

INDIA  
**ENERGY**  
FORUM

# TOTAL ENERGY

Volume 19, Issue 2

May 2024

## PM SURYA GHAR MUFT BIJLI YOJANA



## Profile of Energy Consumption and Demand Side Management to Play Crucial Role in Energy Transition

R.V. Shahi



Managing energy sector in India has always been a challenging task. Despite several achievements, the challenges are becoming more and more complex. In the initial phase, providing access to energy itself was a major task. A large cross section of India, more particularly rural India remained, uncovered in so far as even the minimum quantum of energy in

general and electricity in particular is concerned. Even now, with around 1250 KWhr. per capita electricity consumption, India is far away, in terms of energy and electricity adequacy compared even with many of the newly developed countries. The thrust of Indian planning, therefore, has been rightly on the supply side of energy to catch up and to provide reasonable degree of access and, in so doing, gratifyingly good success has been achieved, despite the fact that India still has a long way to go. During the last over ten years, when the climate change debates picked up further momentum, the thrust has rightly shifted to rapid expansion of renewable sources of energy, the top most among them being Solar Energy. In India, and elsewhere, exponential expansion of Solar and Wind Energy and also other forms of renewable energy are taking place. India has plans to drastically restructure its energy profile. In the case of power, it is aiming at Net Zero target by the year 2070.

Energy equity and environmental sustainability are being balanced with due emphasis on energy security. Several initiatives have been launched, and many are in the pipeline, to drastically change the overall energy profile as rapidly as possible. These directions, with required momentum, would definitely address the challenge of providing adequate supply.

What is being discussed in this piece is that equal amount of direction, thrust and momentum are needed for Demand Side Management (DSM), which should also include changing rapidly the Consumption Profile. In the beginning of the first decade of the current century, energy efficiency was brought in sharp focus, when the Energy Conservation Act was legislated. Follow up actions witnessed emergence of Bureau of Energy Efficiency identifying specific target areas on improving the nature of consumption of energy to make it more efficient and to see how best maximum output is achieved with minimum possible usages of energy. Efforts in this direction saw specific target-oriented missions and activities, and highly satisfying results were achieved in several key areas of industry, agriculture, and household. In manufacturing well directed schemes, properly monitored and regulated, witnessed numerous production gadgets being produced trying to excel over in their several generations to achieve more and more efficient energy consumption with better outputs and results. Thrust in these areas are continuing, list of designated industries are being reviewed to bring into focus with targeted energy efficiency parameters to be achieved within identified time frame. While there could still be further scope for enhancing the coverage and for fine tuning the targets, both in the fields of operating practices as also manufacturing parameters, aimed at more efficient gadgets, India has reasons to be happy about what have been and are being achieved in the field of Demand Side Management (DSM).

Equally important is the challenge of changing the Energy Consumption Profile, which must be recognized to be an integral part of DSM, several initiatives, plans and programmes need to be conceptualized and implemented, all of which should be appropriately aligned to India's overall vision of energy transition and Net Zero by 2070. This indeed is a mammoth task. All areas of energy consumption have to be dissected from the point of view of possibilities of changing the energy profile aimed at the energy transition targets. Each segment of industry, in fact, each manufacturing facility, needs to examine what changes can be made to make a major impact on

changing the nature of energy consumption aimed at the overall energy transition target. In the case of energy efficiency, a line of approach, which was followed, is available. Designated industries, particularly high energy consuming industries, were identified and were given gradually improving efficiency target, so as to optimize energy consumption – power consumption and consumption of other forms of energy. Based on experience the list of designated industries kept getting reviewed as also the targets. Several other schemes were identified with required incentives such as Perform, Achieve, and Trade (PAT). Bureau of Energy Efficiency and its associate organisations launched several programmes, all of which have achieved satisfying outcomes and brought about significant results in terms of efficiency of use of energy. On the manufacturing of energy consuming gadgets – light, fan, air conditioner, fridge, etc. the initiatives by the Bureau of Energy Efficiency through Star Label Programme achieved remarkable success in the industries responding very positively to progressively restructure their manufacturing processes and facilities which could achieve significantly lower levels of electricity consumption.

Similar approach is needed, with required adaptations, so as to progressively bring about rapid changes in the consumption profile (for example can Diesel/Petrol be replaced by electricity or by Hydrogen or by any other energy form aimed at energy transition target). In this context some of the initiatives which have been taken in the recent past are worth mentioning. They definitely provide a line of approach with possibilities of not only further refining them, but also scaling up and on enhancing the pace of their progress.

a) The Author had the privilege of Chairing the Advisory Board of Railway Energy Management Company during 2015-17 which consisted of very distinguished individuals as Members. The Advisory Board considered the entire gamut of energy consumption and the system, including railway network run through diesel engines,

electric locomotives using electric traction, the transmission infrastructure to draw power from the Grid and the various modes of power procurement. Due to highly skewed electricity traction tariff the Railways continued to believe the advantages of diesel locomotives vis-à-vis electric traction. Once the traction tariff for electricity was rationalized, the economics changed. Also, the Advisory Board evaluated the challenges associated with procurement of diesel, the behavior of prices of crude, country dependence on import of liquid fuel, and other relevant factors. As in 2015 out of more than 65,000 Kilometer of railway system, less than 20,000 kilometers had been electrified. The economics of electric traction vis-à-vis diesel driven locomotives was evaluated and it was strongly recommended that Railways may consider rapid transformation of diesel driven locomotive system into electric traction. Gratifyingly, the Railway Board decided, and during the following five to six years more than 55,000 kilometers of railway system is through electric traction. This shift of energy consumption in an important sector will go a long way in achieving the energy transition management objectives.

b) When India was hugely starved of electricity, until even during the first few years of the current century, with deficits being experienced in the range of 20% to 25%, even with reference to depressed demand in the wake of scant electricity distribution infrastructure in large parts of the country, the rural India had little choice than to meet its needs – household and irrigation through diesel driven irrigation pumps and electricity supply. Those parts of the country which did have distribution infrastructure, due to deficit in power supply, used to be persuaded to run their irrigation systems post 12 a.m. in the night when the supply and demand balance could comparatively support the irrigation. Gratifyingly, the Solar revolution has completely changed the energy supply dynamics. India should take advantage – thankfully the process has already started – to entirely shift the rural agriculture from the diesel driven systems into Solar Power-

- driven pumps or Solar Energy driven pumps. A network of mini-Solar plants in the range of 5-10 MW in rural areas could help a significant shift in the present energy consumption profile in a period of next five years or so leading to significant contribution in mitigating the energy transition challenge (It may be relevant to mention that the Author had the privilege of Chairing a Task Force on Rajasthan Power Sector during the period 2015-2018. The State power consumption profile consisted of agriculture accounting to about 40%. The Task Force had made a recommendation to work on the approach mentioned above to shift substantially the rural agriculture irrigation through Decentralised Solar Power Generation System). A beginning seems to have been made.
- c) Transportation is one of the most important areas which should be brought into sharper focus for a more rapid transition from liquid fuel to electricity or any other non-fossil fuel renewable energy. The process has already started, needs a little faster pace. Expansion of renewable energy supply would make significant difference to mitigate the challenges associated with fossil fuel driven transportation system. There have been rapid changes in the development of electric vehicles (two wheelers, three wheelers, and four wheelers). Similar changes are in the offing for large commercial vehicles. The cost of these transportation facilities has also declined substantially and will decline further with increasing demands. It has been established that the operating costs would be significantly less as compared to the vehicles driven through petroleum fuels (liquid fuel as well as gas). In any case, India's challenge on petroleum sector which is hugely dependent on import, and import proportion has always been rising, does not seem to be under control in the present situation, more so with rising international prices and also associated foreign exchange problems. The energy security consideration requires rapid reduction in import and, hence, there is an urgent need for shifting the consumption pattern to other forms of energy.
- d) There is considerable scope for shifting the consumption pattern in the household gadgets from gas to electricity. This process has also started. What is needed is to facilitate the picking up of momentum in this regard. Roof Top Solar, and in general the Solar Power supply system, would facilitate the momentum to pick up. The management strategy and commitment of Discoms in this regard would go a long way to provide the thrust leading to rapid changes in the consumption profile.
- e) Industrial establishments would be an important segment to consider and appropriately restructure their energy consumption profile. Obviously, that might need changes in processes and technologies. Cost benefit analysis must factor in the consequences of use of petroleum fuels, dependence of India on import and other factors. In the use of fossil fuels whether the technology changes could lead to more environment friendly processes should also be a relevant factor to consider. Industries need to be inspired and incentivised, if needed, to consider seriously and implement the initiative of shifting to other forms of energy to achieve the overall mission of energy transition.
- India's journey on the path of Energy Transition to Net Zero, over next several decades, obviously requires multiple strategies to be appropriately integrated. Normally, the planning process heavily depends on the supply side. India's energy sector has demonstrated, over last twenty years that successes on supply side initiatives could be achieved better and faster, if concurrently demand side challenges are also appropriately addressed. In this piece what has been articulated is that demand side challenge and its management is not necessarily only the energy efficiency management, but it also requires an appropriate dynamic shift in and management of consumption profile itself.
- \*\*\*\*\*

## From the Desk of the Honorary Secretary General



Dear Colleagues

You all must be happy to note that during the first quarter of current calendar year coal and lignite share fell below 50% in India's installed power capacity for the first time since 1960.

This is well ahead of the Indian government's target to establish 50% cumulative power generation capacity from non-fossil-based sources by 2030, according to the latest quarterly report from the Institute for Energy Economics and Financial Analysis (IEEFA).

India added a record 13,669 MW of power generation capacity in the January-March period of this year, with renewable energy contributing 71.5%.

Tender issuances for large scale renewable energy projects crossed a record 60 GW during 2023-24, according to IEEFA.

India has achieved third place in the world's solar power generation rankings, behind only China and the United States, according to Ember's fifth annual Global Electricity Review of 80 countries.

Similarly, net oil & gas import bill also increased to 12.3 billion \$ compared to 10.1 billion \$ in 2023. Data shows that our increase in demand for fossil-based energy is much higher than the energy addition through renewable.

During April 2024 India added 1107.04 MW of RE Capacity with cumulative RE capacity reaching 1,44,751 MW which mainly comprised of 92.63 MW Solar and 46.16 MW Wind.

India's total generation in 2023-24 was 1738 BU out of which 412 BU was from non-fossil sources which is 23.7%.

I also want to share with you that during the month of May, a Webinar on "Implementation of PM Surya Ghar - Muft Bijli Yojna in Residential Sector" was organized by Energy Sector Regulations Vertical of India Energy Forum on Saturday 18th May, 2024. Webinar was very informative and discussed a number of issues to be addressed in PM Surya Ghar Muft Yojna in Residential Sector.

In the coming month of June, a webinar on Distribution Sector Reforms is scheduled for 14th June.

With best wishes

**K S Popli**

Edited & e-printed by **Mr K S Popli, Secretary General, IEF**  
Published by **Mr S S Rawat, Head (Admn), IEF**



Registration No. DELENG/2007/20915

303 PHD House, 4/2 Siri Institutional Area, August Kranti Marg, New Delhi – 110 016

**Disclaimer: The information has been taken from reliable sources but no responsibility can be accepted for its correctness.**

## India plans to scale up green hydrogen production, aims for global leadership: MNRE Secretary



India is setting its sights on becoming a major player in the global green hydrogen market by significantly increasing production, Ministry of New & Renewable Energy (MNRE) Secretary Bhupinder Singh Bhalla said recently at the World Hydrogen Summit 2024 in

Rotterdam.

"With a strategic focus on scaling up production, India aims to capitalize on emerging opportunities in the international market for green hydrogen, thereby reinforcing its position as a key player in the global energy transition," Bhalla stated.

As part of its National Green Hydrogen Mission, India plans to reach an annual production capacity of 5 million tonnes of green hydrogen by 2030. This initiative includes a wide range of activities such as pilot projects, research and development, and skill development programs aimed at enhancing innovation and collaboration across the hydrogen value chain.

Bhalla emphasized India's low renewable energy costs and sophisticated grid infrastructure as crucial factors in attracting investment and efficiently integrating renewable energy sources. He also highlighted the crucial role of India's engineering talent in the successful implementation of these ambitious projects.

Currently, approximately 43% of India's installed electricity capacity comes from non-fossil fuel sources, with projections to increase to 50% by 2030.

On the progress being made towards The National Green Hydrogen Mission, Bhalla said, "The government has made substantial progress in this regard, having awarded tenders for incentives to

support green hydrogen production of a total of 412,000 tonnes per annum.

"Additionally, tenders have been awarded for the establishment of electrolyser manufacturing capacity amounting to 1,500 MW per annum, further bolstering India's capacity to produce green hydrogen at scale," he said.

## EVs, green hydrogen to propel India's journey towards net-zero target by 2070

The faster adoption of electric vehicles (EVs), the National Hydrogen Mission and other such initiatives will propel India's journey towards a net-zero target by 2070, eminent scientists and thought leaders have said.

Speaking at an event organised by the Technology Development Board (TDB), under the Department of Science and Technology (DST), Professor Ajay Kumar Sood, Principal Scientific Advisor to the government, emphasised the promotion of EVs through initiatives such as the National Electric Mobility Mission Plan (NEMMP) and Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME), aiming to mitigate greenhouse gas emissions.

He also highlighted the EV Mission, led by Prime Minister Narendra Modi's Science, Technology Innovation and Advisory Council (PM-STIAC), which is dedicated to developing supportive standards and frameworks for EV adoption.

"Substantial investments in green hydrogen production are a key component of the National Hydrogen Mission in India's journey towards a net-zero target by 2070," said Sood.

He also spoke about ongoing efforts in Carbon Capture Utilisation and Storage (CCUS) technologies, with policies aimed at cost optimisation and broader industrial application.

Professor Abhay Karandikar, Secretary, DST further underscored the significance of innovation for national development.

He highlighted the government's initiatives in funding various research and development programmes and nurturing innovation through schemes like NIDHI and TDB, aimed at incubating startups and fostering entrepreneurship.

"Technology is a double-edged sword: it reduces inefficiency but can also drive increased consumption. To combat this, focus on EVs, green hydrogen, carbon capture and energy-efficient habitats. Transitioning to renewable energy globally is essential to tackle climate change," said Professor Ashutosh Sharma, President of INSA and former secretary, DST.

In his keynote address, Padma Shri Professor G.D. Yadav advocated for sustainable solutions, championing carbon removal and technological innovations to achieve net zero by 2070.

### Amitabh Kant stresses on uniform EV policy for all companies



India cannot have individual EV policies for every company, Amitabh Kant told on being asked why Tesla did not come to India after the CEO announced an India visit in April but cancelled it at the last moment. Kant says that India has drafted an EV policy and all the companies have to follow

only that policy.

Kant's statement points out that Tesla may have made some specific demands from the Indian government specifically for the company. India announced an EV policy, where incentives are proposed for setting up manufacturing units in India.

The policy has asked for a minimum investment threshold of INR 4,150 crore (USD 500 million) and encouraging manufacturers to achieve significant levels of domestic value addition (DVA), the government mandates that by the third year of setting up the manufacturing unit, at least 25 per cent of the parts used to make the vehicles should be

sourced domestically. This localization level is expected to increase to 50 per cent by the fifth year of operation.

Under the new policy, the companies that would set up manufacturing facilities in India for EV passenger cars will be allowed to import a limited number of cars at lower customs/import duty of 15 per cent on vehicles costing USD 35,000 and above for five years from the date of issuance of the approval letter by the government.

The total number of EVs allowed for import under the policy will be limited based on the investment made, or of a maximum value of INR 6484 crore, whichever is lower.

If the investment exceeds USD 800 million, a maximum of 40,000 EVs can be imported, with no more than 8,000 per year. Unused import limits can be carried over.

### India to add more than 15 GW of renewable energy capacity annually in FY 2025 and FY 2026: India Ratings

India Ratings and Research (Ind-Ra) expects India's annual renewable capacity addition to remain at 15-18 GW in FY 2025 and FY 2026. It expects 75-80% of the annual RE capacity addition, i.e., up to 14.5 GW, to come from solar and around 20% from wind. The capacity addition will be driven by a significant reduction in equipment prices, continued policy support, availability of liquidity and investment plans of some of the large corporate players in the renewable sector for growth.

"However, the execution timelines of renewable capacity addition would continue to hinge on the regulatory stance towards import duties on cell and modules, support towards domestic cells and modules manufacturing, and indigenisation push towards domestic equipment sourcing," Ind-Ra stated.

The energy transition towards renewable capacity requires deployment and development of energy storage capacities, given the intermittent nature of the renewable energy for grid stability.

Ind-Ra expects pumped storage hydro power projects to emerge as a viable solution, given battery storage is currently economically less viable and an increase in return on equity to 17% from earlier 16.5% for pumped hydro storage as per draft CERC regulations for FY25-FY29.

Ind-Ra stated that the improvement in debtor's position for generating companies continues with an improvement in the liquidity position of distribution companies led by timely tariff hikes, successful implementation of Late Payment Surcharge scheme, and a continued reduction in aggregate technical & commercial losses. However, a delay in reforms including regular tariff hikes, a slower-than-expected reduction in aggregate technical and commercial losses, and other operational improvements could again lead to a pile-up in receivables for generating companies.

#### Thermal PLFs

Ind-Ra has maintained a neutral outlook for the power sector for FY25, as it believes the overall plant load factor (PLF) of thermal power plants would continue to improve and reach closer to 70% in FY25. It stated thermal PLFs will remain healthy owing to continued higher power demand, a ramp up in domestic coal production, slower capacity additions and continued dependence on coal-based generation till the sufficient storage capacity is built up for energy transition towards renewables.

"Ind-Ra continues to see a demand-supply mismatch in the power market, which would lead to a continued uptick in plant load factors of thermal plants and elevated merchant tariffs. While solar capacity addition has picked up pace following a reduction in the module prices and renewable capacity addition is likely to remain at over 15GW annually, effective storage options still need to be developed for the renewable capacities to be able to provide round-the-clock power," says Bhanu Patni, associate director, Corporate Ratings, Ind-Ra.

The agency expects merchant market prices to remain high in FY25 amid continued higher demand and slower thermal capacity addition.

### India's solar module exports hit \$1.97 billion in fiscal 2023-24

India's solar module exports were 91% up to \$1,969.13 million in fiscal 2023-24. USA was the biggest destination with modules shipments to the nation totalling \$1,939.92 million (98.5% of India's total module exports). Exports to South Africa totaled \$4.73 million, as per the data published by India's Ministry of Commerce and Industry.

India's solar module imports hit \$4,353.51 million in fiscal 2023-24, 361% up from \$943.52 million in fiscal 2022-23. China's shipments to India totalled \$2,850.74 million, around 66% of India's total module imports.

Vietnam was the second largest module supplier to India. Its module shipments to India totalled \$935.05 million. Malaysia's shipments to India stood at \$237.99 million.

India's imports of solar cells not assembled in modules or made up into panels were also significantly up. These reached \$1,853.05 million in FY 2024, 41% up in value terms compared to \$1,310.28 million in FY 2023.

China remained the largest solar cell supplier to the Indian market. PV cell imports from China almost doubled to \$1,035.98 million in FY 2024, from \$581.45 million in FY 2023.

Malaysia and Thailand were India's next two biggest sources for solar cells with their shipments to India totaling \$311.81 million and \$248.75 million, respectively.

### New RE park scheme may provide subsidies for floating solar projects

Floating solar projects—panels installed on water bodies such as lakes, reservoirs and ponds—may get a boost as the government is looking to bring them under a new renewable energy (RE) park scheme and give them subsidies, two people aware of the development said.



“A new RE park scheme is in the making. To support floating solar parks, government is looking at whether additional subsidy can be given to them,” said one of the persons mentioned above.

Earlier there was a consideration for viability gap funding under a separate scheme for floating solar parks. Now, however, the government is looking at giving subsidies rather than viability gap funding to floating solar parks.

Renewable energy parks are designated areas used for generation of power through diverse clean sources with all amenities like land, transmission, road infrastructure, communications and water being provided for along with approvals by the government.

Under the new scheme the focus would be on having solar and wind energy sources in the same park.

The person mentioned above also said the renewable energy park scheme would be in line with the existing scheme for the development of solar parks and ultra-mega solar park projects, where subsidy is provided for development of these parks.

Under the ongoing scheme for solar parks, the ministry of new and renewable energy provides central financial assistance (CFA) of up to ₹25 lakh per solar park for preparation of detailed project report (DPR). Further, CFA of up to ₹ 20 lakh per megawatt (MW) or 30% of the project cost, including grid-connectivity cost, is also provided on achieving the milestones prescribed in the scheme.

Under the new scheme, government would look at providing financial assistance to floating solar parks over and above such incentives for RE parks in general.

The ongoing solar park scheme was scheduled to end in the recently-ended FY24, but in December 2023, MNRE extended the deadline of the scheme till FY26.

The scheme was rolled out in December 2014 to support states and union territories set up solar parks with a view to creating the infrastructure needed for setting up of solar power projects.

Floating solar projects, apart from the doing away with the need for land acquisition, also help in conserving water resources by reducing evaporation. Floating solar projects, are however are more capital intensive compared to conventional ground-mounted projects.

According to a recent blog on [blogs.worldbank.org](https://blogs.worldbank.org), India has a potential of 280-300 GW in floating solar power. However, it noted that only a small fraction of its estimated potential has been installed in the states of Madhya Pradesh, West Bengal, Andhra Pradesh, Kerala, Telangana, Bihar and Rajasthan.

If the plan to include floating solar under the upcoming RE park policy and provide higher subsidies takes a concrete shape it is expected that growth in floating solar projects would help in achieving the 500 GW installed non-fossil capacity by 2030. Out of the overall clean energy target, 292 GW has been pegged for solar power capacity.

### Centre to ensure all government buildings have solar roof-top

The Centre recently directed four public sector utilities (PSUs) of the power ministry to saturate all buildings under the administrative control of the central government with solar rooftops by 2025.

In a meeting held in the power ministry, the PSUs were asked to either provide central financial assistance or pursue the offices to install solar rooftops on their own.

The exercise is part of the revamped solar rooftop scheme—PM Suryodaya Yojana (PMSY) or PM-Surya Ghar: Muft Bijli Yojana—which found a mention in Finance Minister Nirmala Sitharaman’s Interim Budget speech in February. The scheme was approved on February 29, 2024 and has a financial outlay of Rs 75,021 crore.

Interestingly, PMSY is primarily aimed at installing solar power systems on the roofs of 10 million households to enable free electricity to consumers. However, what made the government expedite the scheme’s implementation in all central government offices first is the absence of clarity on the credibility

of registered vendors to implement PMSY in households. It is envisaged that the residential sector consumers shall be free to enter into arrangements with registered vendors through a portal at mutually discovered rates and no tendering will take place by the state DISCOMs/agencies under the scheme to empanel the vendors.

“This clause has been creating a lot of trust and credibility issues with respect to the registered vendors to implement the scheme in households in a committed manner,” sources said.

The government is trying to give impetus to rooftop solar in India which has been lagging as compared to the grid-connected ground-mounted solar power projects. Out of the total installed solar power generation capacity of 73 gigawatts (GW) in the country, ground-mounted (large-scale solar power generating units) is 56.9 GW, while grid-connected rooftop solar is only 11 GW and off-grid is 2.75 GW. The power ministry officials said there are currently around 6.5 lakh household rooftop solar systems across the country.

“These numbers need to increase if India wants to meet its targets. The percentage of rooftop solar is very less. While the guidelines for implementing PMSY in households is being finetuned, four power ministry PSUs have been directed, meanwhile, to expedite installation in central government offices,” sources added. As per the draft guidelines for implementation of PM-Surya Ghar: Muft Bijli Yojana, a section on ‘Rooftop Solar on Government Building’ states that all government rooftops under the administrative control of the central government including autonomous bodies and subordinate offices “shall be saturated with rooftop solar to the extent possible technically by 2025.” The guidelines read that the available rooftop space will be utilized on a priority basis.

“The central public sector enterprises with experience in deployment of renewable energy technologies will assist the ministries in deploying rooftop solar on their assets on a priority basis.” The ministry of new and renewable energy will monitor and track installations in the government sector. “All buildings under central government shall deploy roof

top solar in mission mode to achieve saturation by 2025,” it reads.

### SECI extends bidding for 25 MW AC solar plant with 20 MW/50 MWh battery storage in Leh



Solar Energy Corp. of India (SECI) has extended bidding for the installation and commissioning of a 25 MW AC (50 MWp DC) solar

PV plant with 20 MW/50 MWh battery storage in Leh by three weeks.

The revised bidding deadline is now June 3.

SECI had invited bids to install and commission a 25 MW AC (50 MWp DC) solar PV plant with 20 MW/50 MWh battery energy storage system at Taru in the Leh district of Ladakh, in April this year.

The successful bidder's scope includes design, engineering, supply, construction, erection, testing, commissioning and ten-year operation and maintenance of the PV plant with battery storage.

For the supplies to be done under this tender, both the solar cells and modules must be made in India and modules must be from the manufacturers listed in the Approved List of Models & Manufacturers [ALMM list], published and updated by the MNRE from time to time.

### NTPC extends bidding for 630 MW of solar



NTPC Renewable Energy Ltd (NTPC REL) has invited bids to install and commission 630 MW of grid-connected solar PV projects in Barethi, Madhya

Pradesh.

The projects are tendered under the Open category, which means cells and modules of any origin can be used. These are to be set up in two blocks of 315

MW each. A single bidder can quote for any one or both the blocks.

The prospective contractor's scope of work includes design, engineering, manufacturing, supply, installation, testing, and commissioning of the grid-connected, ground-mounted solar PV plant, including Open category PV modules. It will also provide comprehensive operation and maintenance of the PV plant along with electrical equipment, consumables, and spare parts for a period of three years and AMC of major equipment from the date of commissioning of the full project capacity.

### **Rajasthan aims for 90 GW of renewable energy by 2030, focus on solar and wind**

Rajasthan aims to achieve 90 gigawatts (GW) of renewable energy capacity by the fiscal year 2029-30 as part of its new energy policy, Jiwesh Nandan, a Distinguished Fellow at The Energy and Resources Institute (TERI) said. Speaking at an industry meeting in Jaipur, Nandan detailed the Rajasthan Renewable Energy Policy 2023, which anticipates 60 GW of variable renewable energy capacity by 2030, including equal contributions from solar photovoltaics and wind. "Businesses reflect the changing values and changing economics, which the world is currently witnessing, by focusing on resource efficiency and clean energy," Nandan told industry stakeholders.

He emphasized the role of consumers in pushing companies toward sustainability and highlighted the need for public excitement about a sustainable and net-zero future. Nandan also discussed the integration of solar energy into Rajasthan's commercial and industrial sectors and the potential for shifting agricultural demand to daytime hours and incorporating electric vehicle load to reduce reliance on grid-scale batteries. TERI, acting as the Secretariat of the industry coalition, is leading the initiative to integrate renewable energy into India's broader energy and industry transition strategies.

### **India set to boost wind energy capacity to 25 GW by 2028, with ₹2 lakh crore investment**

India is poised to significantly increase its wind energy capacity, with a projected addition of nearly

25 gigawatts (GW) between fiscal years 2025 and 2028, compared to about 9 GW added between 2021 and 2024. This expansion will entail a capital expenditure of between ₹1.8 lakh crore and ₹2 lakh crore, Crisil Ratings said.

The growth in wind power capacity is driven by the increasing need for renewable energy to provide grid balancing and continuous power supply, contrasting with solar power which is limited to daylight hours.

"Hybrid and storage-linked projects would push higher wind additions. Nearly 30-50% of capacity of these projects will comprise wind power as these require developers to provide renewable power throughout the day, especially demand peaks during evening and night hours," Ankit Hakhu, Director, Crisil Ratings, said.

India's focus on wind energy had previously slowed, with annual capacity additions dropping to 1.7 GW from 2018 to 2023, down from approximately 3.0 GW annually from 2014 to 2018. The decline was attributed to a lack of connected sites with high wind potential and diminished returns for developers following aggressive bidding.

In response, the government has rolled out several policies to boost the sector, including setting a target to auction 50 GW of renewable projects annually, with 10 GW dedicated to standalone wind projects. Since fiscal 2023, around 5 GW of standalone wind projects have been auctioned, compared to about 3 GW in fiscal years 2021 and 2022. Auctions of hybrid and storage-linked projects have also risen, from 4 GW in fiscal years 2021 and 2022 to nearly 18 GW in fiscal years 2023 and 2024.

"Average tariffs have stabilized around Rs 3.2 per unit in fiscals 2023 and 2024 and are expected to continue in fiscal 2025, vis-à-vis Rs 2.8 per unit over fiscals 2020-2022. These tariffs are expected to be viable and remunerative to developers at the expected project costs over the medium term," Varun Marwaha, Associate Director, Crisil Ratings, said.

The projected expansion of wind power capacity highlights India's efforts to bolster its renewable energy infrastructure to meet growing energy demands sustainably.

## Solar Panels for Home Consumption

Shri Ajay Shankar,  
Former Secretary (DIPP), GOI



The Pradhan Mantri Suryodaya Yojana announced by the Prime Minister just after the Ram Temple consecration in Ayodhya aims to provide rooftop solar panels to one crore households. It has been elaborated in the Budget speech that these households would be able to obtain three hundred units of free electricity every month.

This would result in 'savings up to fifteen to eighteen thousand annually for households from free solar electricity and selling the surplus to the distribution companies.' The Minister for New and Renewable Energy has since said that the central government will provide a 60% subsidy for the rooftop solar installations under the Scheme. For the remaining 40%, loans to be repaid over ten years would be provided. The repayment could be done from the sale of excess electricity to the Distribution Company. After ten years when the loan has been repaid, there would be additional income for the household from the sale of electricity. The public sector undertakings of the Ministry have been given the responsibility of implementation in the states for which they may set up a subsidiary/SPV for this purpose.

Assuming a 3kw installation on the roof of a house this would require installation of 30 GW capacity to provide solar panels to one crore homes. This is going to be challenging as the pace of rooftop installation in the country has been modest notwithstanding generous subsidies, with the total capacity so far being just over 11 GW whereas the total solar capacity in the country is over 72GW. A good beginning has been made by roping in the central undertakings, assigning states to them, and making the Rural Electrification Corporation the implementing agency. This was tried for the first time for the execution of the national rural electrification program. This did help in achieving spectacular results, electrification of over one lakh villages in a round six years. But the task this time is different,

instead of extending the distribution network to each village and home, solar panels have to be installed in homes with 60% of the cost as a subsidy to be given by the central government and 40% as a loan to the beneficiary.

A good precedent to follow would be the practice of bulk procurement used so effectively to bring down the price of LEDs and more recently electric buses by EESL (Energy Efficiency Services Limited). With the decision of having the solar panels for this program being made in India, this should make us Atma Nirbhar for the entire value chain, from polysilicon to the solar panel. The size of the procurement with the condition of full value addition in India would make private investment in manufacturing attractive.

The decision on the rate at which surplus electricity would be bought by the distribution company should be taken at the outset. The benefit from the sale of surplus electricity generated by the panel would be clear. It would also be necessary to resolve an anomaly. For rooftop solar, net metering is the practice today. The consumers who have been going in for solar panels have been ones in the higher tariff range. The rate at which they are compensated for the surplus that they feed into the grid under net metering is the high rate at which they are buying. The beneficiaries under this program would be under the lowest tariff slab. Under net metering they would therefore be compensated at the lowest rate. The result would be discriminatory in favour of the wealthy. This could not possibly be the intention. Nor would it be sustainable. Much better to get it right now by having one uniform rate of purchase, feed in tariff, of excess electricity from the solar panels of consumers. The same rate should be applicable to the surplus electricity from the irrigation pump solarisation program, KUSUM.

Once the program takes off successfully, there would be confidence regarding the total cost and a realistic date of completion. In aggregate macroeconomic terms it is cost effective to create cheap (solar) generating capacity at the consumption point. Subsidising this capital investment is cheaper than subsidising more expensive supply. One could look forward to all homes of the weaker sections having solar panels and free green electricity.

## Reliance signs up with Norway's Nel for hydrogen electrolyzers

Reliance Industries Ltd has signed an agreement with Norway's Nel ASA for sourcing technology to make electrolyzers for production of green hydrogen as part of billionaire Mukesh Ambani's pivots toward green energy. The agreement with Nel Hydrogen Electrolyser AS, a fully owned subsidiary of Oslo-based Nel ASA, "provides Reliance with an exclusive license for Nel's alkaline electrolyzers in India and also allows Reliance to manufacture Nel's alkaline electrolyzers for captive purposes globally," the Norwegian firm said in a statement.

Ambani, Asia's richest man who built his fortune on fossil fuels, in 2022 announced plans to invest USD 75 billion in renewables infrastructure including generation plants, solar panels and electrolyzers.

Green hydrogen -- made by splitting water using clean electricity in an electrolyser -- is seen as crucial in emissions reduction goals.

Reliance is building a green energy business to supply the equipment India will need for its green energy revolution. Reliance has committed to being a net zero carbon emission company by 2035, which is earlier than the target of any other energy company in the region.

Reliance, which aims to turn net zero by 2035, plans to produce 100 gigawatts of renewable energy, a fifth of the nation's target for non-fossil capacity by the end of the decade.

The Indian government has set a target of 500GW of installed renewable energy by 2030. Of this, solar is expected to account for the largest share with 280GW.

"The signing of this agreement is a great milestone in Nel's history. Reliance is an impressive company with enormous ambitions as a global producer of renewable hydrogen, and I am proud that they have selected Nel as their technology partner. In addition to supporting Reliance in achieving their global aspirations, Nel will through this agreement get a revenue stream from a rapidly growing market Nel

could not have accessed on its own," says Nel's President and CEO, Hakon Volldal.

The statement said Reliance, a Fortune 500 company and India's largest private sector corporation, "is renowned for its capacity to execute large-scale projects and robust investments in technology and innovation.

"Reliance is building a multi-GW fully integrated end-to-end new energy value chain, from photon to green molecules, paving the way for abundant and affordable access to sustainable energy for everyone, as per the vision set by chairman and managing Director Mukesh Ambani. Green hydrogen is a critical element of the new energy value chain - and the partnership between Reliance and Nel in relation to alkaline electrolyzers is an important milestone towards the sustainable energy future. 00

Through the agreement, Reliance gets access to Nel's leading, proven technology platform for manufacturing electrolyzers. Reliance has successfully built multiple businesses of a truly global scale. This partnership of Nel's robust technology platform with its execution prowess - will further add to the success story for both partners.

"Both partners will also collaborate on future performance improvements and cost optimization through research and development (R&D), value engineering, standardization and modularization to improve the competitiveness of the alkaline technology platform," the statement said.

According to the agreement, Nel can procure equipment from Reliance for its own projects. Nel will continue to serve the Indian market with technology platforms that are not covered by the agreement.

Incentivising hybrids, which is a stop-gap solution at best, will only delay the transition to an emissions-free future and extend India's dependence on imported oil. The country will soon face scrutiny from the world as the second-biggest carbon emitter after China. EV technology is a much more feasible and affordable option for India's transport sector in the near to medium term. Even in trucking, electric vehicles are emerging as a feasible option for several applications.

## Coal stocks at power plants, pithead up a quarter on year



कोयला मंत्रालय  
MINISTRY OF  
COAL

Coal stocks at pithead and on transit to thermal power plants stood at 147 million tonnes as on May 15, up 25% from 117 million tonnes during the corresponding period of last year, according to recent data from the coal ministry.

Additionally, the end stock of coal at the country's thermal power plants stood at 45 million tonnes as against 34.83 million tonnes as on corresponding date of last year, registering an increase of 29% .

State-owned major coal producing company, Coal India reported a pithead stock of 85 million tonnes, up 30% from last year, the ministry data showed.

“In a recent sub-group meeting with State Gencos at the level of the Inter-ministerial committee of Coal, Power and Railways, it has been concluded that adequate stock is available at all thermal power plants in the country,” the ministry said.

Coal production during this year is growing at 7.26% over last year, according to the government. Thermal power generation and rake supply, on the other hand, is growing at 8.78% and 8.45% respectively.

The government has estimated peak power demand to touch 260 GW in the summer season and has taken several measures to ensure adequate electricity supply to consumers including mandatory running of imported coal based plants to their full capacity and six percent coal blending at domestic coal-based plants.

In April, the peak power demand met rose to 224.18 gigawatt (GW) as against 215.88 GW in the same period last year. In September last year, the peak demand reached 243 GW.

For the financial year 2024-25 the power ministry has placed a demand of 874 million tonnes of coal. Of this, Coal India is expected to supply 661 million tonnes of coal.

Moreover, the company has targeted to supply 171.4 million tonnes of coal to the power sector in the first quarter of the current financial year, up 11% from 153.4 million tonnes supplied in Q1FY24.

In FY24, the peak power demand met grew by 13.9% from 210.7 GW the previous fiscal year to 239.9 GW. Relative to FY23, the energy requirement grew by 7.5% in the last financial year and the energy availability grew by 7.8%, resulting in a reduction in total energy shortfall from 0.5% in 2022-23 to 0.2% in 2023-24, according to government data.

## Govt invites bids for coal gasification projects from PSUs, private companies

The Ministry of Coal has invited bids from Public Sector Undertakings (PSUs) and private companies for setting up coal and lignite gasification projects. Bids have been invited from companies under three categories and those selected will be provided financial support by the Centre for setting up coal gasification projects. The government has set a target of gasifying 100 Million Tonnes (MT) of coal by 2030.

“India has one of the world's largest reserves of coal and in order to utilise coal optimally and reduce carbon gas emissions in the economy, the Ministry of Coal is implementing a new scheme on financial support for coal/lignite gasification projects. The objective of the scheme is to support demonstration of financial and technical viability of gasification projects more widely, accelerate markets for downstream products and create additional value in the economy for coal. The gasification technology shall not only contribute to the growth of the country in terms of domestic product development and import substitution for products like oil, gas, methanol, ammonia, urea and other products, but also ensure diversified use of coal which will ultimately make the country Atmanirbhar and ensure sustainability in coal sector,” said the Request for Proposal (RfP) floated by the Coal Ministry dated May 15.

### Coal gasification project categories

Under Category I, Rs 4,050 crores will be provided to government PSUs or JV of PSUs. A total of three projects will be supported by providing a lumpsum financial incentive of Rs 1,350 crores or 15 percent of the capex, whichever is lower, to each selected

PSU's project. For this category, bidders will be ranked in descending order based on their bid score under respective downstream products, for example, methanol and syn gas. However, as far as possible, one project for a single downstream product for economies of scale will be taken up. "... to maximise the diversification of products, the Financial Incentive shall be allocated to Bidder 1, Bidder 3 and Bidder 6 on the basis of their rankings on Bid Score as well as inclusion of diversified products under the scheme as far as possible," said the RfP. In case two bidders have the same bid score, the successful bidder will be the one who quotes higher plant capacity or lower viability amount as total percentage of capex.

Under Category II, Rs 3,850 crore has been provisioned for the private sector as well as PSUs. The projects qualifying for support under this category will receive a lump-sum financial incentive (in two equal instalments) of 15 percent of the Capex or Rs 1,000 crore, whichever is lower. At least one project will be bid out on tariff-based bidding process which is adopted for thermal power plant in the power sector. Under this category, the authority will evaluate the Technical Bids and the bidders who qualify the Technical Bid stage will become eligible for opening of the Financial Bid. Once the financial bid is opened, the bid score will be the sum of plant capacity score, viability amount score and sustainability score (based on the implementation of Carbon Capture, Utilisation and Storage technology). Just like Category I, bidders will be ranked in descending order for various downstream products which comprise their bid score.

Under Category III, Rs 600 crore has been provisioned for demonstration projects (indigenous technology) and/or small-scale product-based gasification plants undertaken by both the private sector as well as PSUs to develop indigenous coal/lignite gasification technology. For the third category of projects, the bid score will be the sum of plant capacity score, investment score and viability amount score.

Bids for all these categories have to be submitted within 120 days of the RfP issuance date.

## India's coal imports rise 8% to 268 MT in FY24

India's coal import rose by 7.7 per cent to 268.24 million tonne (MT) in FY24 driven by softness in seaborne prices and likelihood of increase in power demand during summer. The country's coal import was 249.06 MT in FY23, according to data compiled by B2B e-commerce company mjunction services

Coal import in March FY24 also rose to 23.96 MT, over 21.12 MT in the corresponding month of the previous fiscal.

Of the total volume recorded in March 2024, non-coking coal import stood at 15.33 MT, against 13.88 MT in March FY23. Coking coal import in March 2024 was 5.34 MT against 3.96 MT a year ago.

During FY24, non-coking coal import was at 175.96 MT, higher than 162.46 MT imported during FY23. Coking coal import was at 57.22 MT in 2023-24, against 54.46 MT in 2022-23.

"There was an increase in coal import volumes due to the continued softness in seaborne prices and expectation of a demand uptick during the summer season. However, as there is ample availability of domestic coal in the market, it is to be seen if import demand remains strong in coming months," mjunction MD & CEO Vinaya Varma said.

The all-India production of coal during 2023-24 was at 997.25 MT, registering a growth of 11.65 per cent over FY23.

CCO, a subordinate office of the coal ministry, lays down the procedure and standard for sampling of dry fuel and inspects collieries to ensure the correctness of the class and grade of coal.

## Coal share falls below 50% in India's installed power capacity

India added a record 13,669 MW of power generation capacity in the January-March period of this year, with renewable energy contributing 71.5%. Coal's share of total power capacity, including lignite, fell below 50% for the first time since the 1960s.

This is well ahead of the Indian government's target to establish 50% cumulative power generation capacity from non-fossil-based sources by 2030, according to the latest POWERup quarterly report from the Institute for Energy Economics and Financial Analysis (IEEFA).

The report states that the decline in coal's share mirrors a global trend, with demand for coal in the Group of Seven leading industrialized nations hitting record lows in 2023 – levels not seen since 1900. To accelerate the transition, G7 countries vowed in April to phase out all unabated coal power generation by 2035, expanding on their commitment to end all construction of new coal-fired power plants.

As 2024 shapes up to become a pivotal year in the global transition away from fossil fuels, India is at the forefront, making great strides towards the target of net-zero greenhouse gas emissions. Large-scale renewable energy projects have been the focus of intense interest, as evidenced by tender issuances crossing a record 69 GW, according to IEEFA.

Tenders issued for utility-scale renewable energy projects in fiscal 2024 far surpassed the government's target of 50 GW.

"After a slump from 2019 to 2022 due to supply-chain issues and global price spikes brought on by the Covid-19 pandemic and Russia's invasion of Ukraine, the market has rebounded and gone from strength to strength," said the report's contributing author, Vibhuti Garg, director of South Asia for IEEFA. "There is strong investor interest in the Indian utility-scale renewable energy market. The primary reasons are the large-scale potential for market growth, central government support in terms of targets and regulatory frameworks, and higher operating margins."

India has rocketed to third in the world's solar power generation rankings, behind only China and the United States, according to Ember's fifth annual Global Electricity Review of 80 countries, released last week. Ranked ninth in 2015, India has now surpassed Japan, which, along with fellow G7 member Germany, has a stubbornly high demand for coal.

Solar was the world's fastest-growing electricity source for the 19th straight year, adding more than twice as much new electricity as coal last year. India had the world's fourth-largest increase in solar generation in 2023 (18 TWh), behind China (156 TWh), the United States (33 TWh) and Brazil (22 TWh). The top four countries accounted for three-quarters of solar growth in 2023.

Since 2000, the share of global electricity from renewables has expanded from 19% to more than 30%, driven by an increase in solar and wind from 0.2% in 2000 to a record 13.4% in 2023. As a result, the carbon dioxide intensity of global power generation reached a record low in 2023, 12% below the 2007 peak.

"A renewables-powered future is now becoming a reality," said Aditya Lolla, Ember's Asia program director. "Solar power, in particular, is growing at an unprecedented pace. Our report concludes that the rapid growth in solar and wind has brought the world to a crucial turning point – likely this year – where fossil generation starts to decline at a global level."

India generated 5.8% of its electricity from solar in 2023, in line with the global average, which hit 5.5% in 2023.

"Adverse weather conditions and surging power demand mean the country continues to rely on coal for over 70% of its electricity generation," said the report. "The situation is unlikely to change this year, with the Central Electricity Authority expecting a shortfall in hydropower, leading to power shortages, especially during the night when solar is offline. As a result, the country may fire up idled coal plants to meet the shortfall."

On a more positive note, India's push towards renewable energy has attracted a host of new players at state, national and international level. Of the record 69 GW in tenders awarded in fiscal 2024, only a quarter were from the Solar Energy Corp. of India (SECI), highlighting the important role that state-level authorities will play in the country's utility-scale renewable energy landscape.

India installed record solar power capacity of 8.5 GW during the first quarter of this year, driven by many



projects coming online, including Adani's 1.6 GW solar project in Khavda, Gujarat.

"The record solar installations were driven by a sustained year-on-year increase in tendered capacity and the urgency in commissioning of projects prior to the onset of the Approved List of Models and Manufacturers (ALMM) policy from April 1, 2024," said Charith Konda, IEEFA's energy specialist.

The future looks bright for India's renewable energy sector as innovative tender types emerge to meet market needs. There has been an increase in tender issuance for energy storage systems (ESS) projects, which will form a crucial part of India's renewable energy infrastructure.

"Energy offtakers' preference for a less intermittent and improved profile of renewable energy output has increased considerably," said Jyoti Gulia, founder of JMK Research. "Since the introduction of hybrid tenders in 2018, renewable energy tendering has witnessed a strong shift in momentum from solar and wind to hybrid and renewable energy plus ESS. The emphasis on output power quality will continue to strengthen in coming years."

Tendering activity in fiscal 2024 confirms that the future for India's renewable energy sector is bright, with market stakeholders confident the annual tendering capacity will again cross the national target of 50 GW in fiscal 2025.

### **What is the price tag of phasing-out coal? For China & India, at least \$2 trillion**

The fight against climate change demands a transition away from coal, but the economic impact on coal-dependent communities raises concerns. A new study by researchers in Sweden and Austria has shed light on the financial challenges of this transition.

The study, Compensating affected parties necessary for rapid coal phase-out but expensive if extended to major emitters, was conducted by Chalmers University of Technology and Central European University, analysed government plans for coal phase-out around the world. The paper was

published in journal Nature Communications on May 7, 2024.

Its findings reveal that over half of the plans of transition away from coal involve monetary compensation for affected workers and communities. This planned global compensation amounts to a staggering \$200 billion. However, this figure excludes China and India, the world's top coal consumers, which currently lack concrete phase-out plans, according to the study.

The researchers estimated that if China and India were to phase out coal at the pace required to meet the Paris Agreement climate goals and offer similar compensation packages, the cost could skyrocket to over \$2 trillion.

The study underscored the complex balancing act involved in phasing out coal. While the environmental benefits are undeniable, ensuring a smooth transition for workers and communities is equally important.

The researchers emphasised the importance of international collaboration in financing a just transition, particularly for developing countries like India, which may face greater economic burdens.

"Previously, coal phaseout has often been blocked by the interests opposing it. Many countries have put money on the table through 'just transition' strategies, which has made coal phaseout politically feasible," Jessica Jewell, associate professor at Chalmers University of Technology, and one of the authors of the study, said in a statement.

Combined, about 23 countries, home to 16 per cent of global coal power infrastructure, have committed approximately \$209 billion for compensation. However, the amount it translates to just around 6 gigatonnes of carbon dioxide (CO2) emissions avoided.

Moreover, the cost of compensating for coal phase-out per tonne of avoided CO2 emissions (ranging from \$29 to \$46 per tonne) is notably lower than recent carbon prices in Europe (approximately \$64 to \$80 per tonne).

"So far, these 'just transition' policies are consistent with, or lower than, the carbon prices within the

European Union, which means they make sense in terms of climate change. But more funding is likely needed if we want to reach the Paris climate target,” said Jewell in the statement.

If China and India were to implement compensation measures akin to those already established, the projected compensation sum for both nations would be \$2.4 trillion to achieve the 2 degrees Celsius target and \$3.2 trillion for the 1.5°C target, the study said.

“The estimated compensation for China and India is not only larger in absolute terms, but would also be more expensive compared to their economic capacities,” said Lola Nacke, a doctoral student at Chalmers University of Technology, and another author of the paper.

The paper posed a difficult question regarding the source of funding for these substantial amounts. Presently, approximately half of all compensation funds originate from international channels, such as the Just Energy Transition Partnerships — multi-lateral structures for accelerating the phase-out of fossil fuels aiding coal phase-out efforts in Vietnam, Indonesia, and South Africa.

It’s plausible that international financing will also be necessary to bolster future compensation for coal phase-out in major coal-consuming nations, the paper underlined.

However, researchers highlighted that the projected compensation figures for China and India alone rival the entirety of international climate finance pledged in Paris, surpassing current levels of international development aid to these countries.

### **Coal imports for blending by domestic power plants down 32% in FY24**

Coal imports for blending purposes witnessed a decline of 32% in FY24 at 23.92 million tonnes (MT) compared to 35.10 MT in FY23, an official data showed. The decline can be attributed to the increase in the production of domestic coal which touched 997.4 MT last fiscal, up 11.67% from the previous year.

Central sector power plants accounted for 48% of the total coal imports for blending, followed by independent power plants at 33%, and state sector plants at 18.8%. The installed capacity of domestic coal-based plants stands at approximately 193 gigawatts (GW).

According to the data by the Central Electricity Authority, the total receipt of domestic coal in FY24 stood at 864.3 MT against the country’s total consumption of 849.7 MT of coal.

Domestic power plants blend imported coal with coal from domestic mines to increase its calorific value.

Amid projections of high power demand in summer with the peak demand touching 260 GW, the power ministry has directed all coal-based power generating companies to maintain a 6% imported coal blending at their power plants till June. The ministry, in October last year, had extended the norm till March 2024.

According to the CEA data, the total coal stock in the country’s thermal power plants stands at 47.2 MT as on May 10, 67% of the normative stock requirement of 70.56 MT. As many as 28 plants have critical stocks, including 20 domestic coal based plants and five imported coal based plants.

While coal imports for blending purposes fell owing to the government’s measures to increase domestic supply, imports by plants designed to run on foreign coal increased sharply by 104% to 41.81 MT in the FY23 compared to FY23.

After targeting to eliminate imports of substitutable coal by FY26, the coal ministry is now expected to encourage imported coal-based power plants to make capital investments to run on domestic fuel.

The ministry is set to request power plants run on imported coal to make changes in technologies and design to be able to use domestic coal over the next two years, Union coal minister Pralhad Joshi had earlier said.

## Peak power demand to hit 235 GW during day, 225 GW in evening in May: Power ministry



The Power Ministry has projected that peak electricity demand is likely to reach 235 GW during the day and 225 GW during the evening in May. The projection comes as the country prepares for higher electricity consumption with the onset of summer.

The ministry further indicated that in June, the peak demand is expected to rise to 240 GW during the day and 235 GW during the evening hours. The peak evening power demand during April 2024 stood at 224 GW, which was successfully met.

"Power demand is set to increase with the summer months. Our projections for May and June indicate that we are prepared to meet the higher demand," a senior official from the power ministry said.

The official added that the ministry is closely monitoring the situation and taking necessary steps to ensure uninterrupted power supply. "We have made adequate arrangements to meet the rising demand and are confident in our ability to manage the supply effectively," the official said.

"Chaired a meeting with senior officials of the Coal Ministry to review coal production and off-take. We are fully prepared to meet the rising coal demand during the peak summer months and every step is being taken to ensure adequate coal supply across the country, to continue powering up the economy. With expansion in coal mining and improvement in efficiency, we are successfully meeting the rising energy demands of the nation," Joshi tweeted on X.

The increase in peak power demand highlights the need for enhanced generation capacity and efficient distribution mechanisms. The power ministry is also focusing on renewable energy sources to augment the power supply. "We are increasing our reliance on

renewable energy to meet the growing demand. This will not only help in meeting the demand but also in achieving our sustainability goals," the ministry official said.

Experts have pointed out the challenges that come with managing such high levels of demand. "The projected peak demand for May and June is quite high. It is crucial for the ministry to have contingency plans in place to handle any unexpected surges," said an energy analyst.

The successful meeting of the 224 GW peak evening power demand in April 2024 is seen as a positive indicator of the system's capability. "April's performance gives us confidence that we can handle the increased demand in the coming months," the power ministry official added.

The ministry is also urging consumers to use electricity judiciously. "While we are prepared to meet the demand, it is also important for consumers to be mindful of their electricity usage, especially during peak hours," the official said.

## India projects biggest power shortfall in 14 years in June

India is projecting its biggest power shortfall in 14 years in June after a slump in hydropower generation, its government told Reuters, and is racing to avoid outages by deferring planned plant maintenance and re-opening idled units.

The deficit also follows delays, a government source said, in the commissioning of 3.6 gigawatts (GW) of new coal-fired plants which had been targeted to be operational before March.

A peak shortage of 14 GW is forecast in June during night time hours, when solar capacity is offline, the Central Electricity Authority, the country's planning body for the power sector, told Reuters in a statement.

"The planning process relies on worst-case scenarios," it said.

The gap is the widest since 2009-10, according to publicly available government data. India's hydroelectricity output fell at the steepest pace in four

decades in the year ended March 31, while renewable energy generation was flat.

Power Minister R K Singh held an emergency meeting last week to take stock of the situation, and decided to defer shutting down power plants for planned maintenance during June and revive 5 GW of idled coal plant capacity, two separate government sources present in the meeting said.

"All efforts have been made to maximise generation, and with the measures in place it is expected that the power demand would be adequately met during the day and the non-solar hours in the coming months including June 2024," the statement said.

Grid administrator Grid-India projects maximum night-time demand of 235 GW in June, the statement said. On the supply side, nearly 187 GW of thermal capacity is available, and about 34 GW from renewable sources, according to government sources.

The figures on power demand and capacity projections have not been previously reported.

The power ministry last month invoked emergency rights for the first time to direct gas-based and imported coal-based power plants to operate at full capacity.

India has long defended use of coal, but Prime Minister Narendra Modi's administration had slowed capacity growth based on the heavily polluting fuel to focus on the green energy transition, with an eye to meeting 2070 net zero emission goals.

Plans to set up new coal power plants in the country, which is under pressure from rich economies to stop coal use, gathered momentum last year, but they will take a minimum of four years to start generation.

Existing coal-fired power plants and solar plants will help the nation meet its electricity demand during daytime hours, one of the government sources said.

### **Thermal PLFs to remain healthy amid power demand-supply mismatch: Report**

India Ratings and Research (Ind-Ra) recently maintained a neutral outlook for the power sector,

noting that thermal PLFs (plant load factor or capacity utilisation) will remain healthy amid demand-supply mismatch in FY'25.

"India Ratings and Research (Ind-Ra) has maintained a neutral outlook for the power sector for FY'25, as it believes the overall plant load factor of thermal power plants would continue to improve and reach closer to 70 percent in FY'25," an Ind-Ra statement said.

This is attributed to continued higher power demand, a ramp-up in domestic coal production, slower capacity additions and continued dependence on coal-based generation till sufficient storage capacity is built up for energy transition towards renewables, it added.

"Ind-Ra continues to see a demand-supply mismatch in the power market, which would lead to a continued uptick in plant load factors of thermal plants and elevated merchant tariffs," said Bhanu Patni, Associate Director, Corporate Ratings, Ind-Ra.

Patni further stated that while solar capacity addition has picked up pace following a reduction in the module prices and renewable capacity addition is likely to remain at over 15GW annually, effective storage options still need to be developed for the renewable capacities to be able to provide round-the-clock power.

The sector has seen an improvement in debt position backed by a reduction in working capital requirements and an improvement in capital structures of large players, Patni added.

The agency expects merchant market prices to remain high in FY'25 amid continued higher demand and slower thermal capacity addition.

However, Ind-Ra expects the thermal capacity addition to pick up pace over FY'25-26 with the likely commissioning of 6-8 GW each year.

The new draft tariff norms released by the Central Electricity Regulatory Commission for FY'25-29 also ensure stability by keeping the regulated returns of existing power plants.

Ind-Ra expects the annual renewable capacity addition to maintain pace and remain at 15-18 GW over FY'25-26, owing to a significant reduction in equipment prices, continued policy support, availability of liquidity and investment plans of some of the large corporate players in the renewable sector for growth. However, it stated that the execution timelines of renewable capacity addition would continue to hinge on the regulatory stance towards import duties on cells and modules, support towards domestic cells and modules manufacturing and indigenisation push towards domestic equipment sourcing.

### India's reliance on gas-based power in summer months likely to reduce in long term: IEEFA

India's dependence on gas-based power for meeting its soaring peak power demands during the summer months might reduce in the long term, according to a latest note by the Institute for Energy Economic and Financial Analysis (IEEFA).

It said that gas-based power is already a costly option in the short-term without higher allocation of domestic gas or the option to blend imported liquefied natural gas (LNG) with locally produced fuel to the electricity generating units.

The note added that in the medium term, energy storage options were likely to attain commercial viability and round-the-clock renewable energy capacity would likely increase, which would further reduce the cost competitiveness of gas-based electricity.

"Gas-based power plants have a limited role in meeting peak demand, even in the short term. Their role is likely to diminish in the coming years with the government looking at innovative tendering to ensure round-the-clock availability of renewable energy to facilitate grid integration and enable higher capacity utilisation of renewable energy," said Purva Jain, energy specialist – gas and international advocacy, IEEFA, and the note's author.

She added that in the medium- to long-term, the increase in the commercial viability of battery storage and the availability of pumped storage will help eliminate the use of gas.

According to IEEFA, the heat wave sweeping across India has reached unprecedented levels, and government data shows that immediate respite is unlikely. On 24 May 2024, peak demand crossed the government's estimate of 235GW, to touch almost 240GW.

It added that even in the short term, using gas-based power to meet peak demand requires allocating a higher amount of domestic gas, with flexibility on the minimum guarantee obligation on gas offtake to make it cost-effective.

April 2023 are compared, it would be clear that there is a strong case for allocating a limited amount of domestic gas for partially operating gas-based power capacity to cater to peak demand and ancillary services," said Jain.

She said that even partial allocation of domestic gas can help lower tariffs.

"The tariffs can come down to Rs5.83 per unit by increasing the allocation of domestic gas to allow 50 per cent blending with LNG, compared to Rs13.70 per unit, which emerged as the lowest bid for gasbased power supply using LNG in April 2023," she added.

However, emerging trends indicate that peak demand hours are shifting to the daytime, when solar energy can play a more prominent role. Peak demand is also shifting to the months when wind power is more widely available.

Therefore, while imported coal and gas-based power could help the government mitigate a power crisis in the short-term, solar, wind and storage will be more viable options in the coming years, Jain added.

## Govt offers two discovered oil and gas fields in special bidding round



The government has offered two discovered oil and gas fields in Mumbai offshore and a coal bed methane field in West

Bengal for bidding in the latest Discovered Small Fields (DSF) bid round, regulator DGH said recently.

In a notice on its website, the Directorate General of Hydrocarbons (DGH) said, notice inviting offer will be launched on May 28 and bids will close on July 15.

"With the objective to augment domestic production of Petroleum and Natural Gas, the Ministry of Petroleum & Natural Gas, Government of India announces the Special DSF Bid Round offering two (02) Discovered Small Field located in Mumbai Offshore (MB/OSDSF/C37/2024 & MB/OSDSF/B15/2024) and one (01) Discovered Coal Bed Methane field located in West Bengal (SR-ONCBM (Raniganj)-2024) through International Competitive Bidding (ICB)," it said.

It however did not give details like reserves. Those may be included in the NIO.

DSF was launched in 2016 and since then three rounds have been held. In the first round, 67 discovered oil and gas fields that were clubbed into 46 contract areas were awarded. These fields had an in-place resource potential of 45 million tonnes of oil and oil equivalent gas.

DSF-II in August 2018 offered 25 contract areas that were made up of 59 fields. These had an in-place resource potential of 190 million tonnes of oil and oil equivalent gas.

In June 2021, DSF-III offered 32 contract areas, comprising 75 fields with in place resource potential of 232 million tonnes of oil and oil equivalent.

## Petroleum Secretary inaugurates GAIL's 10 MW Green Hydrogen Plant in MP



Marking a major step towards foraying into new and alternate energy and in line with the National Green Hydrogen Mission (NHM), GAIL (India) Limited has installed its first Green Hydrogen Plant at GAIL Vijaipur in Madhya Pradesh. The Plant has been inaugurated by

the Ministry of Petroleum & Natural Gas (MoPNG) Secretary Pankaj Jain in an event organised recently, wherein GAIL Chairman and Managing Director (CMD) Sandeep Gupta, Director (Projects) Deepak Gupta, Director (Human Resources) Ayush Gupta and other Senior Officials were also present.

This Green Hydrogen plant is having a capacity of producing 4.3 TPD of Hydrogen, through 10MW PEM (Proton Exchange Membrane) Electrolyzer units, by electrolysis of water using renewable power. The purity of hydrogen from this plant shall be 99.999 percent (by vol.) and will be produced at a pressure of 30 Kg/cm<sup>2</sup>.

Initially the hydrogen produced from this unit shall be used as a fuel along with Natural Gas for captive purpose in the various processes and equipment running in the existing plant at Vijaipur. Further, this hydrogen is planned to be dispensed to retail customers in the nearby geographies, transported through high pressure cascades.

Besides sourcing renewable power through open access, GAIL is also setting up around 20 MW Solar power plants at Vijaipur (both Ground Mounted and Floating) to meet the requirement of green power for the 10 MW PEM Electrolyzer.

## India boosts natural gas production by 7.8%, imports up 5.4% in April 2024: PPAC

India's gross production of natural gas in April 2024 reached 2,958 million standard cubic meters (MMSCM), marking a 7.8 per cent increase compared to the same month last year, according to

the latest report from the Petroleum Planning & Analysis Cell (PPAC) of the Ministry of Petroleum & Natural Gas. This rise is indicative of the country's ongoing efforts to ramp up domestic production capabilities in the energy sector.

Furthermore, total imports of liquefied natural gas (LNG) reached 2,650 MMSCM during the month, reflecting a 5.4 per cent increase compared to April 2023. These figures underscore India's continuing reliance on imported LNG to meet its burgeoning energy needs, despite increases in domestic production.

Combined, the available natural gas for April 2024 amounted to 5,087 MMSCM, showing a growth of 7.1 per cent year-over-year. This enhanced availability has been crucial in supporting various sectors of the economy, particularly as India pursues more energy-intensive industrial activities.

"The integration of increased domestic production with strategic imports ensures that India is well-positioned to meet its industrial and commercial energy requirements," commented a senior official from PPAC. "These efforts are aligned with the government's objective to increase the share of natural gas in India's energy mix, contributing to more sustainable economic growth."

The sectoral breakdown of natural gas consumption in April 2024 showed that the fertilizer industry continued to be the largest consumer, using 28 per cent of the total gas supplied. This sector relies heavily on natural gas as a feedstock to produce urea and other fertilizers, critical for India's agricultural sector.

City Gas Distribution (CGD) accounted for 20 per cent of the consumption, reflecting the government's push towards using natural gas as a cleaner fuel for cooking and vehicular fuel. The power sector, which consumed 16 per cent of the total, utilizes natural gas for generating electricity, with its relatively lower greenhouse gas emissions compared to coal and oil. Refineries and petrochemicals were other significant consumers, using 11 per cent and 2 per cent of the total natural gas respectively. These industries use natural gas as a feedstock for producing a variety of products, from gasoline and diesel to plastics and synthetic fibers.

The report also emphasized the robust processes involved in the collection and storage of data on gas production and importation, ensuring accuracy and transparency. "The meticulous approach to data handling reflects our commitment to providing reliable and timely information to all stakeholders," the official added.

Looking ahead, the PPAC report highlights the strategic initiatives undertaken by the government to further increase domestic production of natural gas through new exploration and enhanced recovery techniques at existing fields. These initiatives are expected to gradually reduce India's dependency on imports and stabilize the supply for the growing domestic market.

As India continues to navigate its path towards a more diversified and sustainable energy portfolio, the role of natural gas is poised to expand, supporting not only the economic ambitions of the nation but also its environmental commitments on the global stage.

### India's crude oil production up 1.6%, petroleum product exports rise 9.6% in April 2024: PPAC



India's indigenous crude oil production in April 2024 increased by 1.6 per cent to 2.4 million metric tonnes (MMT), reflecting a modest growth in the sector, according to the latest report by the Petroleum Planning & Analysis Cell (PPAC). The Oil and Natural Gas Corporation (ONGC) produced 1.6 MMT, contributing significantly to this rise.

The report also noted a 0.8 per cent increase in total crude oil processed, amounting to 21.6 MMT, with public sector undertakings (PSUs) and joint ventures processing 14.5 MMT, while private refiners processed 7.1 MMT. Of the total, indigenous crude oil accounted for 2.2 MMT, and imported crude oil made up 19.4 MMT.

Further bolstering the energy sector, production of petroleum products surged by 3.9 per cent to 23.4 MMT. The production mainly comprised highspeed diesel (HSD), which accounted for 42 per cent of total petroleum products, followed by motor spirit (MS) at 15.7 per cent, and naphtha at 6.7 per cent.

Imports of crude oil rose by 7.0 per cent from the previous year, indicating increased foreign dependency to meet domestic demand. In contrast, imports of petroleum products also witnessed a significant hike of 35.3 per cent, largely attributed to declines in domestic production of specific products like liquefied petroleum gas (LPG) and petcoke.

Exports of petroleum products from India saw an increase of 9.6 per cent, with notable rises in shipments of fuel oil, naphtha, and high-speed diesel, underscoring India's strengthening position in the global petroleum market.

### India's April fuel demand edges up 6.1% year-on-year

India's fuel consumption rose by 6.1% year-on-year in April, data from the Petroleum Planning and Analysis Cell of the oil ministry showed recently.

India is the world's third-biggest oil importer and consumer. The data is a proxy for the country's oil demand.

"The rise in total fuel consumption in April can be attributed to the increased activity in the run up to elections across the country," said Prashant Vasisht, vice president and co-head, corporate ratings at ICRA. "We expect Indian fuel demand to grow by 3%-4%, with the GDP set to grow. The bulk of the rise will be led by petrol and diesel demand. Air travel in India also has shown good growth."

Total consumption totalled 19.86 million metric tons (4.85 million barrels per day) in April, up from 18.71 million tons last year, data showed.

Demand was down 5.8% on a monthly basis from the 21.09 million metric tons consumed in March.

Sales of diesel, mainly used by trucks and commercially run passenger vehicles, rose by 1.4% year-on-year to 7.93 million tons in April.

Sales of gasoline in April rose 14% from the previous year to 3.28 million tons.

Demand for bitumen, used for making roads, fell by over 5% annually.

Cooking gas, or liquefied petroleum gas sales rose by nearly 10% to 2.36 million tons, while naphtha sales gained by 3.9% to about 1.16 million tons, compared with last April, the data showed.

Fuel oil use decreased by more than 16% year-on-year in April.

Asia's third-largest economy is the fastest growing among major peers and its GDP is expected to expand 6.5% this fiscal year.

Growth in India's manufacturing sector slowed marginally in April but remained robust thanks to strong demand, prompting firms to ramp up purchases of raw materials at a near-record pace, a business survey showed last week.

### Reliance renews bid for US licence to import Venezuelan oil: Report

Indian oil refiner Reliance Industries has resubmitted a request to the US for an authorisation to import crude oil from sanctioned Venezuela, three people close to the matter said, and resume oil trade between the OPEC producer and the once second-largest destination for its oil.

French oil producer Maurel & Prom separately said recently the US granted it a licence to conduct oil and gas operations in Venezuela for the next two years.

The US in April did not renew a general licence for Venezuela to export oil and fuel to its chosen markets, and gave 45 days to companies to wind down transactions. But the US had said some individual authorisations to foreign firms seeking to do oil business with Venezuela would be issued.



The licence had broadly eased Venezuela oil sanctions first imposed in 2019, moving to reimpose punitive measures in response to President Nicolas Maduro's failure to meet his election commitments.

After the easing of sanctions in October, Reliance and other Indian companies that have business in the past with Venezuela previously applied to the US Treasury for individual authorisations. Those were not granted.

Indian refiners, however, resumed Venezuelan oil purchases through intermediaries. Since October, Reliance has chartered at least one supertanker to buy crude from state-run oil company PDVSA. It also received Venezuelan oil cargoes from third parties, according to internal PDVSA documents viewed by Reuters.

Before US oil sanctions were first imposed on Venezuela, Reliance was the second largest individual buyer of Venezuelan crude after China's CNPC.

Maurel & Prom's licence allows it to continue production activities under an agreement signed with Venezuela last November. Its licence is the first authorization issued by the US under the exemptions it offered last month to its reimposed sanctions regime on the South American country.

"It gives us clear visibility for the future," M&P's CEO Olivier de Langavant said in a statement. The company owns a 40% interest in an oilfield joint venture with PDVSA and has agreed to boost oil output in the field.

The US Treasury and State departments in recent years have received dozens of licence requests from firms interested in investing in Venezuela's energy industry or importing Venezuelan crude or gas. Just a few of those individual requests have been approved, including a key licence to US oil major Chevron.

## The Hydrogen Stream: India extends bidding for second round of electrolyzer incentives

Solar Energy Corp. of India (SECI) has extended bidding for setting up 1.5 GW of electrolyzer manufacturing capacity in India under the second round of the government's Strategic Interventions for Green Hydrogen Transition (SIGHT) program.

The revised deadline now stands at May 31.

Bidders setting up electrolyzer manufacturing facilities under this program will be eligible for government incentives provided they meet the qualification criteria as laid out in the tender document.

SECI has been appointed as the implementing agency for the incentive scheme for electrolyzer manufacturing.

Out of the total 1.5 GW capacity, 1.1 GW is tendered for electrolyzer manufacturing capacity based on any stack technology, 300 MW for electrolyzer manufacturing capacity based on indigenously developed stack technology, and 100 MW for electrolyzer manufacturing capacity based on indigenously developed stack technology-smaller units. The minimum/maximum bid capacities for these three categories are 100 MW/300 MW, 100 MW/300 MW and 10 MW/30 MW, respectively.

To be eligible for incentives under this scheme, the electrolyzer manufacturer must commit to fulfilling certain values of electrolyzers performance and local value addition. The electrolyzer's specific energy consumption ( $\sigma$ ) should be equal to or less than 56 kWh/kg of H<sub>2</sub> production. For alkaline electrolyzers, local value addition should be a minimum of 40% in the first year and at least 80% by the fifth year. For proton exchange membrane, solid-oxide, and anion exchange membrane electrolyzers, the local value addition should be a minimum of 30% in the first year and at least 70% by the fifth year. The guaranteed life of electrolyzer shall be at least 60,000 hrs with end-of-life efficiency not falling below 80%.

Asahi Kasei and partners celebrated the official opening of a new hydrogen pilot plant in Kawasaki, Japan. The commercial-scale facility will test its alkaline water electrolyzer, which is optimized for the

production of green hydrogen. “The trial operation of four 0.8 MW modules is another milestone toward the realization of a commercial multi-module 100 MW-class alkaline water electrolysis system for green hydrogen production,” said the Japanese company in an emailed note.

China Aerospace Science and Technology Corp. (CASC) has developed China’s first 100 kg, vehicle-mounted liquid hydrogen system. The system will allow hydrogen-powered heavy trucks to achieve a range of more than 1,000 km with just one charge. “Compared to its predecessor, the system boasts a 20% increase in effective volume within the same overall dimensions while cutting costs by more than 30%,” said CASC.

New Mexico Governor Michelle Lujan Grisham is in Rotterdam for the 2024 World Hydrogen Summit to convince manufacturing companies to invest in the US state. “We’ve created an incredible hydrogen policy landscape in our state that is supportive on the supply side and demand side, and global energy leaders are taking notice,” said Lujan Grisham in a press release.

Nikola has opened its latest HYLE high-pressure modular refueling station and facility in southern California. “This launch is yet another pivotal milestone in Nikola’s strategic plan, aiming to establish a network of up to nine refueling solutions by mid-2024, with a total of 14 operational sites slated for completion by year-end, which include a combination of HYLE modular fuelers and partner stations such as FirstElement Fuels’ in the Port of Oakland,” said the company.

Fortescue has started developing a \$550 million green hydrogen production venture in the United States. It is the first of the Australian company’s planned green energy investments in North America. “The US has made serious strides in attracting global investment in green hydrogen and decarbonization projects, like Fortescue’s solar and wind-powered Arizona Hydrogen facility,” said Fortescue Executive Chair and Founder Andrew Forrest, arguing that the US government has to further support the hydrogen sector.

## Petro products exports fall 11% in April

India’s exports of refined oil products fell by 11% in April to 1.21 million barrels per day, primarily due to the increase in the domestic demand and weaker export margins, according to data provided by Kpler.

Exports to Asia and Europe – the two top destinations of the country also declined by 25% and 3.4% on month to 446,248 barrels per day and 329,279 bpd respectively.

In value terms, petroleum product exports declined 13.6% in FY24 to \$ 84.1 billion, bucking a rising trend of the previous years. India had become a key supplier of refinery products to the world as many countries stopped direct trade with Russia after its war with Ukraine. To be sure, in volume terms, these exports grew even in FY24.

Data sourced from another ship tracking intelligence firm Vortexa showed a similar trend, with total exports declining to 1.15 million barrels per day in April from 1.37 million bpd in March.

“The overall decline in refined products exports may be attributed to robust domestic demand, and weaker export margins,” said Vortexa’s Head of APAC Analysis, Serena Huang. She noted that exports to Southeast Asia fell in April off the back of ample supplies in the region.

India’s diesel exports slumped 13% month-on-month in April to over 438,704 bpd and that of gasoline exports fell by 17% to 251,681 barrels per day. Jet fuel exports however rose marginally by 3.7% to 163,545 bpd.

Asia’s share in Indian petroleum products exports decreased to 36.8% in April against 43.5% in March. Europe’s share, however, increased to 27.2% last month from 25% in the previous month but still remains substantially lower than the 32% share it held during the same period last year.

## Development-led Transition to Net Zero



**Dr R B Grover**  
Emeritus Professor  
Homi Bhabha National Institute

Having declared its intention to achieve an economy-wide net zero by 2070, India has to consider several perspectives. The first and foremost is the development perspective. India's focus

must be on a development-led transition rather than a transition-led development. This needs elaboration. In energy studies, researchers use several approaches to forecast energy demand. A simple top-down approach is to use the correlation between the Human Development Index (HDI) and per capita energy consumption. To become a developed country, India has to aspire to achieve an HDI of 0.9, as achieved by several countries comprising the G20. Looking at the correlation between HDI and per capita energy consumption, considering likely improvement in energy efficiency, electrification of end uses, and substitution of fossil fuels in several industries by electrified products, for example, hydrogen or its derivatives, one can build scenarios to forecast energy requirements in India. Based on such an exercise, we estimated that India will need about 15,600 TWh per annum of electricity for direct use and the rest of the energy services have to be provided by hydrogen or hydrogen derivatives. If all the needed hydrogen is produced by electrolysis, India will need another about 8400 TWh per annum. This number will come down to the extent that hydrogen or its derivatives are produced by other sources such as biomass, urban waste, high-temperature nuclear reactors (when developed), etc. In total, India would need about 24,000 TWh of electricity (Curr. Sci., 2022, 122 (5), 517- 527) to become a developed country and transition to net zero.

In 2022-23, the final energy consumption in India was 6,145 TWh (5,51,550 kTOE), a total (utilities plus non-utilities) of 1,844 TWh of electricity was generated, and electricity consumption was 1,403 TWh (Energy Statistics India 2024). The electricity sector in India has to meet the challenge of continuing to grow at a compound annual growth rate

of above 5 %, which has been its achievement from 2013-14 to 2022-23.

Focusing on transition-led development will not enable India to achieve the HDI target of 0.9. If in place of 0.9, we set the target at 0.8, and assume large improvements in energy use efficiency, the projected energy requirements will come down significantly. Many studies, particularly by international agencies, are based on a lower HDI target and early peaking, and assume over-optimistic projections regarding energy efficiency improvements and a steep fall in the cost of storage. We need to interrogate all assumptions to arrive at projections. For example, the efficiency of air conditioners and refrigerators cannot keep improving indefinitely as thermodynamic limits determine the maximum efficiency.

The second issue is the availability of indigenous resources. In this regard, one has to look not only at fuel, but also at land, water, a trained workforce, and issues arising from the specificity of technology. One must exploit the full potential of solar, wind, and biomass, but the aggregate of their potential is nowhere close to the projected requirements. For the balance, India has to depend on nuclear, and coal with carbon capture. India cannot wish away coal for quite some time, and therefore, we must develop carbon capture technologies, and also look at how much of captured carbon can be used and how much has to be sequestered. Along with the development of technologies, due attention has to be paid to developing institutions, legislation, and processes to manage the risk, liability, and economic issues associated with CO<sub>2</sub> storage.

The next issue is the supply chain. In the area of nuclear energy, India has developed Pressurized Heavy Water Technology and nearly 100 percent of the supply chain is in India. We need to import uranium but infrastructure for fabricating fuel assemblies is in place. One characteristic of uranium is that one can store uranium supplies needed for several years of operation of nuclear power plants without difficulty. No disruption in uranium supply will last several years. One has to make a judgment regarding the duration for storage, which has to account for inventory carrying cost and an assessment of the geo-political situation regarding the likely duration of supply disruption. Fast breeder

technology, now on the cusp of deployment, is also fully indigenous. Wind and hydro sectors are also indigenous.

We need hydrogen to replace fossil fuels in several industrial processes for energy transition. However, wherever feasible, one should use electricity directly. The conversion of electricity to hydrogen and hydrogen back to electricity will introduce huge inefficiency and should be avoided. Hydrogen or hydrogen derivatives should be produced only for direct use in industry. In this connection, one must take note of the Carbon Border Adjustment Mechanism (CBAM), which seems to have been designed to derogate from the principle of “common but differentiated responsibilities”, and is a step toward forcing developing countries to follow a transition-led development path. To respond to CBAM, India should develop a hydrogen certification scheme that is technology-agnostic and is based on a maximum threshold for greenhouse gas emissions allowed in hydrogen production.

The balance between energy generation and consumption has to be ensured by flexing supply and optimal management on the demand side, including demand shaping. Energy storage and hydrogen production have to be synergized to minimize capital investment, avoid curtailing output from renewables, and place no demand on the flexing of nuclear power plants. The present policy of looking at hydrogen generation and storage in a disaggregated manner needs a rethink. Our estimates inform us that one can realize significant savings by looking at electricity storage and hydrogen production by electrolyzers in a synergistic manner (Energy and Climate Change, 2024, 5, 100131).

The diversification of energy mix is of prime importance to provide security of energy supply. India is a large country with a high-density of population. Only a diverse energy mix can ensure that there are no disruptions in energy supply. Diversity has three components: variety, balance, and disparity. Variety refers to the types of energy sources and the geographical region of their production; balance denotes the percentage share of different sources in the energy mix, and disparity informs about the differences between various sources. The disparity between oil and natural gas is lesser than oil and renewables. Disparity is

qualitative, while variety and balance can be quantified (Energy, 2022, 253, 124097).

During the evolution of the energy mix, energy economists devised a metric to compare different electricity generation technologies. This metric is levelized cost of electricity (LCOE) generation. It was devised when solar PV and wind were not a part of the energy mix. Therefore, there is no parameter to account for intermittency. Continued use of LCOE has resulted in a narrative that solar and wind are very cost-effective. Solar and wind are cost-effective when they are available. To make them provide electricity when the consumer needs it, a lot has to be incorporated into the system, making it complex and adding to the cost. Therefore, at the consumer end, the cost of solar PV and wind becomes very high (Energy, 2022, 253, 124905).

In an electricity system, the grid controller has to ensure that the peak load is met, the system remains stable during short-term disturbances, and enough flexibility is available to ramp the electricity supply up and down in response to demand. While intermittent sources can contribute to energy supply, ramping service in response to demand and hence system stability comes from firm sources like nuclear and abated thermal (Curr. Sci. 2022, 123(11), 1309-1316)

All these issues have led to a realization that phasing out coal is a challenge, and therefore, research and development in carbon capture have to be stepped up. The global stocktake issued by COP-28 on 13 December 2023 calls for accelerating zero- and low-emission technologies, including, inter alia, renewables, nuclear, carbon abatement, and removal technologies, and low-carbon hydrogen production. It is the first time that nuclear has been included along with renewables.

Meeting the twin objectives of decarbonization and economic growth is challenging. The complexity of this challenge can be gauged from the Energy White Paper published by the UK in December 2020, wherein the authors state, “We have modelled almost 7000 different electricity mixes in 2050, for two different levels of demand and flexibility, and 27 different technology and cost combinations.” The situation in India is more complex as it has to see a growth in energy use along with a transition. Policies

pursued by India need to merge decarbonization pathways and targets with development goals, energy affordability, and energy security constraints. Scenario building is an efficient tool to bring out issues that need to be considered for formulating policies. The Government must fund studies to build scenarios for energy transition. A report on a study carried out by the Indian Institute of Management, Ahmedabad, was released on 3 April 2024 by the Office of the Principal Scientific Adviser. The study foresees a continuing role for coal and a larger role for nuclear in addition to a flexible grid and storage to support the integration of renewable energy. The study estimates per capita energy requirements for HDI values up to 0.9, but detailed net zero scenarios have been worked out only for an HDI of 0.8; doing so for an HDI of 0.9 is yet to be done. While one may have a different opinion about the detailed numbers projected, the broad conclusions are useful for policymaking. Further studies to build more scenarios need to be funded by the government to bring out all issues that need attention.

This was first published in the CURRENT SCIENCE (Volume 126, Number 8, dated 25th April 2024), and is republished here after permission. CURRENT SCIENCE is a fortnight Journal of Current Science Association, Bengaluru.

**Dr R B Grover**, Emeritus Professor,  
Homi Bhabha National Institute  
Anushakti Nagar, Mumbai 400 094, India  
e-mail: rbgrover@hbni.ac.in

## Russia offers floating nuclear plant tech to India

Russia has offered India technology for building and operating floating “low power” nuclear power generation projects. This has been revealed in a press release of the Russian state-owned nuclear power company, Rosatom, issued in the context of the the meeting of Ajit Kumar Mohanty, Chairman, Atomic Energy Commission and Alexey Likhachev, Director General, Rosatom, in Russia recently.

Russia has also offered “serial construction of the Russian-designed, land-based nuclear power units at a new site in India,” as well as cooperation in

nuclear fuel cycle. Also mentioned is “non-power applications of nuclear technologies.”

“Alexey Likhachev and Ajit Kumar Mohanty also discussed the progress of the joint Kudankulam Nuclear Power Project being constructed as per the Russian design in India, comprising six power units equipped with light-water reactors, each of 1,000 MW capacity,” the release said.

### Proryv project

Indian nuclear industries visited the site of the Pilot Demonstration Energy Complex (PDEC) being built in Seversk, Tomsk region, as a part of “Proryv” (“the Breakthrough”) strategic industry project.

While talks on land-based, large nuclear power plants is a matter of routine, the reference to floating nuclear power plants is significant. There is growing interest in ‘small modular reactors’ (SMR), including in India, and some SMRs could be ship-mounted. Russia operates the world’s only floating nuclear power plant, onboard the ship Akademik Lomonosov, which is stationed at the Arctic port of Pevek.

At an IAEA symposium on floating nuclear power plants that took place in Vienna on November 14 and 15, 2023, legal experts, nuclear and maritime regulators and industry leaders discussed the benefits and challenges of FNPPs and exactly what role they could play in the fight against climate change and the transition to Net Zero.

### ‘Active consideration’

An IAEA press release after the event quoted the agency’s Director General, Rafael Mariano Grossi, as saying, “there is active consideration of floating nuclear power plants”.

Safeguards and the international legal and regulatory implications needed to be thoroughly analysed, Grossi said. “Nuclear energy has already been in use for about 60 years in naval ships and icebreakers propulsion. However, FNPPs are different since they will produce low-carbon power and heat for different applications, including district heating, desalination and hydrogen production, the release said.

**8<sup>th</sup> Roundtable Conference on Coal**  
**12<sup>th</sup> April 2024**

**Recommendations**

The above conference was organized India Energy Forum jointly with Indian School of Mines Alumni Association (ISMAA) - Delhi Chapter and Mining Geological & Metallurgical Institute of India (MGMI) Delhi Chapter, on 12<sup>th</sup> April 2024 at Hotel Le Meridien, New Delhi. The theme of the conference was “**Role of Coal in Energy Transition**”. The conference consisted in an Inaugural session followed by 3 Technical Sessions and Panel Discussion and finally Valedictory Session.

The conference was very well-attended with about 150 Delegates, Guests and Speakers. In all 12 Technical presentations were made which were of very high order and attracted keen interest by the participants and were very interactive.

The following recommendations on different aspects of Coal Production and Usage emerged from the presentations made and technical discussions held at the conference.

**1. Coal Production - Meeting the Demand:**

It was noted that despite the good progress made by India on harnessing Renewables for Power Generation, Coal will continue to be the prime source of Commercial Energy and Power Generation and the country will continue to depend largely on coal.

Coal demand therefore will continue to rise and coal production has to be augmented to keep pace with the demand.

For achieving the desired rate of production, technological aspects for both Underground and Open Cast Mining systems will have to be paid focused attention by Coal Mining Companies in both public and private sector for achieving higher production and productivity.

The ever increasing power requirement in the country, it is necessary to increase coal production despite good progress on harnessing renewables

and for achieving higher production coal mining companies both public and private sector will have to deploy more modern technologies in both underground and open cast coal mining system.

**2. Action for Augmenting Production from Underground Mining:**

Action will have to be taken on:

- (i) Detailed Exploration of Coal Deposits below internal or external overburden dumps in Open Cast Mines and deeper seams below open cast workings which could be worked through Underground Mining Systems.
- (ii) Considering its minimal environmental impact, the process for grant of Environment Clearance for underground coal projects should be streamlined and public hearing should be dispensed with.
- (iii) Since Underground Mining can be carried out without damage to the over lying forest, concerned State Governments should grant permission for development of Underground Mining Projects involving forest land, against payment of compensatory levies without insisting on provision of land for compensatory afforestation.
- (iv) For incentivising underground Mining, the cost of back-filling (not necessarily with sand but also power station ash and crushed over burden consisting in sand stone) should be fully reimbursed from funds available with Coal Controller.
- (v) Manufacture of Underground Coal Mining equipment should be incentivised by the Government.
- (vi) Rate of Royalty of Underground Mining should be reduced.

**3. Action for Augmenting Production from Open Cast Mining:**

India has made tremendous progress towards modernising Open Cast Mining System. For

moving ahead in this direction, Indian Coal Industry:

- (i) Should adopt State-of-the-art Technologies for Open Cast Mining.
- (ii) Should foster and build Community engagement through CSR activities so that Land Acquisition becomes smoother.
- (iii) Should replace Diesel-operated Open Cast Mining equipment with Battery-operated ones or else switch Diesel with LNG/CNG.

#### 4. **Commercial Mining:**

Opening of Coal Sector for Commercial Mining has been a very welcome development and this will go a long way in augmenting India's Coal production which should make it self-sufficient in respect of at least Power Grade Coal. For making a success of Commercial Mining, following should be given attention:

- (i) **Support from Coal India Ltd.:**  
Since most of the commercial blocks are not large enough to support high production levels and justify construction of independent Railway sidings, Coal India Ltd should permit the use of their Railway sidings, by commercial miners to the extent siding capacity be sparable.
- (ii) **Time Bound Approvals / Clearances:**  
All approvals and clearances for commencement of work on Coal Blocks allotted for Commercial Mining should be granted within a fixed time line of 180 days with timelines for different departments in the State Governments as well as Central Government being allotted out of these 180 days.
- (iii) **Land Records:**  
For making Land acquisition easier and this will help mines belonging to Coal India Ltd. also, the land records should be digitalised by the concerned State Governments on urgent basis.

#### (iv) **Rail Infrastructure:**

While some of the Coal Blocks allotted for Commercial Mining are large enough to produce tonnages which can justify construction of their independent Railway sidings which is highly capital intensive, bulk of these Blocks are rather too small to bear this burden.

Government should therefore act as or appoint a Nodal Agency for establishing co-ordination among the Commercial Coal Allocates so that the Trunk Rail System is established with financial contribution from the Allocates depending upon the production level from their Coal Blocks Individual Coal Mines could construct their captive Rail siding taking off from this Trunk Railway Line.

#### 5. **Coal Bed Methane (CBM):**

India is the fifth largest holder of CBM resource in the world with that in Jharia, Raniganj and Sohagpur coalfields being highly commercially viable. An Authority should be created by Government of India which should regulate and should have statutory authority for getting CBM harnessing plans implemented on priority.

This can augment the Natural Gas component in energy mix in the country by 2-8% which will go a long way in saving of foreign exchange which is spent on import of oil and gas.

Simultaneously, the expansion of pipeline network of GAIL in coalfield areas should be given priority attention so that CBM evacuation can keep pace with CBM Production. This expansion however should be planned in a manner that the coal reserves do not get sterilized on account of this pipeline.

- 6. **Coal Gasification –** For containing the problem of GHG emission from coal combustion, coal can easily be converted into Gas which is a better fuel both from the point of view of energy efficiency as well as environmental consideration in as much as Carbon Capture and Sequestration/Utilisation (CCS/U) Equipment can be fitted in the Gasifiers very effectively and at comparatively reduced cost.

The country has launched a very ambitious gasification plants with a target of Gasification of 100 MT of Coal by 2030. This can however be met only when provision of CCS/U is made a mandatory part of gasification plant.

It was noted that a gasification project by itself may not be an economically viable proposition at this stage and Government have appreciated and they have provided for Viability Gap Funding for such projects to be taken up by public as well as private sector.

Government have also granted 50 per cent discount on premium payable by commercial block allocatees on coal produced by them, if used for gasification.

#### 7. Hydrogen:

Hydrogen has emerged as the most effective alternative fuel which is efficient with almost nil pollution. Hydrogen produced through gasification of coal is much cheaper than Green Hydrogen produced through electrolysis powered by Renewables but it suffers from a negative of some GHG Emission. Till the production of Green Hydrogen becomes economically viable, Hydrogen should be produced from Coal and used for various applications. This would enable development of storage and transportation infrastructure which can be used during when switch over to Green Hydrogen becomes economically viable.

#### 8. Coal Washing:

It was felt that the Government decision withdrawing the mandate for using coal having less than 34% ash in Power Stations located 1000 kms and later 500 kms from pit heads and those located in urban/critically polluted areas was unfortunate and this decision should be given a fresh look.

Coal washing has tremendous advantages – starting from reduction in cost of Power Generation to reduction in GHG emission from Coal combustion.

It was recommended that Government should issue immediate directive for restoring the

mandate for coal washing referred to above and they should make sure that this directive is implemented in right earnest.

#### 9. Coal Pricing:

Internationally coal price per ton moves exponentially with increase in Calorific Value. Generally, it is of the order of 2.5% - 3% increase in price for every 1% increase in Calorific Value. In complete contrast, the coal pricing India is flat in Rs. per GCAL terms and is mostly linear in Rs. per ton particularly for Power Grade Coal. It is partly for this reason that consumers find coal washing commercially unattractive.

It is expected that once the pricing system is rationalised the advantage of use of washed coal, would be clearly visible to the consumers and coal washing will become popular in India like elsewhere in the world.

It is therefore recommended that the pricing system of coal should be aligned with the trend prevailing internationally.

#### 10. Integration of New Technologies

It was noted that mining science and practices have recorded tremendous advances in recent years. It was recommended that we should integrate the new technologies closely into our mining operations which will unlock unprecedented efficiencies, ensure high safety standards, mitigate environmental impact and ensure the sustainability of our Energy landscape.

#### 11. Application of IT in Mining:

Application of IT will result in tremendous benefits to Indian Coal Industry.

It is therefore recommended that big Data Analytical centres should come up to establish the data analytics eco systems. This shall help in use of predictive and prescriptive analytics in the Mining Industry which will go a long way in identifying and deciding on ways of improving production and productivity and economising on cost.

\*\*\*\*



**Webinar on  
“Implementation of PM-Surya Ghar:  
Muft Bijli Yojana in Residential Sector”  
18th May 2024**

**Record of discussions and recommendations**

1. The Webinar on “Implementation of PM-Surya Ghar: Muft Bijli Yojana in Residential Sector” was held on Saturday the 18<sup>th</sup> May, 2024. About 70 persons participated in the Webinar. The Chief Guest for the event was Shri Alok Kumar, Director, Lantau Group and former Secretary (Power), Government of India. Other distinguished guest speakers were Smt. Nalli Natarajan, Executive Director, REC and Shri Balawant Joshi, MD, Idam Infrastructure Advisory. A background note on the subject was circulated in advance.

2. **Shri Rakesh Nath, Vice President, IEF**



introduced the subject. The Government of India has launched PM Surya Ghar- Muft Bijli Yojna with a total financial outlay of about Rs 75,000 crores with the aim of installing roof top solar plants

in about one crore households. Administrative approval to the scheme has been granted and the draft guidelines for implementation of the scheme for the component “CFA to Residential Sector”, which has the financial outlay of Rs 65,700 Cr has been circulated. Though the total targeted installed capacity of the solar plants is 30 GW, this capacity will be installed in one crore households spread across the country. This makes its implementation challenging. Besides financially benefiting the consumers, it will make the domestic consumer aware and directly involve them in the National Program to reduce CO2 emission in power sector and give them a sense of pride that they are consuming green energy and contributing to reducing the carbon footprint of the country.

3. **Shri RV Shahi, President IEF** in his address



recalled the work done by the Ministry of Power during the period 2005-2007, when a scheme for electrification of one lakh villages and one crore households with substantial grant from the Government was developed. The scheme

was subsequently modified and a comprehensive rural electrification program was launched with 90% grant from the Government. Discussions on Roof Top Solar schemes started sometime in 2015. The scheme was widely supported by World Bank and SBI. Over the period the scheme has undergone lot of changes, including putting in place Regulatory framework, Net Metering, implementation through aggregators with consumer groups etc. However, certain commercial, technical and maintenance issues need to be finetuned through continuous training and commitment both by Consumers and Discoms. The PM-Surya Ghar: Muft Bijli Yojana in Residential Sector, is a comprehensive scheme and its best part is encouraging the Domestic Manufacturers. We need to work together to ensure that the scheme is a success and addresses and supports the rural economic development. We need to revisit and develop an appropriate mechanism by making the best use of our past experiences for getting better results.

4. **Shri Alok Kumar, Director Lantau Group and former Secretary (Power),**



Government of India, the Chief Guest of the event in his address made the following points:

- i. The new scheme of GoI of subsidy up to 60% supported rooftop solar in ten million households is a path breaking initiative as it moves away from tariff subsidy scheme approach to capital subsidy approach, focusing on promoting local manufacturing of solar cells (after successful expansion of module manufacturing capacity),

- targets better the subsidy by excluding C&I consumers, and adopts a Mission approach for implementation.
- ii. India should set even larger targets- China has 254 GW rooftop capacity, and Taiwan has 63% of solar capacity from RTS while India has just 15%.
  - iii. The scheme would have different pace of implementation as the states take into account the other less costlier options to fulfill RPO and other considerations, e.g., hydro rich states, low variable costs from pit head coal-based stations and their RE integration costs. Such states may have to give additional subsidy if they want to promote RTS for advantage of local job creation.
  - iv. As most of smaller households in India enjoy either free power or highly cross subsidized tariffs, gross metering arrangement is likely to be preferred by them to retain both benefits- low cost grid power and income from sale of RTS generation to utility (partly to be used to repay loan taken).
  - v. SERCs will have a critical role in the success of the scheme to provide a) an adequately attractive price for sale of surplus power to utility; b) long term visibility to such rates for 15 years by grandfathering arrangement whenever this rate is changed for new RTS investment; c) providing monthly credit to consumers for such sale, including pre-paid consumers; d) smart TOD tariff design which balances the DSM aspect and need to incentivize RTS installations as surplus power will be injected in (off peak) solar hours.
  - vi. Discoms will need to develop capabilities for utilizing smart metering data for optimizing power procurement in high decentralized RE scenario, and also the network expansion or BESS investments in high RTS pockets.
  - vii. MoP must make a Rule clarifying that in RESCO arrangement, sale of power to rooftop owner is not an open access sale and is not liable to pay cross subsidy surcharge or other such charges.

5. **Ms Valli Natarajan, Executive Director, REC** in



her presentation explained the salient features of the scheme. She said that the scheme was launched by Hon'ble PM on 13th Feb 2024. REC has been assigned the responsibility of National Program Implementing Agency. The scheme also envisages incentive to various stakeholders. For ease of business, 100% online process for registration, application, approvals and subsidy release a portal has been put in place. She further explained that option of National Vendor Registration on National Portal has been created. Customer Call Centre with Short Code 15555 for Queries and Complains and Facilitating consumers has been created. For Creating awareness and understanding the bottlenecks, Vendors/DISCOMs Meets are being organized. During her presentation, Ms Natarajan explained the implementation challenges, such as Consumer Awareness on Green Energy and Rooftop Solar Installation; availability of Vendors for installation of Roof Top Systems; availability of Net Meters and Solar Meters and its testing by DISCOMs; outreach of the program in Remote Areas; timely release of subsidies, availability of cheap loan etc. She also showed her concerns on availability of adequate number of domestic vendors to generate competition, pricing of panels and availability skilled manpower. While concluding her presentation, she also suggested some steps for effective and speedy implementation of the scheme.

6. **Shri Balawant Joshi, MD, Idam Infrastructure Advisory** pointed out the following challenges in implementation of the scheme and suggested some possible solutions:



- i. Vendor Quality & Management: Large number of vendors have registered on the National Portal (last count more than 10k). Maintaining quality of

- RTS systems would be a big challenge. Uncertainty of existence of small EPC players will put system performance and gains at stake over plant life.
- ii. Intended beneficiary of CFA may not benefit: Economically backward section for whom the retail supply tariff is low may not be benefitted and during initial period of the scheme, beneficiaries are likely to be residential consumers with higher consumption.
  - iii. Non-availability/high pricing of DCR panels: Since the announcement of the scheme, domestic manufacturers have increased the prices of panels. This may result in manufacturers appropriating subsidy meant for consumers.
  - iv. Regulatory Frameworks: Price for procurement of electricity must be just. Net metering should be provided for residential consumers.
  - v. RESCO model implementation: Many SERCs do not allow RESCO or Third Party implementation and levy charges.
  - vi. Levy of Grid Support Charges: Some SERCs allow grid support charges on net metering system. RTS systems under this scheme should be exempted from levy of any such charges.
  - vii. Mismatch between warranty period: Modules are available in the market with 20-25 years' generation warranty but inverters are being offered with 6-8 years' warranty. Many inverters may fail within 10 years of installation and consumer may not replace the same which may impact on long term sustainability of the system. Scheme should mandate inverters with longer warranty.
  - viii. Viability with TOD Tariff: Right to Consumers Rules provide for TOD tariff with retail supply tariff during solar hours 20% lower than normal tariff for that category of consumer. When implemented, it will reduce the viability of RTS.
  - ix. Rooftop Vs ground mounted: Panels are permitted on only rooftops. Ground mounted solar panels may be a cheaper option in households in rural and small towns.
  - x. Fire & Safety hazards: In case of fire during daytime at prosumer premises, even if grid supply is tripped, the system remains live. This is a serious safety hazard. Prosumers need to be educated about the same.
  - xi. Readiness of grid infrastructure at LT level: Nearly entire 30GW capacity will be connected through 220V single phase inverters which would cause phase imbalance which could be different for generation and load operation. This could lead to operational challenges for distribution system. Investments in grid upgrades, advanced management strategies, alongside continuous monitoring and technological advancements are required to mitigate grid integration challenges.
  - xii. Cost implications for Discom: Solar energy will be injected into LT grid by Prosumer during day time when power purchase cost will be lower while Discom will have to arrange expensive power to supply to consumers during evening peak hours. Evening peak surcharge of 10% may not be sufficient.
  - xiii. Smart Pre-Payment meters: MoP has mandated installation of smart pre-paid meters. The question here is: how will net-metering be integrated into the homes with smart pre-paid meters?
  - xiv. Environmental issues/disposal of waste after useful life: The scheme stresses vendor registration and training to ensure adherence to environmental standards. Though direct recycling and disposal of solar panels aren't addressed, the scheme acknowledges their importance. National policies can guide proper disposal of solar waste, even as consumer awareness efforts promote environmental sustainability.
7. In the Q/A session some useful suggestions were given by **Shri Anil Razdan**, former Secretary (Power), Gol and **Shri Ajay Shankar**, Distinguished Fellow, TERI and former Secretary, Gol, which have been duly reflected in the recommendations. The Webinar ended with Shri B P Singh, former Member, DERC summarizing the discussions and proposing a vote of thanks to the distinguished speakers and the participants.

8. **Conclusion and Recommendations:** PM-Surya Ghar: Muft Bijli Yojana in Residential Sector is a path breaking initiative as it moves away from tariff subsidy scheme approach to capital subsidy approach, encourages domestic production of solar cells, generates employment and involves residential consumers in the National Mission of Decarbonization and make them proud that they are consuming green energy. Considering the large spread of the scheme covering one crore households across the country, its implementation poses several challenges. The guidelines for implementation of the scheme should be finalized after taking inputs from all the stakeholders and addressing their concerns. Some of the concerns have been highlighted above. The recommendations are as under:
- i. The residential consumers with higher electricity consumption are likely to be the beneficiaries of the scheme as net metering proposed under the draft guidelines will benefit them the most and financing of RTS system will be easier. Most of smaller households enjoy either free power or highly cross subsidized tariffs, gross metering arrangement is likely to be preferred by them to retain both benefits- low cost grid power and income from sale of RTS generation to utility. It is suggested that the residential consumers may be provided an option of selecting either gross or net metering.
  - ii. SERCs have an important role in ensuring success of the scheme by specifying tariff for sale of surplus power from RTS which is attractive for the consumers and also just for the Discom. Long term visibility of tariff for sale of surplus power from RTS to the Discom, at least for a period of 15 years, is very important to facilitate the consumers to take investment decision and for banks to provide debt financing for the RTS.
  - iii. Quality of equipment and long term operation and maintenance are major concerns. Modules are available in the market with 20-25 years' generation warranty but inverters are being offered with 6-8 years' warranty. Long term warranty of for inverters should be explored. Gol may also consider bulk public procurement for domestically manufactured modules/cells, on the lines of LED program, to reduce costs and accelerate local manufacturing capacity.
  - iv. Timely payment of CFA to the Consumer is very essential. The CFA is proposed to be released after the RTS system is installed, the concerned DISCOM has conducted a physical inspection, signed the necessary agreements with the beneficiary, conducted a checklist-based inspection and approved the DISCOM report. The above actions by the Discoms are required to be carried out in a time bound manner to be prescribed in the detailed procedure. A monitoring system has to be devised by the National Programme Implementation Agency to check the delays.
  - v. The lender should not insist for signing of agreement with Discom for purchase of surplus energy from the RTS for approval and release of the loan. It will be better if the agreement with the Discom is initialed before the installation of RTS system to avoid any delay in commissioning of the system after it is ready and duly inspected by the Discom.
  - vi. In order to avoid any controversy regarding levy of cross subsidy surcharge and other charges in RESCO model or implementation through third party, MoP may notify appropriate rules clarifying that no surcharge or any other charge is leviable.
  - vii. Prosumers as well as Fire Departments need to be educated about the fire and safety hazards by the concerned Discom for which necessary training modules are required to be developed.
  - viii. Discoms will need to develop capabilities for utilizing smart metering data for optimizing power procurement in high decentralized RE scenario, and also the network expansion or BESS investments in high RTS pockets.
  - ix. National policy to guide proper disposal of solar waste after completion of useful life are required to be devised and made part of the agreement as the responsibility of the Prosumer.

\*\*\*\*\*