenting certificates to recognise their achievements. The Best Performing DISCOM, District, and vendors from the region were also felicitated.

The workshop concluded with a call for stronger coordination between the Centre, North Eastern States, and industry stakeholders to tap the region's renewable potential and ensure an energy-secure future.

MNRE asks power regulator CERC to review draft norms for renewable energy sector

The Ministry of New and Renewable Energy (MNRE) has asked power regulator, CERC, to review its draft regulation for renewable energy projects, saying the proposed norms may discourage investments in the sector, sources said.

Earlier in September, the Central Electricity Regulatory Commission (CERC) issued a draft framework for clean energy producers (wind and solar) within the Deviation Settlement Mechanism.

The framework, planned for implementation in April 2026, aims to lessen the gap between the permitted difference between committed supply and actual generation.

A source privy to the development told PTI that MNRE has shot off a letter to the CERC for reviewing the issue and has sought suggestions from the power regulator.

This assumes significance in view of India's ambitious target of having 500 GW of renewable energy by 2030.

According to experts, India needs to add at least 50 GW of renewable energy capacity every year till 2030 to meet the target.

They said that stricter norms may affect investment in the sector.

According to the Central Electricity Authority (CEA), India has a renewable energy capacity of 250 GW, including 50 GW of large hydro projects (above 25 MW), 130 GW of solar, 54 GW of wind energy and 10 GW of biomass power as of October 31, 2025.

Presently, the government is grappling with the issue of non-signing of power sale agreements for about 40 GW of renewable energy projects.

Power sale agreements are necessary to avail finance for these projects.

Earlier, on many occasions, top officials in the ministry flagged the issue and sought an earlier resolution to achieve the ambitious target of 500 GW by 2030.

India's renewable energy sector hits record 25GW capacity addition in H1 FY26

India's renewable energy sector continues to maintain strong momentum, with the first half of the current fiscal year witnessing a record capacity addition of about 25GW (24,833MW), the highest ever in a sixmonth period, driven largely by the solar power segment.

Of the total capacity of 25GW (excluding large hydro) added during April-Sept 2025, the solar power sector - encompassing ground-mounted, rooftop, hybrid, and off-grid segments - contributed around 21.7 GW, while the wind energy sector added 3.09 GW, according to data from the Union Ministry of New and Renewable Energy (MNRE).

The wind power segment also appears to be regaining momentum, with new capacity additions rising steadily. It added 4.2GW in FY25 and 3.3GW in FY24.

"Increased uptake from the corporate and industrial segment and higher installations of tender-driven projects allotted 1.5 years to 2 years ago have supported growth. The wind sector is likely to add more capacity, driven by new renewable procurement mechanisms such as wind-solar hybrids, wind/solar with energy storage systems (ESS), and Firm & Dispatchable Renewable Energy (FDRE) tenders gaining traction," said Jyoti Gulia, CEO, JMK Research.

Solar capacity in the country has surged from just 3GW in 2014 to 127GW now. The cumulative wind power capacity stood at 53GW.

CERC Adopts Tariff for SECI's 420 MW Round-the-Clock Renewable Energy Projects

The Central Electricity Regulatory Commission (CERC) has adopted the tariff for 420 MW of round-the-clock (RTC) renewable energy power projects with energy storage systems under the Solar Energy Corporation of India Limited's (SECI) RTC-IV tender.

In an order dated November 22, 2025, the three-member CERC bench approved the tariff discovered through a transparent competitive bidding process conducted under Section 63 of the Electricity Act, 2003.

The projects were awarded to four developers at tariffs ranging from INR 5.06 to INR 5.07 per kWh, representing what SECI described as the first-of-its-kind RTC renewable energy tender with stringent performance criteria.

Successful Bidders and Capacity Allocation
Following an electronic reverse auction conducted on May 26, 2025, SECI awarded a total of 420 MW capacity to four successful bidders out of an original tender floated for 1,200 MW.

Hero Solar Energy Private Limited secured the largest allocation of 120 MW at a tariff of INR 5.06/kWh, while Hexa Climate Solutions Private Limited won 100 MW at the same rate. Jindal India Power Limited was awarded 150 MW at INR 5.07/kWh, and Sembcorp Green Infra Private Limited received 50 MW, also at INR 5.07/kWh.

The tender attracted five bidders offering an aggregate capacity of 540 MW, all of whom met the techno-commercial criteria and qualified for the financial bid opening.

The competitive bidding process, conducted through the ISN Electronic Tender System (ISN ETS) e-bidding portal, followed the Guidelines for Tariff-Based Competitive Bidding Process for Procurement of Firm and Dispatchable Power from Grid Connected Renewable Energy Power Projects with Energy Storage Systems, dated June 9, 2023, issued by the Ministry of Power.

Project Configuration and Requirements
The awarded projects will combine solar, wind, and battery energy storage systems to deliver firm, round-the-clock power. For instance, Hero Solar Energy's 120 MW project will comprise 175 MW of solar capacity, 160 MW of wind capacity, and 75 MW/300 MWh of energy storage systems (ESS), with interconnection at the 220 kV level at the Lakadia-II CTU substation.

Energy storage systems are mandatory for all projects, and the ESS must be charged exclusively using renewable energy sources to qualify as RE power. Developers have the flexibility to own the ESS or tie up with third parties for power supply. The PPAs are valid for 25 years from the Scheduled Commencement of Supply Date (SCSD).

The CERC order noted that the discovered tariff was deemed reasonable by SECI's Bid Evaluation Committee despite being higher than recent comparable tenders. The committee compared the RTC-IV tariff with the SJVN FDRE-3 tender issued in February 2025, which yielded tariffs ranging from INR 4.82/kWh to INR 4.91/kWh.

However, the committee emphasized that the SECI RTC-IV tender imposed more stringent performance and dispatchability criteria, justifying the marginally higher tariff.

The Bid Evaluation Committee stated that "the tariff was to be viewed not merely as an energy cost, but as the price of firm renewable capacity and reliability," justifying the discovered tariff range of INR 5.06-5.07/kWh.

Bidding Process Timeline
The competitive bidding process began with SECI issuing the Request for Selection (RfS) on October 28, 2024. Following a pre-bid meeting on November 14, 2024, and nine corrigenda and two amendments to the RfS documents between October 2024 and March 2025, the last date for bid submission was March 24, 2025.

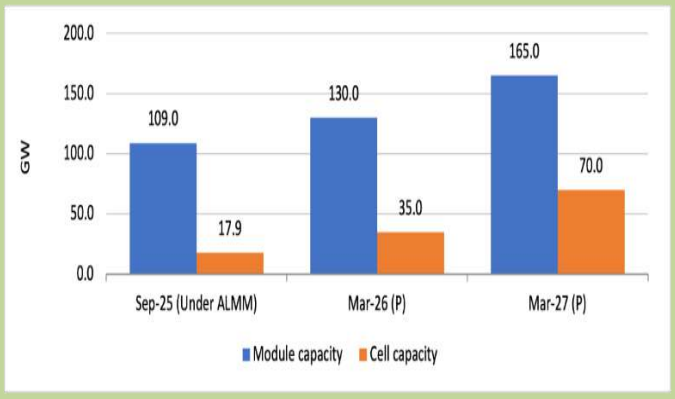
Techno-commercial bids were opened on March 27, 2025, and financial bids on May 26, 2025, with the e-reverse auction conducted on the same day. Letters of Award (LoAs) were issued to successful bidders on June 11, 2025.

India's solar module manufacturing capacity to cross 165 GW by 2027: ICRA

India's solar module manufacturing capacity is projected to cross 165 gigawatts (GW) by March 2027 from about 109 GW currently, according to credit rating agency ICRA. The expansion, driven by policy support such as the Approved List of Models and Manufacturers (ALMM), basic customs duty on imports, and the production-linked incentive (PLI) scheme, could lead to overcapacity and squeeze margins for solar module makers.

ICRA added that the country's solar cell manufacturing capacity is expected to expand sharply to about 100 GW by December 2027 from 17.9 GW at present, as the implementation of ALMM List-II for solar PV cells from June 2026 prompts new investments by module original equipment manufacturers.

Current and projected solar PV module and cell manufacturing capacity in India (GW)

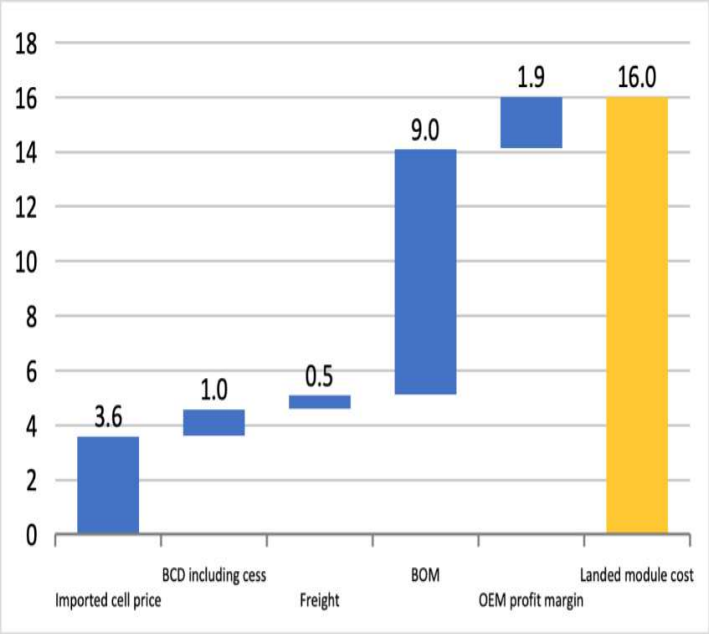


Source: ICRA Research; Ministry of New and Renewable Energy (MNRE); P - ICRA Projections

However, annual domestic solar installations are expected to be about 45–50 GW, compared to a likely annual module output of 60–65 GW, signalling potential oversupply. The situation has been compounded by the recent imposition of US tariffs, which have curtailed exports and diverted supply to the domestic market.
"The operating profitability for ICRA's sample set of domestic solar OEMs, which remained elevated at around 25 per cent in FY2025, is likely to moderate due to competitive pressures and overcapacity buildup," said Ankit Jain, Vice-President & Co-Group Head, Corporate Ratings, ICRA.

Jain added that while the ALMM requirement for cells from June 2026 will support local manufacturing, the cost of modules using domestic cells is expected to be higher by 3–4 cents per watt compared to those using imported cells.

Landed cost of solar PV modules sourced from domestic OEMs (cents/watt) using imported PV cells



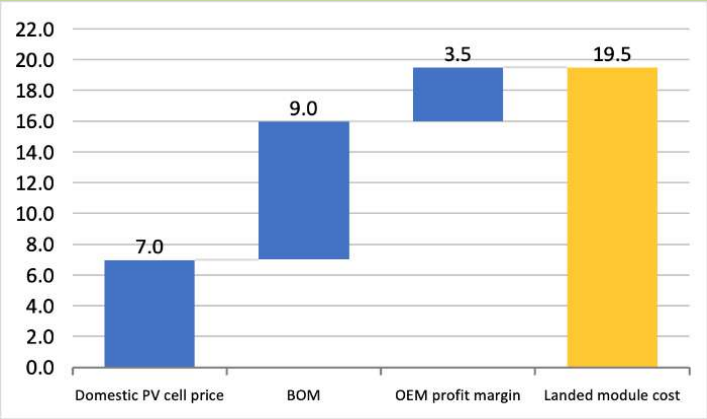
Source: ICRA Research, Infolink

Exemptions and near-term outlook

ICRA noted that projects with bid submission dates before September 1, 2025, accounting for a pipeline of 45–50 GW, will be exempted from the use of ALMM-listed solar cells even if commissioned after June 2026. This will offer temporary support for module makers without integrated cell manufacturing capacity.

However, bidding activity has slowed in recent months — a key factor to watch, according to the agency.

Landed cost of solar PV modules (cents/watt) using domestic cells



Source: ICRA Research, Infolink

Global dependency and technology risks

The global solar manufacturing value chain remains dominated by China, with over 90 per cent share in polysilicon and wafer production, 85 per cent in cells, and 80 per cent in modules. India's dependence on Chinese wafers and ingots poses risks, particularly if geopolitical restrictions disrupt technology or machinery supplies. Backward integration into wafers and ingots demands significant capital and technical expertise, making project execution and stabilisation key challenges for Indian OEMs. ICRA emphasised that while overcapacity could lead to industry consolidation, vertically integrated players with cell and module capabilities are better placed to withstand pricing pressures and protect margins over the long term.

The research suggests that reusing materials such as silicon, copper, aluminium and silver from discarded solar panels could meet 38 per cent of India's solar manufacturing material requirements and prevent 37 million tonnes of carbon emissions by replacing virgin resources with recycled ones.

By 2047, India's installed solar capacity is projected to generate over 11 million tonnes of solar waste, primarily from crystalline silicon modules. Managing this volume would require an estimated 300 recycling facilities across the country and ₹4,200 crore in investments, CEEW noted.

Recycling yet to become viable

According to the twin reports, solar module recycling remains financially unviable in its current form, with recyclers incurring losses of ₹10,000–₹12,000 per tonne. The largest cost driver is the procurement of used modules — about ₹600 per panel, or two-thirds of total expenses.

It added that recycling could become profitable if module prices fall below ₹330 per panel, or through mechanisms such as Extended Producer Responsibility (EPR) certificate trading, tax incentives, and research support for efficient recovery of materials like silicon and silver.

"India's solar revolution can power a new green industrial opportunity. By embedding circularity into our clean energy systems, we can recover critical minerals, strengthen supply chains, and create green

jobs while turning potential waste into lasting value," said Rishabh Jain, Fellow, CEEW.

"Solar recycling can bridge India's clean energy and manufacturing ambitions. By promoting recyclability and circular product demand, India can turn its solar waste challenge into a green industry opportunity," said Akanksha Tyagi, Programme Lead, CEEW.

India adds 4.9 GW rooftop solar capacity in Jan-Sept period of 2025; installations soar 161% YoY: Report

India installed a record 4.9 GW of rooftop solar capacity in the first nine months (9M) of 2025, marking a 161 per cent year-on-year increase from 1.9 GW added during the same period in 2024, according to a recent report by Mercom India

According to the report, rooftop solar additions in Q3 2025 reached an all-time high of 2.1 GW, up 29 per cent quarter-on-quarter from 1.6 GW in Q2 2025 and 164 per cent higher than the 791.1 MW installed in Q3 2024. The PM Surya Ghar residential rooftop program remained the biggest driver, contributing 73 per cent of installations during the quarter.

"Residential installations, which made up only a third of rooftop solar three years ago, now account for 75 per cent of the market. We expect this trend to continue until the PM Surya Ghar target is reached. The awareness created by the program is also likely to influence smaller C&I customers and encourage them to go solar," said Raj Prabhu, CEO of Mercom Capital Group.

Industrial consumers accounted for about 20 per cent of Q3 installations, while commercial and government segments contributed nearly 6 per cent and slightly over 1 per cent, respectively. The CAPEX model dominated Q3 deployment, making up 84 per cent of total installations.

"To keep this momentum on track, quality control in residential systems and persistent cost and supply challenges will need ongoing attention from the policymakers," Prabhu added.

Uttar Pradesh led rooftop additions in Q3 with 16 per cent of installations, followed by Maharashtra (over 15 per cent) and Gujarat (14 per cent). The top ten states contributed more than 80 per cent of the country's quarterly rooftop additions.

For the first nine months of 2025, Gujarat was the top contributor with over 16 per cent of national installations, followed by Maharashtra and Rajasthan at nearly 16 per cent and 15 per cent, respectively. India's cumulative rooftop solar capacity reached 18.6 GW as of September 2025.

Assam recorded the fastest growth, posting a more than 35 per cent compounded quarterly growth rate between Q3 2024 and Q3 2025.

Rooftop solar tender activity also surged, with more than 1.5 GW issued in Q3 2025 — a 19 per cent quarter-over-quarter and 311 per cent year-over-year increase. However, auctions dropped to just over 6 MW in the quarter, down 87 per cent from Q2 2025 but up 200 per cent compared to Q3 2024.

India's solar boom could generate ₹3,700 crore recycling market by 2047: CEEW

India's growing solar sector could create a recycling market worth nearly ₹3,700 crore by 2047, according to new studies by the Council on Energy, Environment and Water (CEEW). The research suggests that reusing materials such as silicon, copper, aluminium and silver from discarded solar panels could meet 38 per cent of India's solar manufacturing material requirements and prevent 37 million tonnes of carbon emissions by replacing virgin resources with recycled ones.

By 2047, India's installed solar capacity is projected to generate over 11 million tonnes of solar waste, primarily from crystalline silicon modules. Managing this volume would require an estimated 300 recycling facilities across the country and ₹4,200 crore in investments, CEEW noted.

Recycling yet to become viable

According to the twin reports, solar module recycling remains financially unviable in its current form, with recyclers incurring losses of ₹10,000–₹12,000 per tonne. The largest cost driver is the procurement of

used modules — about ₹600 per panel, or two-thirds of total expenses.

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“India’s solar revolution can power a new green industrial opportunity. By embedding circularity into our clean energy systems, we can recover critical minerals, strengthen supply chains, and create green jobs while turning potential waste into lasting value,” said Rishabh Jain, Fellow, CEEW.

“Solar recycling can bridge India’s clean energy and manufacturing ambitions. By promoting recyclability and circular product demand, India can turn its solar waste challenge into a green industry opportunity,” said Akanksha Tyagi, Programme Lead, CEEW.

India’s green economy could draw $4.1 trillion in investments by 2047: Report

India could attract ₹360 lakh crore ($4.1 trillion) in cumulative green investments and create 48 million full-time equivalent (FTE) jobs by 2047, according to a new national study released by the Council on Energy, Environment and Water (CEEW).

The study estimates that India could unlock an annual ₹97.7 lakh crore ($1.1 trillion) green market by 2047, mapping 36 green value chains across the energy transition, circular economy, and bio-economy.

“India today imports 87 per cent of its crude, which can be reduced to zero with electric vehicles, solar energy and next-generation bioethanol and biodiesel. We import 100 per cent of our lithium, nickel and cobalt, and even 93 per cent of copper ore—all of which can become zero-import with a circular economy,” said Abhishek Jain, Director, Green Economy and Impact Innovations, CEEW.

According to the analysis, the energy-transition segment could generate 16.6 million FTE jobs and attract $3.79 trillion in investments across renewables, storage, distributed energy and clean-mobility manufacturing. Electric mobility is projected to account for more than half of these jobs.

“With much of our infrastructure yet to be built, we have a unique chance to design cities, industries and supply chains around circularity, clean energy and the bioeconomy,” said Amitabh Kant, former G20 Sherpa, former CEO, NITI Aayog, and Chairman, GEC.

CEEW also announced the launch of the Green Economy Council, chaired by former G20 Sherpa Amitabh Kant, to identify and support emerging opportunities in these sectors.

The bio-economy and nature-based solutions could create 23 million jobs and unlock $415 billion in market value. Key job-generating areas include chemical-free agriculture, bio-inputs, agroforestry and wetland management.

The circular economy could contribute $132 billion in annual output and create 8.4 million FTE jobs, mainly across waste collection, recycling, refurbishment and material recovery.

The analysis emphasised the importance of women’s participation in India’s green-economy shift and recommended gender-responsive skilling, secure working conditions and financial support for women-led enterprises.

India will be largest contributor to global energy demand growth till 2035, says IEA

India will be the largest contributor to global energy demand growth till 2035, with its growth in demand being as much as demand growth in China and all Southeast Asian countries combined, according to the International Energy Agency’s World Energy Outlook.

India will also be the largest contributor to growth in oil demand also in this period, the second-largest for electricity generation and coal demand growth, and third-largest, for natural gas demand growth, the agency added.

IEA has also projected that the share of non-fossil sources in installed generation capacity which is already 50% in India will rise to 70% in 2035 and that India will account for over 95% of global capacity increase of non-fossil sources by 2035.

Every year between now and 2035, India will add the equivalent of one Bengaluru to its urban population. And every day in this period, it will add nearly 12,000 cars to its roads.

In support of its long-term objective of net zero emissions by 2070, in 2022 India announced an objective to increase the share of non-fossil sources in the power generation mix to 50% by 2030. India met this target for grid-connected capacity in 2025, five years ahead of schedule. “This success was underpinned by surging investment in renewables. In 2015, every dollar invested in fossil power generation sources in India was broadly matched by a dollar invested in non-fossil sources, a 1:1 ratio. By 2025, this ratio had increased to 1:4 in favour of non-fossil sources. Solar PV alone has attracted $ 113 billion in cumulative investment in the past decade, compared with $ 112 billion for all fossil fuel power generation sources combined,” the IEA said.

Non-fossil sources are likely to contribute to over half of electricity generation in India by 2035. This reduces the carbon intensity of electricity generation by nearly 45% to around 400 grammes of carbon dioxide per kilowatthour, which narrows India’s gap with the global average level of carbon intensity of electricity generation. Other benefits include significant declines in emissions of key air pollutants such as fine particulates and sulphur dioxide,IEA has said.

The rising share of variable renewables in power generation brings with it both challenges and opportunities. One challenge is the need for investment in storage and transmission to facilitate the deployment of renewables. Over 230 gigawatt-hours (GWh) of battery storage are likely to be added to the system by 2030. The government is in the process of putting out tenders for new storage capacity.

Traditional energy risks affecting the security of oil and gas supply are now accompanied by other major concerns especially critical minerals due to high levels of market concentration. China mines 50% of the world’s rare earth elements but refines and produces almost 90% of processed rare earth elements and industrial products, utilising extremely polluting and energy-intensive processes.

HT reported recently that access to critical minerals has emerged as a key factor in India’s pursuit of its long-term net zero emissions goal, prompting the country to sign agreements with resource-rich nations including Australia, Argentina and Chile for mining, exploration and investment, whilst launching a ₹34,300 crore (approximately $4 billion) National Critical Mineral Mission to secure supplies amid China’s tightening control over global reserves and processing.

“When we look at the history of the energy world in recent decades, there is no other time when energy security tensions have applied to so many fuels and technologies at once – a situation that calls for the same spirit and focus that governments showed when they created the IEA after the 1973 oil shock,” said IEA Executive Director Fatih Birol in a statement.

“This report confirms India is a global leader in the energy transition, having met its 50% non-fossil capacity target five years ahead of schedule. It proves that ambitious renewable-energy goals are not only possible; they are being delivered in the Global South. India is showing how to power a growing economy with clean energy. The report notes that India is set to be the ‘largest source of energy-demand growth in the world’. Our challenge is to meet this demand cleanly,” said Harjeet Singh, Climate Activist and Founding Director, Satat Sampada Climate Foundation.

Three Coal Blocks Successfully Auctioned in 13th Round of Commercial Auctions

The Ministry of Coal have successfully auctioned three coal blocks under the 13th round of commercial coal mine auctions. The ministry launched the 13th round of commercial coal block auctions on August 21, 2025. Following this, the forward auctions were conducted from November 20 to November 25, 2025, during which the three fully explored coal blocks were successfully auctioned. Together, these blocks hold geological reserves of approximately 3,306.58 million tonnes, with a cumulative Peak Rated Capacity (PRC) of 49 MTPA.

The block-wise result for auctions held is as under:

Name of Block	PRC (MTPA)	Geological Reserves (MT)	Closing Bid Submitted By	R Price (%)	F Offer (%)	Coking/ Non-Coking
Pirpainti Barahat Jharkhand	25.00	798.56	Damodar Valley Corporation	4.00	5.50	Non-coking
Dhulia North Jharkhand	14.00	1181.25	Damodar Valley Corporation	4.00	5.50	Non-coking
Mandakini-B Odisha	10.00	1326.77	Damodar Valley Corporation	6.00	12.75	Non-coking

*In case of Takua coal block, no bids were received in the Final Offer stage and hence, no closing bid was received.

These three blocks are poised to generate annual revenue of approximately ~₹4,620.69 crore, and likely to attract capital investment of nearly ₹7,350 crore, and create 66,248 employment opportunities.

Since the inception of commercial coal mining in 2020, a total of 136 coal blocks have been auctioned successfully, with a production capacity of 325.04 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 ₹43,330 crore, mobilize capital investment of ₹48,756 crore, and generate 4,39,447 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.

India's coal production & despatch fell for second consecutive month in October 2025

India's coal production and despatch declined for the second consecutive month in October this year largely in line with lower demand for the dry fuel from the Power sector, which also reflected in lower electricity consumption.

According to the Coal Ministry, the pan-India production fell by 8.5 per cent Y-o-Y to 77.43 million tonnes (mt) in October 2025 on a provisional basis. Despatch also declined by almost 5 per cent Y-o-Y to 80.44 mt.

The IIP numbers for last month also share a similar picture. Coal production (weight: 10.33 per cent) declined by 8.5 per cent Y-o-Y in October 2025. Its cumulative index declined by 2 per cent Y-o-Y during April-October FY26.

Pan-India lignite production also declined back-to-back for two months ending October 2025. While production fell by a little over 1 per cent to 3.04 mt last month, despatch of the commodity rose by 1.34 per cent to 3.40 mt.

India's energy consumption hit 132 billion units (BUs) in October 2025 declining by 6 per cent Y-o-Y.

Coal power generation was lower on an annual basis in October 2025 and April-October 2025 at 93.61 BU and 718.02 BU, respectively, against 108.76 BU and 760.50 BU in October 2024 and April-October 2024, respectively. Coal accounted for 67.21 per cent of

India's total power generation, up from around 63 per cent in September 2025.

Lower demand for coal also led to a fall in requirement for railway rakes. The loading of rakes fell by 3.47 per cent Y-o-Y to 289.6 rakes per day. For the Power sector, the requirement declined by 5.49 per cent Y-o-Y to 254.8 rakes per day.

Lower demand for electricity also reflected in lower prices on power exchanges. For instance, Indian Energy Exchange (IEX) said that enhanced hydro, wind, and solar generation, combined with steady supply from coal-based generation resulted in higher supply liquidity on the exchange platform, leading to a decline in DAM and RTM prices.

The market clearing Price in the Day Ahead Market (DAM) at ₹2.67 per unit during October 2025, a fall of 32 per cent on an annual basis. Similarly, price in the Real Time Market (RTM) fell by almost 28 per cent Y-o-Y to Rs 2.73 per unit.

Interestingly, the production and despatch of coal had also declined for two consecutive months in June and July 2025 as monsoon rains impacted mining activity. The monsoon months are characterised by lower consumption of electricity, which reflects in lower demand for coal and hereby lower supplies are required.

Historically, coal and mining operations enter the slow lane during the four-month monsoon season. They pick up from October to March in line with festival, marriage season and travel season.

However, the year 2025 has been an outlier in terms of India's power consumption declining from May onwards as early rains cooled temperatures, unlike 2024 when the country's peak power demand rose to 250 gigawatts (May 2024), an all time high record.

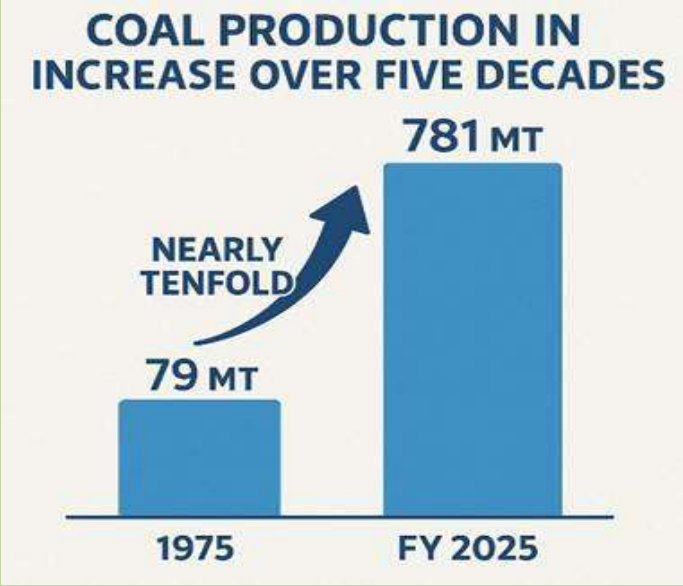
In order to meet future demand of coal through indigenous sources and to reduce non-essential import of coal, domestic coal production is expected to grow by 6-7 per cent annually in the next few coming years to reach about 1.5 billion tonnes by FY30.

The all-India domestic coal production rose by around 5 per cent Y-o-Y to 1,047.67 mt in FY25 against 997.83 mt in FY24.

Coal India Limited Celebrates 50 Glorious Years of Nation Building

Coal India Limited (CIL), a Maharatna Public Sector Undertaking under the Ministry of Coal, is marking a momentous milestone — completing 50 years of its establishment. CIL stepped into its 51st year of foundation on 1st November 2025. Established on 1st November 1975, CIL was formed as the apex holding company of the nationalized coking coal mines (1971) and non-coking coal mines (1973). With a dedicated workforce of over 2.2 lakh employees, CIL remains one of the largest corporate employers in the country.

The *MAHARATNA* coal behemoth's production increased nearly tenfold in five decades by 702 million tonnes (MTs) from 79 MTs in its year of founding in 1975 to 781 MTs at the closure of FY 2025. Similarly, during the referred period coal supplies were up by 685 MTs from 78 MTs to 763 MTs.



Interestingly, production and off-take pace was fastest during the last decade with production raising from 494 MTs during FY 2014-15 to FY 781 MTs in 2024-25, which was a high trajectory jump of 287 MTs. This is close to 41% of the entire increase of 702 MTs that CIL achieved in five decades. The decadal growth in coal off-take also was high at 40%, up in volume terms by 274 MTs from 489 MTs in FY 2014-15 to 763 MTs in FY 2024-25.

“For any company to be in the forefront of the country’s energy sector persistently for 50 years, accounting for 75% of the nation’s entire coal output is a notable achievement” said a senior executive of CIL. This highlights CIL’s increasing commitment and the Coal Ministry's impetus to take up the coal production to higher orbit.

This year’s CIL’s foundation day coincided with Shri. P M Prasad relinquishing his office as Chairman on reaching superannuation. Shri. Sanoj Kumar Jha, Additional Secretary, Ministry of Coal stepped in holding the additional charge as Chairman CIL. Shri B Sairam, CMD of Northern Coalfields Limited, a subsidiary of CIL, was selected for CIL Chairman’s post by the country’s governmental headhunter Public Enterprises Selection Board but is yet to formally take charge.

Diversification Ventures

Apart from its core competency, CIL is stepping big into diversification initiatives like setting up solar power plants of 3000 MW by FY 2028 in the first phase, critical mineral acquisitions, coal gasification etc.

As diversification, CIL established a JV with a stake of around 30 percent with Hindustan Urvarak Rasayan Limited (HURL) to set up three mega fertilizer plants. All the three plants have become operational generating profits from FY 2024. During the last two financial years combined CIL’s portion of Profit was Rs. 900 Crores. HURL has also declared the first ever interim dividend where CIL’s share was Rs.404 Crores out of the total of Rs.1343 Crores.

CIL is actively participating in domestic auctions of critical minerals held by the Ministry of Mines. It is also scouting for acquiring assets overseas in mineral rich countries like Australia, Argentina and Chile with focus on lithium, graphite and cobalt. The company has already emerged as preferred bidder for two graphite blocks one each in Madhya Pradesh and Chattisgarh. CIL was also the preferred bidder for the Ontillu-Chandragiri REE block in Andhra Pradesh and secured the Exploration License for this block targeting Rare Earth Elements.

CIL is pursuing three gasification projects aligning with three Indian PSUs, through joint venture mode for ammonium nitrate and synthetic natural gas. Coal Gasification Plant Development and Production Agreement was signed with the Ministry of Coal for financial support of Rs.1350 Crores for each project.

Workers’ Welfare

Recently, to strengthen social security and pensionary benefits for coal mine workers, Coal Ministry introduced a new draft legislation “Coal Mines Employees’ Provident Fund and Miscellaneous Provisions Bill, 2025”. Comments are being sought on this.

Enhancing the Workers’ Welfare starting September 17 the ex gratia payment for coal workers for fatalities from mine accidents, compensation has been raised from Rs. 15 lakh to Rs. 25 lakh. This applies equally to regular and contract workers under Coal India's "We Care" initiative. Regular Coal workers will get additional personal accident insurance cover of Rs 1 crore. Contract workers are now covered with a Rs. 40 lakh insurance policy for the first time. Employees are not required to pay any premium for this coverage making it a truly welfare-oriented measure.

As an important arm of inclusive growth, CIL and its coal companies under CIL booked an expenditure of Rs. 6,149 Crores in last ten years. This is 26% higher than the statutory requirement. During FY 2024-25 CIL’s CSR spend at Rs. 850 Crores grew by 30% compared to Rs. 654 crore of FY 2023-24. CIL’s flagship CSR initiative is Thalassemia Bal Sewa Yojana under which CIL has provided financial aid for treatment of more than 800 children suffering from Thalassemia and aplastic anemia.

As CIL enters its 51st year, it stands committed to continuing its legacy of powering India’s growth while advancing toward a sustainable, self-reliant, and carbon-conscious future.

Coal India production drops 9.8% to 56.4 MT in Oct

CIL recently said its production declined 9.8 per cent to 56.4 million tonnes (MT) in October. The company's production was 62.5 MT in the corresponding month of the previous fiscal year.

However, no reasons were given by the company for the drop in production.

Coal India Ltd's (CIL's) subsidiaries, which registered a drop in production during the month include Bharat Coking Coal Ltd (BCCL), South Eastern Coalfields Ltd (SECL) and Mahanadi Coalfields Ltd (MCL).

CIL's production also dropped 4.5 per cent to 385.5 MT in the April-October period of the current fiscal year, over the year-ago period.

The company's output was 403.8 MT in the corresponding period of the previous financial year.

Coal India, which accounts for over 80 per cent of domestic coal output, is targeting coal production of 875 million tonnes in 2025-26, with a dispatch target of 900 MT, to meet rising energy demands.

This represents significant growth, as the company is also implementing a strategy to increase dispatch from its mines. During 2024-25, CIL produced 781.07 MT of coal.

Coal India Aims to Achieve 875 MT Production in FY26

Coal India Ltd aims to increase production to reach its target of 875 million tonnes for the financial year 2025-26, as stated by Chairman Sanoj Kumar Jha.

Despite a challenging September and October due to heavy monsoon rains affecting mining operations, Jha expressed optimism about meeting industry coal requirements and stocking more coal by year-end compared to the previous year.

CIL targets a total dispatch of 900 million tonnes for 2025-26 and plans to ramp up production in the remaining months of the financial year after a production decline to 56.4 million tonnes in October. Additionally, regulations for a proposed coal exchange are expected to be finalized by the end of November.

NTPC plans to enter coal gasification business

Coal power giant NTPC is looking to enter the coal gasification business with a plan to start producing 5- 10 million tonnes per annum of synthetic gas over the next three-four years, a source familiar with the move said recently.

The tender for technical consultation for the project is expected within this fiscal year ending March 31 and the company is looking at sites for the project, the source said.

NTPC, which also uses coal from its own mines, is looking to use coal for producing synthetic gas, the source said.

India in 2024 approved plans to provide incentives worth ₹85 billion ($967.06 million) for projects to convert coal into gas, that could be used for fertilisers and petrochemical projects.

India aims to gasify 100 million tonnes of coal by 2030.

Globally, several countries are looking to explore coal gasification technology, including the United States, as a part of reducing emissions.

NTPC has also started scouting land for nuclear projects in 16 indian states as a part of its plan to build 30 gigawatts of nuclear portfolio, the source said. India is seeking to expand its nuclear power generation capacity to at least 100 gigawatts by 2047, up from just over 8 gigawatts currently. NTPC's projects would range from 700 megawatt to 1600 MW and will be using multiple technologies as a part of the process, the source said.

NTPC did not immediately respond to Reuters request seeking comment. The cost of 1 gw of

nuclear project is estimated at around ₹150 billion to ₹200 billion.

But sustaining clean energy growth beyond 2030 will require strong policy support, modernised grids and political will to phase down coal use.If successful, CREA said, China, India and Indonesia would join other BRICS nations such as Brazil, South Africa, the UAE and Ethiopia in having peaked their power sector emissions.

Govt expands accredited prospecting agencies to fast-track coal exploration

In a major move to accelerate coal exploration and strengthen India's push toward Aatmanirbhar Bharat, the Government of India has expanded the pool of Accredited Prospecting Agencies.

On 26 November 2025, under the second proviso to sub-section (1) of Section 4 of the Mines and Minerals (Development and Regulation) Act, 1957, private entities accredited by the Quality Council of India National Accreditation Board for Education and Training (QCI-NABET) were officially notified as authorized agencies for prospecting operations.

"This adds another 18 agencies for carrying out prospecting operations for the exploration of Coal and Lignite, enabling the coal blocks allottees to have more flexibility and choice towards engaging these agencies for carrying out the exploration of coal and lignite," Ministry of Coal said in a statement.

The expanded list of accredited agencies is expected to reduce project timelines by nearly six months, eliminating the earlier requirement for prospecting license acquisition by individual agencies. This reform is designed to streamline exploration processes and expedite the development of coal blocks.

The newly accredited prospecting agencies include Indian Mine Planning and Consultants, Kolkata; Merrox Mining Solutions Pvt. Ltd., Gurugram; United Exploration India Pvt. Ltd., Kolkata; Maheshwari Mining Pvt. Ltd., Kolkata; Natural Resources Division - Tata Steel Ltd., East Singhbhum; Mining Associates Pvt. Ltd., Bidwan; Remco Coal Exploration Pvt. Ltd., Chandrapur; South West Geological Exploration Ltd., Gurugram; and Geotechnical Mining Solutions, Dharmapuri.

Also added to the list are Novomine India Pvt. Ltd., East Khasi Hills; Surmine Consulting Pvt. Ltd., Delhi; Kartikey Exploration and Mining Services Pvt. Ltd., Nagpur; and Mining Tech Consultancy Services Pvt. Ltd., Ahmedabad.

The remaining accredited entities include Gems Projects Pvt. Ltd., Ranchi; Revel Consulting Pvt. Ltd., Ahmedabad; CMMCO Technology Services Ltd., Hyderabad; Jasni Geotech Pvt. Ltd., Nagpur; and APC Drilling and Construction Pvt. Ltd., Namakkal.

By expanding the pool of authorized prospecting agencies, the Government aims to harness private sector resources, promote efficiency, competitiveness, and technological innovation in the exploration ecosystem.

This step is expected to significantly accelerate the pace of exploration and enable early enhancement of mining contributing to faster resource development and enhance coal and lignite availability for the country, contributing enhanced availability of coal and lignite to meet the nation's growing energy needs.

India's met coal deficit to persist, green hydrogen boosts steel export prospects

India's metallurgical coal supply-demand gap is expected to see little respite from the 15 million to 20 million metric tons of coal washeries that are likely to come in the next three to four years, Dr. P.K. Banerjee, Outstanding Scientist and Professor at the Central Institute of Mining and Fuel Research, told Platts, part of S&P Global Energy.

Meanwhile, blast furnaces and basic oxygen furnaces are expected to expand for the next 20-25 years, despite the EU's carbon border adjustment mechanism concerns and potential for adaptation to clean hydrogen, market participants said at the Steel Tech International Seminar in Bhubaneswar on Nov. 21.

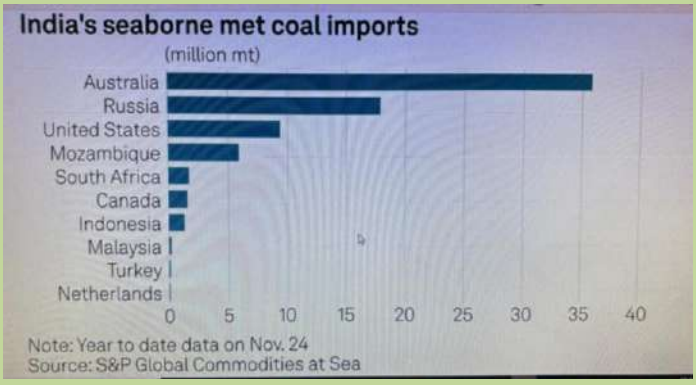
India's steel production is likely to reach 230 million mt by 2030, below the 255 million mt target outlined in the national steel policy, according to Banerjee.

India's national steel policy outlines steel capacity expansion to 300 million mt by 2030, alongside a production of 255 million mt. While a 90% utilization sets production at 270 million mt, "in reality, 230 million mt is a realistic figure," Banerjee said.

More than 90% of India's coking coal demand is met through imports, which accounts for 35%-45% of crude steel cost, and "we can only bring imports down to 85% or 80%, unless more washeries are built," he added.

Innovations to bridge gap
India's "Mission Coking Coal" targets 140 million mt met coal production by 2030, with only 60 million mt/year mined at present.

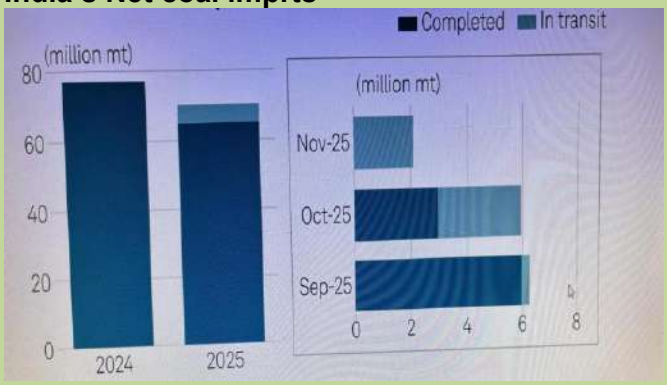
Nearly 100% of the 20 million mt/year coal is required for pulverized coal injection, and more than 60% of the 25 million mt/year non-coking coal required for direct reduced iron plants are imported, according to Banerjee. Major steel producers import 100% of their coal requirement, while others import 70%-80%, he added.



India's year-to-date seaborne met coal imports totaled 74 million mt, according to data from S&P Global Commodities at Sea Nov. 24.

Australia was the largest supplier with a net volume of 35.8 million mt, followed by 17.8 million mt from Russia, 9.4 million mt from the US, 5.9 million mt from Mozambique, and 1.7 million mt from South Africa, the CAS data showed.

India's Net coal imprts



Note: Data available on Nov. 10
Source: S&P Global Commodities at Sea

"Coal with low ash and good coking properties is a key driver for imports," Banerjee said. "Indian coal has the disadvantage of high ash content." Improving the efficiency of existing washeries and constructing new ones could create significant opportunities. PCI reduces coke consumption in ironmaking, thereby bringing down coking coal requirements, Banerjee said.

Clean hydrogen opportunities
"If we can clean up the post-carbon gas for the hydrogen component, remove the [hydrogen sulfide], and use the hydrogen for the blast furnace, the operations become green to the extent possible," Sengupta said.

India's steel is predominantly produced through the blast furnace route, which is highly carbon-intensive. The EU's CBAM imposes a carbon charge based on carbon emissions from steel entering the bloc and is set to take effect in January 2026. CBAM is expected to have a major impact on India's steel exports. In 2024, more than 60% of Indian steel outflows were destined for Europe, Platts reported earlier.

The Indian government has been promoting the use of hydrogen in steelmaking to safeguard exports to the EU, but hydrogen costs remain a concern.

"It cannot be done with electrical infrastructure or electrolyzer at the moment, but we are working on small modular reactors with cheap electricity," Sengupta added. "In India, the opportunity lies in the existing coke ovens and blast furnaces, and is just a matter of cleaning up the coke oven gas."

Pumped Storage Projects (PSPs) can play crucial role in storing surplus green power: Shri Manohar Lal

The Ministry of Power convened today a meeting of the Consultative Committee of the Members of Parliament at Pinnapuram, Kurnool district, Andhra Pradesh. The meeting that focussed on *PUMPED STORAGE PROJECTS (PSPS)* was chaired by Shri Manohar Lal, Union Minister of Power. It was attended by Sh. Shripad Yesso Naik, Minister of State for Power, Members of the Consultative Committee for Ministry of Power from Lok Sabha and Rajya Sabha, senior officials from the Ministry of Power, Central Electricity Authority (CEA) and CPSUs.

Addressing the members, Shri Manohar Lal, Union Minister of Power emphasized that PSPs can play a critical role by storing surplus green power and meeting electricity demand during non-solar hours. On the issue of evaporation losses from PSP reservoirs, the Minister suggested deploying floating solar power projects as a viable solution. He further underscored the pivotal role of State Governments in facilitating PSP development through timely site allocation, water allocation, and expeditious clearances. He urged the Members of the Committee to engage with State Governments to consider withdrawal of charges such as Green Energy cess, water tax, and reservoir lease fees, to accelerate the development of PSPs.

The Members of the Committee were informed that a nationwide PSP potential of approximately 224 GW has been identified. Of this, ten PSPs with a total capacity of around 7 GW have been commissioned, another ten PSPs of about 12 GW capacity are under construction and fifty-six PSPs with a capacity of about 78 GW are at various stages of planning and development.

The Members were apprised of the key policy initiatives undertaken by the Government of India to accelerate Pumped Storage Project (PSP) development. These include the issuance of Guidelines for PSP development outlining modalities for site allotment, exemption from free power and Local Area Development Fund obligations etc., and a full waiver of Inter-State Transmission (ISTS) charges for 25 years for projects awarded on or before 30.06.2028. The Government has also extended budgetary support for enabling infrastructure, notified Renewable Consumption Obligations for energy storage systems, and issued Tariff-Based Competitive Bidding (TBCB) guidelines for procurement of storage capacity/stored energy from PSPs. Further, off-stream closed-loop PSPs have been exempted from the requirement of CEA concurrence. Additionally, the capital expenditure threshold for CEA concurrence for hydro and PSP projects has been revised to ₹3,000 crore, as against the earlier limit of ₹2,500 crore for competitively bid projects and ₹1,000 crore for MoU-route projects.

The Members of the Consultative Committee for Ministry of Power commended the Ministry of Power for the comprehensive policy push being given to PSPs They noted that the recent steps, such as easing the technical appraisal requirements for off stream closed loop PSPs, strengthening the viability through budgetary support for enabling infrastructure and waiver of ISTS charges, have significantly improved confidence among developers and States.

The Members of the Committee provided valuable suggestions to further accelerate the development of PSPs across the country. The Committee also discussed the environmental implications of PSPs and renewable energy sources such as wind and solar. They underscored the advantages of PSPs, highlighting their relatively lower environmental impact.

Sh. Shripad Yesso Naik, Minister of State for Power also addressed the Committee, and informed that the successful commissioning during 2025-26 of all eight units of the 1680 MW Pinnapuram PSP alongside the 500 MW Tehri PSP marks a major national achievement reflecting strong coordination between the Centre, States, CPSUs and the private sector.

Power consumption dips 6% to 132 billion units in October

Power consumption in the country fell by 6 per cent to 132 billion units in October from 140.47 BUs in

same month last year, mainly on account of less use of cooling appliances.

The October month also saw rains in various parts of the country.

The decline in power consumption was attributed to unseasonal rainfall during the month in some parts of the country coupled with onset of winter season, which kept temperatures in check, experts said.

The peak power demand met during October was at 210.71 GW, lower from 219.22 GW recorded in October 2024.

The peak power demand had touched an all-time high of about 250 GW in May 2024. The previous alltime high peak power demand of 243.27 GW was recorded in September 2023.

However, this summer (April onwards), the record peak power demand was 242.77 GW in June.

Experts said the power demand and consumption are likely to be subdued in November as well due to moderation in temperature levels, which would reduce use of cooling appliances.

Government Launches Asset Monetisation Plan for Power Transmission Sector

The Central Electricity Authority (CEA) of India has proposed a monetisation strategy for public sector transmission assets, outlined in a concept note to the Forum of Regulators.

This initiative is part of the Acquire, Operate, Maintain, and Transfer (AOMT) model established by the Power Ministry in 2022, which facilitates the temporary transfer of public assets to private firms to improve efficiency and financial outcomes. State electricity regulators are expected to implement this framework, focusing on establishing a clear and stable tariff structure to enhance investor confidence.

The proposal addresses concerns such as revenue certainty and payment security, emphasizing the need for a systematic identification and monetisation process, including the establishment of Special Purpose Vehicles (SPVs) for assets subjected to the Regulated Tariff Mechanism (RTM).

Transparency will be ensured through the engagement of technical consultants and independent valuers, while comprehensive legal documentation will support the transfer agreements. One significant challenge identified is the predictability of cash flow from monetised assets, especially those operating under Real Time Market (RTM) norms.

Non-fossil fuels power one-third of India’s electricity generation in 2025

Electricity generation from non-fossil fuel sources - including wind, solar, small and large hydro, and nuclear - is steadily inching towards one-third of India's total power output, with the first half of the current fiscal year witnessing a marked rise in its share compared to the same period last year.

Excluding thermal and Bhutan imports, India's non-fossil domestic generation stood at 301.3 billion units (BU) during April-Sept 2025, accounting for about 31.3 per cent of the country's total electricity generation of 962.53 BU.

In the year-ago period, non-fossil generation was 258.26 BU, representing a 27.1 per cent share in the total power generation of 952.29 BU, according to Central Electricity Authority (CEA). While the large hydro segment reported a 13.2 per cent rise in generation during the first half of this fiscal, other renewable sources together posted a 23.4 per cent increase. In contrast, nuclear generation recorded a modest decline of 3.7 per cent year-on-year.

Gujarat emerged as the top performer with total renewable energy generation of 36.19 BU during the first half of this fiscal, followed by Rajasthan (35.87 BU), Himachal Pradesh (33.53 BU), Tamil Nadu (32.08 BU), and Karnataka (31.35 BU). The growth in clean energy generation - particularly from renewable sources - comes even as the country's installed capacity from non-fossil fuel sources has crossed 250 GW, putting India halfway towards its 2030 target of 500 GW. India's total installed generation capacity stands at around 500 GW, with more than half coming from non-fossil sources.

Excluding large hydro and nuclear, the country's total renewable capacity stood at 197 GW, comprising 127 GW of solar and 53 GW of wind, as of Sept 30, 2025.

Power Ministry convenes taskforce to review strategy and architecture drafts for India Energy Stack

The Ministry of Power convened a meeting of the India Energy Stack (IES) Taskforce to review two foundational draft documents for developing the sector's digital public infrastructure. According to the Ministry, the IES initiative is being advanced with REC Ltd as the nodal agency and FSR Global as the knowledge partner.

The meeting was chaired by Dr Ram Sewak Sharma, with Pramod Verma as chief architect and Pradeep Kumar Pujari as vice-chair.

Attendees included representatives from regulatory bodies, technology institutions and power-sector organisations such as the CEA, AIDA, REC Ltd, Grid India, IEEMA, NITI Aayog, regional distribution utilities and the Ministry of Power. The meeting focused on the draft IES Strategy Document (version 0.1) and the draft IES Architecture Document (version 0.1).

Taskforce members held a roundtable discussion after presentations, aiming to provide high-level strategic guidance on the proposed framework.

Jitendra Srivastava, CMD of REC Ltd, said the meeting marks a key step in building a unified and open digital backbone for India's energy sector. He said the inputs received will guide refinement of the framework and transition towards a pilot phase.

Taskforce members stated that, as a digital public infrastructure, the IES is intended to connect stakeholders and enable open data exchange across the energy value chain.

The Ministry said the IES aims to support transparent and reliable energy access through common digital protocols, open APIs and federated registries. The framework is intended to facilitate real-time data exchange, integrate renewable energy, support green power markets and improve consumer-centric services.

The Ministry said taskforce meetings will now be held monthly. The IES project is scheduled to be completed by July 2026.

ICRA revises electricity demand growth forecast downward to 1.5-2% in FY26

Rating agency Icra has revised its forecast for electricity demand growth downward to 1.5-2 per cent for FY26 from 4-4.5 per cent earlier, mainly impacted by the prolonged monsoon. India's electricity demand fell by 3 per cent year-on-year in the first 10 days of November 2025, the agency said, citing official data.

Ankit Jain, Vice President & Co Group Head - Corporate Ratings, Icra said the early and prolonged monsoon and high base effect have kept demand growth muted throughout FY2026, with overall flat growth for the first seven months.

"Reflecting this slowdown, the full-year demand growth forecast has been revised down sharply to 1.5-2 per cent from the earlier 4-4.5 per cent, with expectations of some seasonal recovery during winter," he said.

India added 25.7 GW of gross power generation capacity during April-September 2025, more than double the 10.7 GW added in the same period last year. The growth was primarily driven by the renewable energy (RE) segment, supported by developers rushing to commission projects before the expiry of the complete waiver on transmission charges on June 30, 2025.

With a strong RE project pipeline, full-year capacity addition is expected to reach around 45-50 GW in FY26, significantly higher than FY25 levels. Coal inventories at power plants increased to 16.6 days as of November 10, compared to 15.6 days at the end of October.

India among world's top 5 oil refining countries: Hardeep Puri

Minister of Petroleum and Natural Gas Hardeep Singh Puri recently said that India with its 23 worldclass refineries and a total capacity of 258.2 MMTPA (million metric tonnes per annum) now stands among the top five refining nations in the world.

"India's oil refining story is a story of growth, innovation and self-sufficiency. From meeting domestic demand to fuelling global markets -- the journey has been remarkable," the Minister observed in a post on X.

He highlighted that in 2024-25, the country's petroleum product exports reached 64.7 million tonnes -- up from 55.5 million tonnes in 2014-15.

"Every refinery today produces BS-VI fuels, which are among the cleanest in the world and with new petrochemical hubs in Rajasthan and Odisha, India is redefining the future of energy under PM Narendra Modi's leadership," the minister added.

He earlier said that the country is on track to reach around 310 MMTPA by 2030, with long-term plans to scale further to 400-450 MMTPA to become a global refining and energy hub.

Addressing the inaugural session of the Energy Technology Meet recently, the minister said this expansion will come at a time when around 20 per cent of existing global refining capacity faces potential closure by 2035 with over 100 refineries expected to shut down worldwide.

While the global energy market is expected to grow at a slow pace, India stands out as a bright spot, projected to contribute nearly 30-33 per cent of global energy demand growth in the coming decades, he added.

Hardeep Singh Puri also observed that India's refineries are world-class, globally integrated, and exportready. India is already among the top seven exporters of petroleum products, with exports to more than 50 countries valued at over $45 billion in FY 2024-25. The Minister underlined the importance of innovation and indigenization in India's energy ecosystem with the country achieving nearly 80 per cent import substitution across the energy value chain.

The minister stressed that India's energy strategy encompasses both fuel and petrochemical growth as part of a calibrated transition toward sustainability. He said that while the share of traditional fuels will gradually reduce, they will continue to play a major role for decades as India moves toward its 2047 goals.

India's Crude demand likely to zoom 37% by 2035: IEA

India's oil demand is expected to rise 37% to 7.4 million barrels per day (mbpd) and natural gas by 85% to 139 billion cubic metres by 2035, according to the International Energy Agency (IEA).

The bullish forecast contrasts with IEA's projection of sluggish global oil and gas demand over the next decade. India will be the single-largest source of energy demand growth through 2035, IEA said in its outlook.

Globally, oil demand-at about 100 mbpd in 2024-is expected to edge up to a peak of 102 mbpd around 2030 before easing back to the current levels by 2035. This reflects "reductions in demand from passenger cars and power sector, more than offset by increases from petrochemicals, aviation and other industrial activities," under the IEA's stated policies scenario, which factors in policies already implemented as well as those proposed.

India will see the largest increase in oil consumption of any country, rising by 2 mbpd to 2035, and continuing the growth momentum through 2050.

India's natural gas output dips 3.9% in September; LNG imports up 1.2%

India's domestic natural gas production declined by 3.9 per cent year-on-year to 2,860 million standard cubic metres (MMSCM) in September 2025, while liquefied natural gas (LNG) imports rose 1.2 per cent to 2,819 MMSCM, according to the Petroleum Planning and Analysis Cell (PPAC) of the Ministry of Petroleum and Natural Gas.

The total gas available for sale during the month stood at 5,207 MMSCM, marking a 1.1 per cent decrease from the same period last year. The combined availability of natural gas for consumption — domestic and imported — was 5,642 MMSCM, the report said.

"The gross production of natural gas for the month of September 2025 was lower by 3.9 per cent compared with the corresponding month of the previous year," PPAC stated in the report.

Among domestic producers, ONGC, OIL, and private/joint venture operators together accounted for the total gross output. Production by ONGC stood at 1,518 MMSCM, OIL produced 254 MMSCM, and private and JV companies contributed 1,088 MMSCM. Of the gross production, around 84 per cent was available for sale, with the rest used for internal consumption or lost through flaring as part of technical operations.

Imports on the rise

India's LNG imports increased slightly to 2,819 MMSCM from 2,787 MMSCM in September 2024. The imports were sourced mainly through terminals along the western coast.

The rise in imports indicates a continuing dependence on overseas gas supplies to meet domestic demand amid stagnant or falling local production.

How the gas was used

The fertiliser sector remained the largest consumer of natural gas in September, accounting for 28 per cent of total consumption, followed by city gas distribution (CGD) with 24 per cent, power generation with 13 per cent, refineries with 8 per cent, and petrochemicals with 6 per cent.

Overall consumption during the month was 5,782 MMSCM, marginally higher than August 2025 but 2 per cent lower than September 2024.

Between April and September 2025, cumulative natural gas consumption stood at 34,867 MMSCM, a 4.9 per cent decline from the same period last year, when consumption was 36,655 MMSCM.

Sectoral shifts: CGD rises, power and refinery dip

Consumption patterns showed a clear divergence across sectors. Gas use in the city gas distribution segment grew 8.8 per cent year-on-year, reflecting continued expansion in piped and compressed natural gas networks. In contrast, power sector consumption declined 17.2 per cent, while the refinery sector saw a 17.8 per cent drop.

Petrochemical demand increased sharply by 34.8 per cent, while the fertiliser sector saw a 4.9 per cent decline. Other industrial users registered a 10.9 per cent fall.

During September 2025 alone, CGD consumption stood at 1,360 MMSCM, power at 725 MMSCM, fertilisers at 1,644 MMSCM, refineries at 448 MMSCM, and petrochemicals at 328 MMSCM.

State-wise gas use: Gujarat leads, followed by Maharashtra and Uttar Pradesh

At the state level, Gujarat continued to be the largest consumer, with 44.2 million metric standard cubic metres per day (MMSCMD) of gas usage, followed by Maharashtra (27.6 MMSCMD) and Uttar Pradesh (31.1 MMSCMD).

Other key consuming states included Rajasthan (10.8 MMSCMD), Delhi (7.2 MMSCMD), and Assam (7.5 MMSCMD). The total gas consumption across all states stood at 192.7 MMSCMD in September 2025.

Overall trend: marginal growth in imports, lower domestic output

The data reflects a continued slowdown in domestic gas output and higher reliance on LNG imports to meet national demand.

Domestic output has been constrained by ageing fields, delays in new field development, and technical issues at offshore blocks. At the same time, rising consumption from city gas and industrial users has maintained overall demand levels, balancing the decline in domestic supply.

PPAC data suggests that while domestic production has fallen marginally, India's gas consumption mix continues to shift toward imported LNG — a trend consistent with past quarters.

Oil prices little changed as markets eye US government reopening

Oil prices were little changed recently after rising in the previous session amid expectations that an end to the longest-ever US government shutdown could boost demand in the world's biggest crude consuming nation.

Brent crude future slipped 8 cents, or 0.12 per cent, to $65.08 a barrel by 0106 GMT after gaining 1.7 per cent recently. US West Texas Intermediate crude was down 7 cents, or 0.11 per cent, to $60.97 a barrel, after climbing 1.5 per cent in the previous session.

The US Republican-controlled House of Representatives is set to vote recently afternoon on a bill, already signed off by the Senate, that would restore funding to government agencies through January 30.

A government reopening would boost consumer confidence and economic activity, spurring demand for crude oil, IG market analyst Tony Sycamore wrote in a note.

An end to the US government shutdown, which has disrupted tens of thousands of flights in the last few days alone, could also lead to a rebound in travel and jet fuel consumption ahead of the upcoming holiday season.

On the supply side, the fallout is emerging from US sanctions against Russia's two biggest oil producers, Lukoil and Rosneft, further supporting prices.

Chinese refiner Yanchang Petroleum is seeking non-Russian oil in its latest crude tender, and Sinopec subsidiary Luoyang Petrochemical has shut for maintenance as an indirect result of the sanctions, Reuters reported recently.

The measures last month were the first direct sanctions on Russia imposed by US President Donald Trump since the start of his second term.

Kazakhstan pushes for major entry into TAPI gas pipeline project with 30% stake bid

Kazakhstan has proposed joining the Turkmenistan–Afghanistan–Pakistan–India (TAPI) gas pipeline project with a stake of up to 30 per cent, but has not yet received a reply from existing participants, Energy Minister Yerlan Akkenzhenov said recently, according to Russian news agency Interfax.

Speaking to reporters on the sidelines of the Kazakh presidential residence during the Turkmen president's state visit, Akkenzhenov said that an official request had already been sent to shareholders of the project operator.

"We are awaiting a response. There have been no responses thus far. We have raised the issue at a highlevel meeting, and we are awaiting a response from the Turkmenistan side. There is nothing yet on when a response would be given." he added.

Kazakhstan first signalled interest in joining TAPI at the Kazakhstan–Afghanistan Business Forum in October 2024 and began talks with Turkmenistan soon after.

"If a Kazakh company joins the project, then it would open new prospects for cooperation between our countries in the gas sector," Akkenzhenov said at the time.

The proposed TAPI pipeline will run 1,814 kilometres – 214 km through Turkmenistan, 774 km through Afghanistan and 826 km through Pakistan to the

border with India. It is designed to transport 33 billion cubic metres of gas each year from the Galkynysh field in southern Turkmenistan, which has estimated reserves of 27.4 trillion cubic metres.

The route would pass through Herat and Kandahar in Afghanistan, Quetta and Multan in Pakistan, and terminate in Fazilka in western India.

Turkmengaz holds an 85 per cent stake in TAPI Pipeline Company, the project operator. Afghan Gas Corporation, Pakistan's Inter State Gas Systems and India's GAIL each hold 5 per cent.

Preliminary estimates place the total project cost at $10 billion.

Natural gas is India's most practical transition fuel, says Subhash Kumar, DG, Assn of CDG entites

India must prioritise low-carbon fuels like natural gas over highly polluting options such as coal, petrol and diesel to drive India's energy transition, Subhash Kumar, Director-General, Association of CGD Entities, said in his keynote address at the 5th edition of The Economic Times Oil & Gas Annual Conference & Expo being held recently.

Speaking on Day 1, he linked India's economic ambitions with the need for a stable, scalable energy pathway. He said that with India facing the dual pressures of rising energy demand and tightening decarbonisation commitments, he made a case for natural gas as the country's most practical transition fuel.

"In the transition phase, we must prioritise low-carbon fuels like natural gas over highly polluting options such as coal, petrol and diesel. Gas is not a temporary bridge — it is a key tool to drive India's energy transition," he said.

Kumar noted that even with aggressive gains in energy efficiency, India will require four to five times more energy by 2047. He added that with fossil fuels still accounting for nearly 90 per cent of India's energy mix and import dependency rising across crude, gas and even coal, the country must adopt a structured approach to increase gas usage, supported by clear policy signalling and coordinated execution.

He highlighted several challenges and priorities:

- Reaffirming the 15 per cent gas share target, first announced in 2015, and positioning it as a national mission.
- Building an execution ecosystem, noting that the gap lies not in intent but in the absence of "foot soldiers" to drive ground-level implementation.
- Leveraging gas infrastructure to support cleaner fuels such as CBG and green hydrogen as they scale.

Recognising gas as a low-carbon, high-utility fuel, capable of reducing emissions, operating underground to ease congestion, and offering 24×7 supply flexibility similar to electricity.

"Natural gas offers lower emissions, avoids bottling and road congestion, and supports renewables by addressing intermittency. If we handle methane responsibly, gas becomes the most logical fuel to ensure a smooth and stable energy transition," he added.

Kumar concluded by emphasising that India's transition will ultimately rely on domestic solutions and coordinated action across the value chain. With an estimated $10 trillion to $15 trillion required for the shift, he called for a realistic, systems-level approach that treats natural gas as a foundational pillar in India's path to 2047.

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Govt Plans to Open Nuclear Sector to Private Players

Prime Minister Narendra Modi recently said the Union government is preparing to open India's nuclear sector to private companies, arguing that the move would bolster the country's energy security and strengthen its technological capabilities.

Speaking virtually at the inauguration of Skyroot Aerospace's new rocket manufacturing hub, the Infinity Campus, Modi drew a parallel with earlier reforms in the space industry. The prime minister remarked that the scope of reforms is continuously expanding and highlighted that just as space innovation was opened to the private sector, India is now moving towards opening the nuclear sector as well.

"A strong role for the private sector is being laid in this field, which will create opportunities in small modular reactors, advanced reactors, and nuclear innovation," he said.

Modi added that this shift would "give new strength to India's energy security and technological leadership."

India is pursuing an ambitious target of installing 100 gigawatts of nuclear power capacity by 2047, as part of its Viksit Bharat mission. Now, the government plans to increase private participation in research and development, an area currently closed to joint ventures between PSUs and private firms. To change that, the government is planning to introduce a Bill before the parliament during the upcoming Winter session to amend the Atomic Energy Act, 1962, and the Civil Liability for Nuclear Damage Act, 2010.

NTPC steps up nuclear play, starts site search in 16 states for new power plants

State-run power producer NTPC Ltd is in talks with 16 states including Bihar, Andhra Pradesh, Madhya Pradesh, Chhattisgarh and Gujarat to acquire land for setting up nuclear power plants as part of its plan to add 30 gigawatts (GW) of nuclear capacity by 2047 under the national target of 100 GW, according to people aware of the matter.

"NTPC is now talking to the governments of 16 states and looking for land there for nuclear power plants," said one of the persons cited above

The company plans to develop large-scale nuclear power plants with pressurised heavy water reactors (PHWR) ranging between 700 MW and 1,600 MW. "While the company would work standalone for smaller capacities, for capacities like 1,600 MW, it would look at collaboration with foreign players," said the second person.

In January, NTPC incorporated NTPC Parmanu Urja Nigam Ltd to lead its nuclear energy business. The company has already entered the segment with the 4x700 MW Mahi Banswara project in Rajasthan, being developed jointly with Nuclear Power Corporation of India Ltd (NPCIL), whose foundation stone was laid by Prime Minister Narendra Modi in September.

NTPC has also initiated training for about 60 employees in nuclear operations at its Power Management Institute in Noida and is exploring uranium mine acquisitions abroad

India currently has around 8 GW of installed nuclear capacity across 23 operational reactors, all run by NPCIL. The country aims to reach 22.5 GW by 2031 and 100 GW by 2047, according to official data.

At an estimated cost of ₹15,000–₹20,000 crore per GW, NTPC's 30 GW nuclear expansion plan could entail a total capital investment of ₹4.5–₹6 lakh crore over the next two decades.

India's nuclear power programme is being positioned as a critical non-fossil base-load component to support the 500 GW renewable energy target by 2030 and ensure grid stability alongside solar and wind.

NTPC Showcases India's Advancing Nuclear Energy Vision at WNE-2025, Paris

NTPC Limited, India's largest integrated power producer, marked a significant milestone by showcasing the country's growing capabilities in the nuclear power sector at the World Nuclear Exhibition (WNE) 2025, held in Paris, France, from November 4 to 6, 2025. This marks NTPC's first-ever participation at the world's leading civil nuclear industry event.

Representing NTPC at the exhibition, Mr. A. P. Samal, Chief General Manager, and Mr. Sumit Dashmana, Deputy Manager, highlighted NTPC's strategic roadmap for entering nuclear power generation—an important step towards diversifying its clean energy portfolio and strengthening India's long-term energy security.

During the exhibition, Mr. Rafael Mariano Grossi, Director General of the International Atomic Energy Agency (IAEA), and Dr. Sama Bilbao y León, Director General of the World Nuclear Association (WNA), visited the NTPC booth at the India Pavilion, organized by the Confederation of Indian Industry (CII). They interacted with NTPC representatives and appreciated the Company's initiatives and vision for advancing nuclear energy development in India.

NTPC's participation at WNE-2025 underscores its commitment to exploring new frontiers in sustainable and secure energy solutions, aligning with the nation's pursuit of achieving Net Zero by 2070.

Two key amendments to open up N-power sector likely in Winter Session, nuclear collaborations driven more by the need for capital than technology: Official

The NDA government is readying multiple amendments to two overarching legislation governing the country's atomic energy sector, with an internal deadline to wrap up political consultations in time for introducing these in the upcoming Winter Session.

While confirming that a winter session deadline is being targeted, a senior government official told that India's move to look outwards for collaborations on nuclear is driven by two clear policy imperatives: the desperate need for base load alternatives to coal-fired capacity to tide over the limitations of renewables; and more importantly, the external outreach for nuclear collaborations is driven more by the need for capital than the need for technology.

This is despite the realisation that India's existing nuclear technology — its mainstay Pressurised Heavy Water Reactor (PHWR) technology — has scalability issues. The official indicated that foreign funds, including sovereign funds from West Asia, have expressed early interest to put in capital to part-finance India's stated objectives to scale up nuclear power, including getting into the manufacturing value chain of SMRs or small modular reactors. SMRs are increasingly being seen as important for nuclear energy to remain a commercially competitive option into the future.

The groundwork to build political consensus is currently underway, even as the government official expressed confidence that the amendments will be moved in the upcoming winter session after a monsoon session target was missed. The amendments aim to tweak and align the two domestic legislations with legal provisions globally, addressing festering investor concerns and setting the stage for an opening up of India's civil nuclear sector.

Liability law and Atomic Energy Act.

The first amendment entails an easing of the provisions in India's nuclear liability law called the Civil Liability for Nuclear Damage Act, 2010 (CLNDA), which sought to create a mechanism for compensating victims from damages caused by a nuclear accident, and allocating liability and specifying procedures for compensation, but has subsequently been cited as an impediment by foreign equipment vendors such as US-based Westinghouse Electric and French nuclear company EDF. This is on the grounds that this legislation

channellises operators' liability to suppliers through a provision called the right of recourse of the operator — an operator of a nuclear plant would typically be a company such as the state-owned Nuclear Power Corp of India Ltd (NPCIL) while the suppliers could include foreign reactor manufacturers, but also domestic equipment suppliers such as L&T or Walchandnagar Industries. Foreign vendors, both involved in the nuclear island and the conventional parts of an atomic power project, have cited this specific provision of the operators' 'right of recourse' as a reason for worries about investing in India's nuclear sector due to fear of incurring future liability in the event of a nuclear accident. Workarounds, including capping liabilities above a certain limit and a state-backed fund pool as a backstop, are being considered.

The second major amendment in the works is aimed at tweaking the Atomic Energy Act, 1962 to enable private companies to enter nuclear power plant operations in India to potentially take a minority equity exposure of up to 49 per cent in upcoming nuclear power projects, while also setting the stage for foreign companies to infuse equity into these projects to scale up the execution pace. Hitherto, atomic energy has been one of India's most closed sectors. The set of legal amendments are being seen as a reform push that could help leverage the commercial potential of the Indo-US civil nuclear deal, nearly two decades after it was inked. New Delhi is also keen to package this as part of a broader trade and investment outreach with Washington DC, which could eventually culminate with a trade pact that is currently under negotiation.

The SMR push

In the civil nuclear sector, New Delhi is now pushing SMRs — advanced nuclear reactors that have about a third of the generating capacity of most traditional nuclear power reactors but can produce a large amount of low-carbon electricity — as a technology of promise that can help in industrial decarbonisation, including a determined hard sell of the country's ability to take something of a leadership role in the dissemination of this technology. These are important in offering base load power that could give grid operators some degree of flexibility, especially given the imperative of inducting renewables into the grid brings with it the challenge of inducting more base load generation to balance out the vagaries of renewable power output. While thermal generation is seen as important in this regard, nuclear energy offers a more carbon-neutral base load generation option.

Though India's civil nuclear programme has expertise in manufacturing smaller reactor types, it is almost entirely based on its mainstay PHWR technology — based on heavy water and natural uranium. But these are increasingly out of sync with the light water reactors or LWRs (also called pressurised water reactors or PWRs) that are now the most dominant reactor type across the world. The Americans, alongside the Russians and the French, are among the leaders in LWR technology — thermal-neutron reactor that utilise normal water, as opposed to heavy water, as both its coolant and neutron moderator.

This renewable surge of the last decade in India is coming at a cost, as grid managers are figuring out. India's focus on rapid expansion of renewables in the absence of energy storage systems is now resulting in increasing instability in the country's electricity grid due to the vagaries associated with green power — not generating power when the sun's not shining or the wind is not blowing. The issue is compounded by the scaling down of thermal expansion, which provides critical baseload support to the grid during evenings in summer months, when solar generation dips and demand remains high. "That is leading to a tough situation for grid managers. We need baseload capacity to come up fast. And since coal is not really a palatable option, nuclear is key," the government official quoted above said. Unlike renewables such as solar or wind, base load power sources including thermal or nuclear run nonstop to meet the bare minimum of power demand.

'Bharat Small Modular Reactors'

As part of its domestic SMR push, the NPCIL announced a tender in March 2024 for a stepped-down version of indigenously-produced nuclear reactors. Reliance Industries Ltd, India's largest private-sector corporation, Tata Power and Adani Power are among six private entities that are learnt to ave formally expressed interest to set up small mdular nuclear reactor-based projects. In response to requests for proposals floated by NPCIL to set up

its proposed 'Bharat Small Modular Reactors' or BSMRs, Hindalco Industries, JSW Energy and Jindal Steel & Power too evinced interest.

Some 16 sites have been tentatively marked across six states — Gujarat, Madhya Pradesh, Odisha, Andhra Pradesh, Jharkhand and Chhattisgarh. The BSMRs are proposed to be constructed and operated under NPCIL's supervision and the state-run company will retain operational control and asset ownership, while the successful bidders will hold beneficial rights over the net electricity generated for captive use. The fine print shows that the successful bidder must fund the entire project, including capital costs, and will be required to repay NPCIL for all costs incurred by the latter across the lifecycle of the project — from pre-project activities to final decommissioning. In return, these private players, which operate large industrial utilities ranging from petrochemical and edible oil refining units to cement and steel plants, will get access to long-term, assured electricity output from the project for their captive use.

Some of the bidders are also learnt to have flagged multiple queries relating to ownership, charges and operations in this NPCIL proposal, which they feel could adversely impact the long-term viability of these projects.

India's own range of at least three SMR prototypes that are being designed and developed by the Bhabha Atomic Research Centre, a constituent unit of the DAE, include broadly three reactor types. These reactors, apart from the Bharat Small Modular Reactor (BSMR – 200MWe), are the Bharat Small Reactor (220 MWe), and another smaller modular reactor (SMR-55 MWe). Of these, the BSR would be a PHWR-based prototype, while both the BSMR and the new 55MWe small reactor are both envisaged as light water reactors. The Russians are currently building light water reactor-based projects at Kudankulam, the early stages of which are producing electricity and supplying to the grid. A majority of the units that NPCIL currently operates are PHWR-based.

Conceptual and detailed designs for these SMR reactors are learnt to be at "an advanced stage" and, citing "the available in-house expertise and know-how of technologies being developed", DAE officials said "no foreign collaboration" is being envisaged at this stage. It is planned to establish lead units of SMR-55 and BSMR 200 MWe at DAE sites for technology demonstration. These demonstration reactors are likely to be constructed in 60 to 72 months after being accorded project sanctions, officials said.

India-Russia summit to boost small nuclear reactors, localization

The 23rd India-Russia annual summit slated for December will give a strong push to expanding bilateral civil nuclear cooperation including small and modular reactors (SMRs) and enhancing localisation of nuclear plant equipment.

Alexei Likhachev, director general at Russia's state nuclear corporation Rosatom met Ajit Kumar Mohanty, director general of the Department of Atomic Energy in Mumbai recently to discuss developing new large and small-scale nuclear power plant projects in India and broader nuclear fuel cycle cooperation.

The two officials reviewed in detail progress on the Kudankulam Nuclear Power Plant (KNPP), the largest nuclear facility in India and the flagship project of Russian-Indian technological and energy cooperation, according to a Rosatom statement.

KNPP Units 1 and 2 were connected to the country's national power grid in 2013 and 2016 respectively and currently supply electricity to southern India. At Unit 3, pre-commissioning activities are underway, with preparations for one of the key upcoming milestones - testing of safety systems on an open reactor.

Meanwhile, construction and installation work, and equipment deliveries continue at Unit 4, while the third phase comprising Units 5 and 6 is actively under construction.

The discussion recently also covered expansion of the partnership, including the development of projects for both large- and small-scale nuclear power plants, and cooperation in nuclear fuel cycle.

Webinar on "Challenges in Implementation of CSP Technology: The Pivotal Role of R&D"

28th November, 2025

Concentrated Solar Power (CSP) uses mirrors to concentrate sunlight, generating high-temperature heat that produces steam to drive turbines and generate electricity. Integrated thermal energy storage (TES) enables CSP to deliver reliable, on-demand clean power, unlike intermittent sources such as solar PV and wind. This ability to provide dispatchable electricity is essential for grid stability and decarbonization targets. However, CSP faces technical, economic, and institutional challenges that limit its broad adoption and commercial competitiveness compared to more mature renewables like PV. The webinar examined these obstacles and emphasized the need for focused R&D and policy advocacy to speed up CSP deployment in India.

The webinar began with an introduction to the theme by **Dr (Mrs) Malti Goel**, Chairperson, R&T Group in the Energy Sector of the India Energy Forum. The pros-cons of CSP, key areas of research and future innovations were presented.

The presidential address was delivered by **Shri R. V. Shahi**, Former Secretary, Ministry of Power and President, India Energy Forum. He recalled that NTPC was looking at it as a promising technology in 1991. However, some of the operational challenges could not be resolved, and it was suggested that a critical evaluation should be made.

Dr Mahesh Kumar, Sr. Principal Scientist CSIR and Prof. AcSIR, in his address, suggested that we need to build standards of our own for this versatile technology. He cited an example of RKDF University, where a CCUS pilot plant has been put up using solar thermal energy to regenerate the solvent.

Shri Rajan Varshney, DGM, NTPC, has been on the CSP Committee of the Ministry of Power and said many of the existing plants have used the latest technology. The cost of electricity produced has been falling, but the availability of suppliers is a key issue. He described plant-wise success and failure stories.

Prof Manoj Soni, Mechanical Engineering, BITS Pilani, having vast experience working in CSP, highlighted the R&D focus to address various challenges in the implementation of technology. New materials from storage are being developed, which are more efficient, and materials degradation studies have been carried out. He pointed out that accurate data availability is one of the major constraints for LCA studies.

Dr Abhinav Kumar, DGM SESI, described the lack of bankable DNI resource for proper site selection, non-availability of vendor choices and uncertainty for power sale arrangements as some of the barriers for growth. In his concluding remarks, Shri R.V. Shahi pointed out that a technology evaluation for CSP thermal storage and PV battery storage should be made for non-intermittent power.

The vote of thanks was presented by **Shri SM Mahajan**, Secretary General IEF, who profusely thanked the speakers and participants on behalf of the forum.

CSP holds promise for providing stable, clean energy, but overcoming its current challenges will require coordinated action, with R&D as a central focus. Progress in materials science, storage technologies, and system integration is necessary to reduce LCOE and boost CSP's competitiveness. The webinar concluded that with targeted policy and investment, CSP can play a critical role in India's clean energy future and global transition.

FUTURE PROGRAMME

24th National Power Conference
23rd December 2025

Theme: "Towards Net-Zero: Ensuring Reliability and Resilience in a high Renewable Power System"

India's commitments under the Paris Agreement, which it updated in 2022 and 2025, include reaching net-zero emissions by 2070, achieving 50% non-fossil fuel-based electricity capacity by 2030. India has already achieved its non-fossil fuel capacity target in 2024 – five years ahead of schedule (2030). Integration of a large share of Renewable based capacity specially the wind and solar, into the Electricity Grid poses a formidable challenge due to the inherent nature of variability and intermittency of this power.

In the absence of large grid scale storage facilities including the Battery Storage and Pumped Hydro Storage Schemes and others, Thermal plants; which are conventionally designed to run as base load stations; will have to bear the brunt of variable load operations as well as fast ramping up ramping down due to variable and intermittent nature of the Renewable based power. This requires technical interventions for enhancing the capability of fossil fired plants as well to make them suitable for high ramping up and ramp down rates in the range of 3 to 5% as well as by reducing their minimum load to about 30% levels for grid reliability and stability. Regular two shift operation of thermal plants has also to be explored. Any design and material modifications required would need to be identified and implemented at least on new plants.

Driven by the need for energy security, reducing fossil fuel dependency, and achieving net-zero emissions by 2070, India has set an ambitious goal to reach 100 GW of nuclear power capacity by 2047 as part of its Nuclear Energy Mission for Viksit Bharat. For our upcoming nuclear plants, we need to deploy advance reactors capable of low and variable load operations.

For enabling growth of Renewable Energy (RE) capacity, areas which have high solar and wind energy potential, needs to be connected to Inter-State Transmission System (ISTS), so that the power generated could be evacuated to the load centres without hassles. Since the gestation period of wind and solar based electricity generation projects is much less than the gestation period of transmission system, the transmission system needs to be planned much in advance. As a major step towards achievement of the goal of 500 GW RE capacity, ISTS network has been planned by CEA for the projected RE capacity addition by the year 2030.

However, transitioning to net-zero involves complex challenges requiring coordinated efforts across all sectors. To discuss all such issues, conference will have presentations from Central Electricity Authority besides BHEL, L&T, Siemens, NTPC, GRID India, Greenko, IREDA, Power Grid, NHPC, THDC, Essar Power, Adani, BSES Rajdhani, and other Transmission and Distribution companies.

Keeping this in mind, the FORUM is organizing its prestigious event; 24th National Power Conference on the theme "Towards Net-Zero: Ensuring Reliability and Resilience in a high Renewable Power System" on 23rd December 2025 at Hotel Le Meridien, Janpath, New Delhi. Such Conferences have had patronage and support of the Ministry of Power, and power sector organizations. The event is a large meeting of top level energy professionals. Last year the Conference was attended by the more than 150 professionals.

IEF requests its members to pencil the date in their Diary to attend the programme.

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