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ROLE OF NUCLEAR ENERGY IN ACHIEVING NET ZERO ENERGY MIX

Role of Nuclear Power in India's Initiatives towards Net Zero

R V SHAHI

India Energy Forum organized a Nuclear Power Conclave on 2nd March 2023. The objective was to discuss about the efforts and steps that are needed for accelerating the pace of nuclear power capacity, particularly in the wake of large-scale expansion of Solar power and Wind Power, and the rapid path India has chosen to follow to achieve Net Zero. The recent global developments and highly complex geo political situation have further enhanced the challenge for developing countries to not only address energy access with due regard to environmental sustainability but also cope with an added dimension of energy security meaning energy independence)

India has targeted to achieve 500,000 MW (500 GW) of renewables by the year 2030. Solar and Wind Power Program of this nature can succeed only if appropriate arrangements are made to provide the back up during evening hours when solar plants would not be able to supply power. Part of this challenge can be mitigate by having larger expansion of wind power and hybrid arrangement of wind and solar. It has been seen that wind power plants, during evening and night give better output than during daytime. However, several other options will be needed to address the mammoth challenge of such massive expense of solar power and the technical challenges that it brings about in the management of grid. One of these options, which is being pursued seriously, is the program of Pump Storage Hydro Plants (PSP), for which the Power Ministry has recently announced a draft guideline soliciting comments and observations. Battery storage is being explored on a global level, but it appears that to bring this option into effective and affordable viability might take time. Hence, India will need to work on several options simultaneously.

Nuclear power is a carbon free power generation process. It can be viewed, on a larger scale, to be operating, on base load basis, and remain available in evening and night when power from solar system is not available. India should be proud of its nuclear scientist and engineers who have demonstrated a very high level of performance in various nuclear power plants which today aggregate to a total capacity of about 7,000 MW (7 GW). The country is one of the 35 nuclear power nations, and is among top 12. There was a time, prior to the famous international Nuclear Fuel Supply Agreement, when due to inadequacy of fuel supply, the utilization of capacity in terms of Plant Load Factor used to be between 50 percent to 60 percent. Post this Agreement, the situation has improved substantially. Now most of the plants are operating at an average of around 80 percent and some of them at 90 percent PLF.

Progress on the capacity addition has however, remained very slow. India started its journey toward design and building Nuclear Power Plant in mid 60s. The Atomic Energy Act of provided for during the period of last six decades, we have been able to develop only about 7000 MWs. There are various reasons for this slow growth, which we need not to discuss and focus on how we do go now. So that the pace of capacity addition is accelerate. At present about 9600 MWs of plants are being developed and should be completed in 5 years or so. A number of plants are at the stage of drawing boards and will require approvals of different nature and financing to take off one construction. But the task ahead is much larger. In next 10 years or so India's total power generation capacity might reach 800 GW. Nuclear Capacity today is about 7000 MW compared to 410 GW of total capacity, which is just 1.7 percent, though in terms of power generation it is about 3.4 percent. Can we hope that in the next 10 years, when India reaches an overall capacity of 800 GW, Nuclear capacity grows from 1.7 percent as at present to about 4 percent? It is indeed a challenging target, but it is doable.

It would be relevant to examine as to why the progress in last several decades has been slow, with a view to evolving a course of action which will

lead to accelerating the pace of capacity addition. One of the reasons has been that when we entered the new century, even the existing capacity, which was of the order of 4500 MW then, did not have adequate nuclear fuel. Another reason could be that our domestic manufacturing base was not sufficient to provide the support that was needed for a larger growth rate. In the middle of 1980s, the government did decide to set up a Company - Nuclear Power Corporation (NPC) so that the nuclear power plants could be developed through a corporate entity. This did work out and NPC has proved to be a successful organisation. Though the Atomic Energy Act did provide for other government companies to also undertake development of nuclear power plant, but for variety of reasons we continued to depend solely on the nuclear power corporation. After Electricity Act 2003 was enacted, during 2004 - 2005, discussions were held for amending the Act to provide for also private sector participation to develop nuclear power plants, besides also facilitating capacity addition through other Government companies. However, the challenge then was to arrange nuclear fuel even for the existing capacity and hence intensive diplomatic efforts were mounted to see that India gets access to nuclear fuel globally through signing nuclear supply agreement. The priority thus shifted from amending the Act to this agreement. In the process of these discussions, it was found that the existing restrictions and safeguards needed to be properly reassessed before opening up of the Sector.

Now that the issue of accessing nuclear fuel has been addressed, it is time that the Department of Atomic Energy revisits some of these issues and formulates concrete Action Plan aimed at accelerated growth of Nuclear Power. While giving reply to a Parliament Question recently (after the IEF Conclave), the Union Minister Mr Jitender Singh mentioned in the Lok Sabha " the present Nuclear Power capacity is set to increase from 6,780 MW to 22,480 MW by 2031 on progressive completion of projects under construction and accorded sanction. In next three years capacity addition of 5,300 MW is planned." This indeed is reflective of a renewed thrust to nuclear power.

To further accelerate the capacity addition programme, the outline could form the framework of such an approach:

1. Nuclear Power Corporation should draw a more aggressive capacity addition plan - medium and long term - to see that in next ten years the capacity crosses 30 GW thus raising the proportion to about 4 percent of total installed capacity.

2. NPC is a profit making Company. It has and will continue to add internal financial resources. Besides, it can access capital marker to further enhance its equity base. It need not depend on government budgetary support even for a faster growth.

3. It has already been decided that NTPC and NPC could form Joint Venture to develop power projects to supplement the efforts nuclear power corporation. Power Ministry and Department of Atomic Energy may create a Steering Group to see that this initiative moves forward. NPC could form JV Companies with other government companies as well.

4. Next step could be to enable NTPC and a few other Public Sector Companies to develop nuclear power plants on their own without having to go through JV route with NPC. The apprehensions about the ability of other companies developing these plants are misplaced since they could access appropriate expertise by hiring the required experts to implement these projects.

5. The Government could consider amending the Act to enable private sector also to develop nuclear power plants. After gaining experience through other options mentioned earlier, the government could allow private sector also to develop nuclear power plants.

6. As the Sector opens up progressively, the Regulatory Safeguards will need to be reviewed to further strengthen the process as well as Regulatory set up. Even though the existing organisation is fully competent, such strengthening will enhance the confidence of people at large.

7. There is general acceptance in India to have Nuclear Power in the Energy Basket. India has demonstrated an excellent track record. From time to time, however, narratives keep changing and negative perceptions crop up. It would be desirable to have focused awareness programmes to keep the support base for Nuclear Energy intact and also to change the perceptions of others.

8. Top priority should be given to ensure that the on-going projects (under construction) aggregating to 9,600 MW are commissioned in time. Similarly the other projects at planning stage, aggregating to about 30 GW should be brought into active project management mode.

9. While Fuel availability does not appear to be a challenge now, it will be desirable that, when the capacity addition programme gets a quantum jump, the availability of required amount of Fuel over a long period is properly reassessed.

10. There are a number of large public and private sector companies - many of them were set up during last fifteen years - to manufacture plants and machinery mainly for thermal power plants. They could reorient and equip themselves for manufacturing of equipments for Nuclear Power Plants.

11. The Initiative on Fast Breeder Reactor Technology, started in 2003, holds tremendous potential for a rapid expansion addressing largely the challenge of fuel security. This obviously deserves all supports to complete this project.

India's ambitious programme of transforming its energy profile, from a highly fossil fuel centric character to predominance of renewables, aimed ultimately at Net Zero by the year 2070, requires several other initiatives for a successful energy transition. It has unfolded a good space and opportunity for nuclear power to grow and support this challenging transition. The Task is huge and the time frame too demanding. An attempt has been made in this article to provide a brief framework of actionable and doable agenda.

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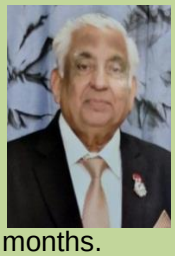
From the Desk of the Secretary General



I am pleased to release this sixth issue of our Flagship publication Total Energy in digital for this FY 2022-23. This issue includes articles contributed by our members and report of seminar/webinars organised in last two months.

During the period we organised two webinars one on **Panel Discussion on DSM Regulations 2022** on 7th February 2023. Shri Sushant Chatterjee, Chief (Regulatory Affairs), CERC, Shri S.C. Saxena, ED, NLDC and Shri BB Mehta, Director, Orissa SLDC and EX-Chief Engineer, Gujarat SLDC were the Panellists. Shri Rakesh Nath and Shri BP Singh were the moderators. About 100 delegates participated.

The second one was also **Panel Discussion on "MoP Draft Guidelines to promote development of Pump Storage Projects in the Country"** on 27th February 2023. The distinguished Panelists were Shri Ajay Shankar, Former Secretary, Govt of India; Shri Rakesh Nath, Former Chairperson, CEA and Shri Anil Sardana, MD & CEO, Adani Transmission. Shri R V Shahi gave the Presidential Address and moderated the Q&A, Mr HLBajaj, Chairman, Power Group, IEF gave the welcome address and chaired the panel discussion.

During this period we organised our fourth physical seminar "12th Nuclear Energy Conclave" which was held on 2nd March 2023 and was inaugurated by Shri K N Vyas, Chairman, AEC. Mr Gurdeep Singh, CMD, NTPC also addressed the Inaugural Session. Several nuclear energy experts and senior Officials of several Indian and foreign nuclear companies participated and share their views. We had very good presentations. Dr Kakodkar also shared his recorded message at the Valedictory Session. Nuclear Counsellors of Russia and France also participated. The programme was very successful and largely attended.

We also organised a meeting of the Board of Management in which IEF Office Bearers were elected. Apart from these Webinar and Summit we are organising our monthly executive committee meetings very successfully.

B Bhambhani

India one of most attractive destination for renewable energy investment: Bhupendra Yadav

India has emerged as the most attractive destination for renewable energy investments, the Union Cabinet Minister of Labour and Employment, Environment, Forest and Climate Change Bhupendra Yadav said on March 15.

“India has the fastest growing renewable energy capacity in world. It has emerged as one of the most attractive destination for investment in renewables,” the minister said at the CII Partnership Summit in Delhi.

India has set a target to reduce the carbon intensity of the nation’s economy by less than 45 percent by the end of the decade, achieve 50 percent cumulative electric power installed by 2030 from renewables, and achieve net-zero carbon emissions by 2070, according to the minister.

The country, with its vast renewable energy resources, has an opportunity to produce green hydrogen for the world, Yadav said.

A number of countries have started to work with India on green partnerships. India is engaged with other countries for green initiatives such as Joint India-UK Green Grids Initiative, International Solar Alliance, Coalition for Disaster Resilient Infrastructure, all aimed at strengthening international cooperation to tackle climate change, the minister said.

India should aim at 100 per cent E2W, E3W sales in 5 years: Amitabh Kant

India has to target making two and three-wheelers sales 100 per cent electric in the next five years to reduce air pollution and to become a global manufacturing champion of these vehicles. “Public mobility is the backbone of a civilised society. Focus should be on e-buses also,” Amitabh Kant, G20 Sherpa of India, said at the ‘National Dialogue on Emerging Trends in E-Mobility’, organised in New Delhi recently by the Council on Energy, Environment and Water (CEEW).

He also added, “ Financing will be pivotal to the e-mobility transition, There should be such mechanisms as first-loss guarantee, credit enhancement and blended finance, to enable private-capital flow at scale. India must target to install five million fast chargers, and push for battery swapping and PLIs for localised manufacturing, he added. Kant released CEEW Centre for Energy Finance’s (CEEW-CEF) independent report ‘Greening India’s Automotive Sector’ at the event.

The report, supported by Bloomberg Philanthropies, showed that more electric vehicles (EVs) were sold in the country in the first six months of FY 2022-23 than in the previous full financial year. EVs constituted 6 per cent of all new auto sales in September 2022, up from only 1 per cent in January 2021. CEEWCEF also launched its ‘Electric Mobility Dashboard’, a free, online tool that captures and dynamically updates, on a fortnightly basis, EV volumes at a national, state and RTO level.

India Fastest in Renewal Energy Capacity Addition Among Major Economies

Since time immemorial, India has remained the hub of climate protection and environmental sustainability. A substantial chunk of folklore literature and practices geared at taking a holistic view of the natural resources remain the solid foundation on which the mainstream narrative of Indian society is built. However, there has been a renewed focus over the climate protection in the recent past. India's international image has been on the path of widening its reach and clout of late, and now India has assumed the G20 Presidency.

India is emerging as an inspiration for countries across the globe, particularly on the fact that how economic development and conservation of the environment can go hand in hand. India has become the fastest in renewal energy capacity addition among major economies that had added

over 100 gigawatts of renewable energy capacity by the end of 2021 with the vision of 500 gigawatts by 2030.

India now has the lowest cost for large-scale solar power in the world-another spectacular achievement of its traditional skill at supply-side process innovation. India has tremendous potential to lead the world in green energy and she will forward the cause of global good apart from generating green jobs.

In that context, the Ministry of Power recently led the first post-budget webinar on green growth with discussions taking place in six parallel sessions on the 12 announcements made under the Union Budget this year.

With over 1,100 participants from the industry, academia, state governments as well as concerned stakeholders, the deliberations for finalisation towards an action plan for implementation of the aspects of green growth took place.

With the first session on storage and inter-state transmission systems as well as the Green Hydrogen Mission, the second session deliberated on the GOBARdhan (Galvanizing Organic Bio-Agro Resources Dhan) scheme that aims to support villages in effectively managing their cattle and biodegradable waste under Swachh Bharat Mission Grameen-Phase II.

The third session discussed the green credit programme, MISHTI (Mangrove Initiative for Shoreline Habitats and Tangible Incomes) scheme that will facilitate mangrove plantation along India's coastline and on salt pan lands.

This new programme has the sole objective to intensive afforestation of coastal mangrove forests. India has such forests on both its Eastern and Western coasts with the Sundarbans in Bengal being one of the largest mangrove forests on the planet. Additionally, the Amrit Dharohar initiative will encourage optimal use of wetlands and preservation, and enhance bio-diversity, carbon stock, eco-tourism prospects and income generation for local communities with an outlook for them to be caretakers of the ecosystem.

The fourth session deliberated on PM-PRANAM (Prime Minister Programme for Restoration, Awareness, Nourishment and Amelioration of Mother Earth) that will seek to incentivise the entire country for promoting alternative fertilisers and the balanced use of chemical fertilisers.

The programme aims to ultimately bring down the government's subsidy burden, which is estimated to reach Rs 2.25 lakh crore in 2022-23 i.e. 9 per cent higher than last year's figure of Rs 1.62 lakh crore and they are posing multiple risks including health hazards by entering into our food chains and responsible for environmental degradation as well. To further facilitate the adoption of "natural farming,".

As many as 10,000 Bharatiya Prakrutik Kheti Bio-Input Resources Centres will be setup, creating a national-level distributed micro-fertiliser and pesticide manufacturing Network

With the enormous potential to lead the world in green energy sector and generate green jobs, the Government of India invited each global energy player to invest in India. It must be pointed out that India achieved the target of 40 per cent contributions from non-fossil fuels in the installed electricity capacity nine years before the target date, of 10 per cent ethanol blending in petrol five months before time and is next aiming to strike the 20 per cent ethanol blending in petrol by 2025-26 instead of 2030 further ahead.

Whether it is the initiative to deal with the challenges of climate change through Mission LiFE or showing the world a path towards a solution through the Panchamrit (five ambrosia: a proposal of five-fold strategy for India to play its part in helping the world get closer to 1.5 degrees Celsius declared at the 26th Conference of Parties (CoP26) to the United Nations Framework Convention on Climate Change (UNFCCC) in November 2021 at Glasgow), India has always set an example.

By choosing a path where economy and ecology can both co-exist happily, India has been able to protect the environment without blocking a large number of infrastructural projects.

While the renewable energy capacity in 2014 was pegged at 20GW, the ambitious target set for 2022 was 100 GW of renewable energy capacity. However, India has been able to achieve this goal much before the decided timeline, ensuring that the cost of solar energy drastically reduced from Rs 16/unit to Rs 2/unit as on date.

Today, India has the lowest cost of setting up renewable energy capacity and its cost of green hydrogen is touted to be the most competitive in the world in near future.

Therefore, India is poised to transform from a net importer of energy to becoming a net exporter of energy. Within the next six years, India's renewable energy capacity has increased by more than 250 per cent which in itself is a rapid pace of growth for any country, especially a developing country with 140 crore individuals.

As a result, India is now a global leader in renewable energy with third-largest production of renewable energy in the world, fourth-largest installed wind power capacity, and fifth-largest installed solar power capacity.

Despite the fact that the nation consists of over 17 per cent of the world population, it only accounts for about 5 per cent of global emissions. In spite of such meagre contributions to emissions, India has announced a number of measures to tackle climate change with Mission LiFE - aimed at changing the mantra of lifestyle, the Pradhan Mantri Unnat Jyoti by Affordable LEDs for All (UJALA) - a non-subsidised indigenous lighting programme. In addition, the Government of India has also initiated major reforms with missions like the Green Hydrogen Mission, renewable energy evaluation storage projects, the Green Credit programme, PM-PRANAM, Gobardhan scheme, Bhartiya Prakrutik Kheti Bioinput Resource Centres, MISHTI, Amrit Dharohar initiatve, coastal shipping replacement, vehicle scrapping policy for cities, PM-KUSUM Yojana, etc., which are spread across 13 ministries as part of the green growth agenda of the nation. India has already been able to start off on a firm footing while the world is still grappling with the idea. Energy transition holds monumental significance in the new world order and has the capacity to influence and necessarily determine geopolitical transitions as well. Therefore, this urgency to become self-sufficient as well as meet the energy needs of not just its own people but the larger global community is about doing the right thing and it may well propel India further on to global superpower.

Green Hydrogen mission norms, tender by first half of 2023-24

The government will notify guidelines and issue tender for incentives under the Green Hydrogen Mission by the first half of the next financial year, Ministry of New and Renewable Energy secretary Bhupinder Singh Bhalla told recently.

He said a draft for the incentive schemes has been prepared and the consultation process should begin soon. “We want to expedite them (the guidelines and tender) but bring them out with clarity so that companies can start planning how to manufacture electrolysers or produce green hydrogen,” he said.
The Union cabinet approved the National Green Hydrogen Mission in January with an outlay of Rs 19,744 crore. The mission aims to lift India’s green hydrogen production capacity to at least 5 million tonnes per year, with associated renewable energy capacity addition of about 125 GW.

The European Investment Bank last month announced indicative euro 1 billion funding to support large-scale green hydrogen hubs and projects across India. The ministry has floated a concept note on the offshore wind sector.

While discussions on viability gap funding (VGF) are on, Bhalla said other processes are also being identified. “We have floated a concept note on the proposed VGF for the initial installations.

Once that gets through, we will take formal approvals and begin implementing. The process for non-VGF projects is also being finalised,” he said. Offshore wind projects hold importance in India’s quest to meet 500 GW of non-fossil fuel capacity by 2030. Bhalla said no formal decision on the relaxation in the approved list of models and manufacturers has been taken by the government yet but the matter is currently being evaluated. This

comes in the backdrop of a large solar capacity addition pipeline, which the local manufacturers may not be able to cater to until enough production capacities come online.

The list so far includes domestic solar module manufacturers that have been given certificates by the Bureau of Indian Standards. The ministry will calibrate targets of renewable energy as domestic solar equipment manufacturing increases. “But we will see a gradual rise in capacity addition in renewable energy. There is no other option if we want to reach the 500 GW target,” said Bhalla. As for the upcoming summer demand, which is expected to be higher than that last year, the ministry is helping expedite the renewable energy projects that are near commissioning.

India Adds Just 487 MW of Solar Capacity in February 2023

As per the latest figures of installed capacity of renewable energy released by the CEA (Central Electricity Authority), India’s solar capacity rose to a little over 64380 MW as on February 28, 2023. In January 2023, the total solar power capacity stood at a little more than 63893 MW. Thus, over the span of a month, the country has added solar capacity of just 487 MW. That’s a marginal growth over the 473 MW added in the corresponding month last year.

In January 2022, India’s solar capacity installed was 50303.58 MW. In February 2022, the solar capacity installed was pegged at 50777.77 MW. Between January 2022 and February 2022, the total capacity of solar energy added was 473.53 MW.

In financial year 2021-22, the solar energy capacity installed was 12.3 GW. With the financial year heading to a close, it will be interesting to watch the final figures.

Recently, the MNRE relaxed its ALMM requirements for domestic projects till March 31, 2024. The exemption has come as a relief for developers, who have been long hoping for it while maintaining that domestic capacity of high quality modules was inadequate both quantity and quality wise

Wind energy generation can surge 4-5 times on policy tailwinds, add 6-8 GW annually: Report

Positive policy moves by the new and renewable energy ministry can crank up the annual wind capacity addition by 6-8 gigawatt (GW) from fiscal 2026, around 4 times more than 1.6 GW of growth clocked in the past five fiscals, a report said.

According to a Crisil analysis, the aggressive tariff bids in reverse auctions since fiscal 2018 has been one of the key drivers of the wind energy growth.

The process led to discovery of irrationally low tariffs that were favoured by state distribution companies, but compromised returns left little incentives for developers to complete the projects. There were also delays in land acquisition and setting up of evacuation infrastructure.

Under reverse auction, bidders compete on an open e-platform, adjust tariffs within timeframes with their quotes visible to all participants. Prior to FY18, wind projects were awarded under the feed-in-tariff regime, where payments at fixed tariffs were made by discoms to producers under long-term contracts without competitive bids.

Only 41 per cent of projects awarded by the Solar Energy Corporation of India (SECI) during fiscals 2018-21 got commissioned till December 2022, while 23 per cent were cancelled and the remaining projects are delayed due to issues in land acquisition, and evacuation and supply-side constraints, the report noted.

While the annual solar capacity addition averaged 8.3 GW in the five fiscals through 2022, wind

capacities grew a meagre 1.6 GW per annum during this period. All that can change now with the ministry introducing four key policy measures in January, the report said.

The first of these four major policy changes include setting a goal to award 8 GW of wind tenders per annum. This is significant because wind tendering has been low at just 3.3 GW per annum in the past five fiscals. This can propel capacity growth at a faster rate if executed well.

Secondly, the ministry has replaced the reverse auction process with a single stage, two-envelope closed bidding, which will curb irrational bidding. The agency now expects tariffs to rise 20-30 per cent over the recent Rs 2.89-2.94 per unit, which provides more than 10 per cent internal rate of return, due to the change in bidding process, resource variability at newer sites etc.

Thirdly, to ensure that higher wind power tariffs are conducive for state discoms, the ministry mandated that all discovered renewable tariffs for each state will be pooled and offered to discoms at an average pooled tariff by an intermediary such as the SECI. This will lower the risk for wind projects because the SECI fares significantly better than state discoms in terms of payments.

Finally, to ensure discipline in terms of timely project completion, the ministry notified that bank guarantees of developers will be revoked if they delayed project completion by more than a year beyond the scheduled commissioning date. Also, the developers delaying projects beyond 18 months will be barred for five years.

According to Ankit Hakhu, a director at the agency, considering 8 GW of bidding in fiscal 2024 and 20-24 months to commission, around 6-8 GW capacity can be installed every year starting FY26, provided the policy push continues at the same pace.

The step-up in wind power generation is crucial to the country's energy transition goals despite it being costlier than solar. That's because wind projects can provide electricity even during the night to meet peak power requirements, which balances out day-centric solar generation on the grid. Hence, it forms an important part of round-the-clock power supply set-up as desired by discoms.

MNRE signed agreements with Australia, Finland, Germany, UAE for promotion of bilateral cooperation in renewable energy

The Ministry of New and Renewable Energy (MNRE) entered into various kinds of agreements with foreign countries like Australia, Finland, Germany and UAE from time to time to promote bilateral cooperation in the field of renewable energy, said Union Minister of Renewable Energy and Power RK Singh in the Rajya Sabha recently. According to an official release, since 2022, the Ministry of New and Renewable Energy has signed the following Memorandums of Understanding/ Joint Declarations of Intent/Letters of Intent:

A Letter of Intent (LoI) on New and Renewable Energy Technology cooperation was signed between the Ministry of New and Renewable Energy, Government of India and the Ministry of Industry, Energy and Emissions Reduction, Government of Australia on February 15, 2022.

A Memorandum of Understanding (MoU) on cooperation in the field of Renewable Energy was signed between the Ministry of New and Renewable Energy, the Government of India and the Ministry of Economic Affairs and Employment of the Republic of Finland on April 29, 2022.

A Joint Declaration of Intent (JDI) on the Indo-German Green Hydrogen Taskforce was signed between the Ministry of New and Renewable Energy (MNRE), the Government of India and the Ministry for Economic Affairs and Climate Action (BMWK) of the Federal Republic of Germany on 02nd May 2022.

A Joint Declaration of Intent (JDI) regarding Renewable Energy Partnership was signed between the Ministry of New and Renewable Energy, the Government of India and the Ministry

for Economic Cooperation and Development of the Federal Republic of Germany on May 2, 2022.

A Memorandum of Understanding to promote discussion and cooperation between the Parties in the Potential Areas of Cooperation in the Spectrum of Green Hydrogen Development and Investments in India and the UAE was signed between the Ministry of New and Renewable Energy, the Government of India and the Ministry of Energy and Infrastructure, Government of the United Arab Emirates on 13th January 2023.

Electricity is a concurrent subject and the supply/distribution of electricity to all consumers of rural areas falls primarily under the purview of the respective State Governments and/or State Power Utilities. The government of India has supplemented the efforts of the States through its various schemes including Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and Pradhan Mantri Sahaj Bijli Har Ghar Yojana (SAUBHAGYA) to help them to achieve the objective of providing uninterrupted power supply to all villages and households.

Under Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), it was targeted to connect every inhabited village with electricity by strengthening the rural distribution system. All inhabited villages as per the census 2011 stood electrified as of 28th April 2018 across the country and the scheme has been closed on 31 March 2022.

Further, universal household electrification was targeted under SAUBHAGYA by providing electricity connections to all un-electrified households in rural areas and all poor households in urban areas in the country. A total of 2.817 crore households were electrified since the launch of Saubhagya, up to 31 March 2021. Thereafter, 4.34 lakh households were electrified under DDUGJY till 31 March 2022. Accordingly, as of 31 March 2022, a total of 2.86 crore households were electrified. The Scheme has been closed on 31 March 2022.

The European Investment Bank (EIB) and state-owned Indian Renewable Energy Development Agency (IREDA) Limited are exploring a partnership on financing of renewable energy and green hydrogen projects in India.

Reliance, Tata Power & Other 12 Companies to Get Rs 13,937 Cr Under Solar Cells PLI

Renewable energy subsidiaries of Reliance Industries, Tata Power Company and JSW Energy are among the bidders for the selection of solar photovoltaic (PV) module manufacturers to set up manufacturing capacities under the government's Production Linked Incentive (PLI) Scheme (Tranche-II). SECI, the scheme's nodal body, announced the winners on March 28 who would receive a total of Rs 13,937.575 crore for establishing 39.6 GW under the PLI Scheme's second tranche.

The Union Cabinet authorised the second tranche of the PLI scheme for the development of solar PV modules on 21 September with an outlay of Rs 19,500 crore. This tranche of the incentive seeks to support the establishment of 65 GW per year of completely and partially integrated solar PV module manufacturing capacity.

“The PLI scheme has proven to be a watershed event in India's renewable landscape, resulting in around 48 GW domestic module manufacturing capacity within the next three years,” said RK Singh, Union Minister for Power and New and Renewable Energy.

“The plan has bolstered the government's efforts to reduce not only the impact of global supply chain shocks but also our reliance on imports, in line with the Prime Minister's vision of an Aatmanirbhar Bharat,” Singh added.

According to the ministry, a total of 7,400 MW of manufacturing capacity is anticipated to be operational by October 2024, followed by another 16,800 MW capacity by April 2025 and the remaining 15,400 MW capacity by April 2026. The PLI Scheme Tranche-II is anticipated to attract an investment of Rs 93,041 crore. It will also create 1,01,487 jobs, with 35,010 directly employed and 66,477 indirectly employed.

India's approach to oil import guided by its energy security requirements: Indian Ministry of External Affairs

India's approach will be guided by energy security requirements with regards to importing oil, Ministry of External Affairs said recently even as media reports suggested divergence of opinion in some Western capitals over keeping the price cap on Russian crude at $60 a barrel.

"We have repeatedly made it clear that our approach will be guided by our energy security requirements," Ministry of External Affairs spokesperson Arindam Bagchi said at the weekly media briefing in response to queries concering price cap. Earlier in December, G7 nations and Australia reached a consensus on a maximum price of 60 USD per barrel for seaborne Russian-origin crude oil in line with the decision by the Member States of the European Union to endorse a price level for the price cap on seaborne Russian-origin crude oil, according to the statement released by G7 nations and Australia on Australia's foreign office website.

On September 2, G7 Finance Ministers initiated a price cap on Russian-origin crude oil and petroleum products to be implemented by each coalition member in the wake of Russia-Ukraine war.

"The price cap on Russian-origin crude oil will enter into force across our jurisdictions on December 5, 2022 or very soon thereafter. Our respective regulations are expected to include a time-limited exception for transactions involving oil that is loaded onto a vessel at the port of loading prior to 5 December 2022," G7 nations and Australia had said in a statement.

Russia is now India's top oil supplier.

Green Hydrogen Can Help India Save Rs.1 Trillion on Fuel Imports by 2030

Union Minister of Renewable Energy and Power R. K. Singh informed the Rajya Sabha that the government aims to reduce a total of Rs1 trillion (~$12 billion) worth of fossil fuel imports by 2030, following the targets set under the National Green Hydrogen mission.

The minister said nearly 50 million metric tons of carbon emissions are likely to be mitigated through the production and use of green hydrogen.

In January this year, the Union Cabinet approved the National Green Hydrogen Mission with an initial outlay of Rs 197.4 billion (~$2.3 billion).

Singh said the government would support the infrastructural development of electrolyzers to accelerate green hydrogen production.

He said the government would facilitate the demand creation of green hydrogen by encouraging exports and domestic utilization.

The minister added that the government has initiated efforts to launch green hydrogen pilot projects in the steel, mobility, and shipping sectors.

Recently, Union Minister for Ports and Shipping Sarabananda Sonowal said two ports on India's east coast and one port on the west coast would be developed by the Ministry of Ports, Shipping, and Waterways as hydrogen hubs as part of the Green Shipping Initiative.

Earlier this year, Singh said green hydrogen will play a central role in the country's target to reach 500 GW of non-fossil capacity by 2030 and in developing energy storage solutions that

could potentially replace lithium-ion-based batteries.

The hydrogen mission also intends to pave the way for the government to form partnerships with international research institutes to explore green hydrogen production opportunities.

Last month, the Department of Science and Technology (DST) signed a letter of intent with Germany's Fraunhofer Institute for Solar Energy Systems for a long-term collaboration focused on hydrogen and other clean technologies.

DST will provide the framework for cooperation in the hydrogen valley cluster projects, support activities, and facilitate resources. Fraunhofer will act as a technology partner for the hydrogen valley or cluster, providing information and access to technologies and scientific and technical experts.

Five firms make the PLI cut to manufacture hydrogen-powered vehicles

The government selected five companies -- Ashok Leyland, Eicher Motors, Pinnacle Mobility, Tata Motors, and Booma Innovative – for manufacturing hydrogen fuel cell electric vehicles under the Rs 25,938-crore production-linked incentive scheme for the automobile and auto component industry (PLI-Auto), Minister of State for Heavy Industries Krishan Pal Gurjar has informed the Lok Sabha.

"Several automobile companies have expressed their interest to set up their manufacturing units and invest in India for hydrogen fuel cell-powered automobiles. So far, five companies have been approved under the PLI Auto scheme," Gurjar said in a written reply recently.

The five original equipment manufacturers (OEMs) are part of the Ministry of Heavy Industries' (MHI's) 20 approved applicants for its Champion OEM Incentive scheme.

The Rs 25,938 crore PLI-Auto scheme has two components — Champion OEM and Component Champion. The Champion OEM Incentive scheme is a sales value-linked scheme, applicable to battery electric vehicles and hydrogen fuel cell vehicles of all segments.

According to the MHI data, the PLI-Auto scheme has attracted a proposed investment of Rs 74,850 crore, against the estimated target of investment Rs 42,500 crore over a period of five years. Of this, a proposed investment Rs 45,016 crore is from approved applicants under the Champion OEM Incentive Scheme and Rs 29,834 crore from approved applicants under the Component Champion Incentive Scheme.

While informing Parliament about the research and development in the hydrogen blending initiative, the minister said, according to information received from the Automotive Research Association of India (ARAI) Pune, ARAI and Indian Oil Corporation (IOCL) had extensively worked on hydrogenated CNG (HCNG) engine development for the finalisation of hydrogen blend in CNG and developed HCNG engines for Indian OEMs.

"Demonstration on buses in Delhi using hydrogenated CNG (HCNG-blend of hydrogen 18 per cent by volume in CNG) was carried out by IOCL," the minister said.

At present, various OEMs like Volvo Eicher Commercial Vehicle (VECV), Ashok Leyland, Tata Motors, and Cummins are working on dedicated hydrogen internal combustion engine development for Heavy Commercial Vehicle applications.

Some of these OEMs are ready with the prototype of hydrogen engines and vehicles.

Tata Motors & IOCL is planning to demonstrate fuel cell buses in Delhi, Gurjar said.

The minister also informed the Parliament that the research and development projects on hydrogen-based internal combustion engines, hydrogenated CNG, and diesel and hydrogen-fuelled vehicles are being developed across the country.

The Centre is relying on PLI-Auto, along with the already launched PLI scheme for Advanced Chemistry Cell (Rs 18,100 crore) and Faster Adoption of Manufacturing of Electric Vehicles (FAME) (Rs 10,000 crore) for helping the country leapfrog from the traditional fossil fuel-based automobile transportation system to an environmentally cleaner, sustainable, advanced and more efficient electric vehicles (EV)-based system.

India's efforts to avoid a power crisis set to boost LNG imports

India will boost fuel imports after gas-fired power stations were asked to increase output to meet soaring demand during the summer months.

Gail India Ltd. will tap the seaborne market to supply state-run power producer NTPC Ltd., which has been asked by the government to run 5 gigawatts of plants to meet peak demand during April and May, according to people familiar with the matter, who asked not to be named as the details are private.

NTPC estimates it will require 250 million metric standard cubic meters of the fuel during the two-month period, according to some of the people. An additional 4 gigawatts of capacity run by other companies will also be kept ready to operate if needed. NTPC and a Gail spokesman didn't immediately reply to emails seeking a comment.

India's government is taking action as harsher-than-expected weather threatens to create a surge in electricity demand. An early onset of hot weather has already pushed power demand to near-record levels, stoking fears of a repeat of the intense heat wave last year.

India has already invoked an emergency rule forcing some plants running on imported coal to run at capacity.

Nearly 25 gigawatts of India's gas-fired capacity has been lying underutilized for years, as the electricity is too costly for the competitive market dominated by coal. Bringing these units back shows the extent of the challenge, as the nation is forced to ditch concerns over high prices to meet supply shortfalls.

Now, with prices softening in the spot market and increased demand from power stations, imports are likely to rise, according to Rajesh Mediratta, chief executive officer at Indian Gas Exchange.

India's February crude oil imports jump to meet growing demand

India's imports of crude oil in February rose about 8% from a year earlier, government data showed recently, as fuel demand hit over 2-decade highs in the world's third-biggest oil importer and consumer.

Rising crude demand and a strong Indian economy bodes well for higher refinery runs and imports, in addition to cheaper Russian crude, said Refinitiv analyst Ehsan Ul Haq, adding he expects refiners to boost runs and imports as temperatures rise and people travel more.

Fuel demand in February hit its highest level in at least 24 years, data from the website of the Petroleum Planning and Analysis Cell (PPAC) showed this month.

With Indian demand likely to rise further over coming months, crude imports should recover, said UBS analyst Giovanni Staunovo. On a monthly basis, imports were down 6% to 22.57 million tonnes, PPAC data showed.

The month-on-month drop in imports could also be seasonal, as February imports were lower last year as well, Haq said.

Russia tightened its grip on India's oil market in February, leaving African crude oil imports in India at the lowest level in at least 22 years.

Elsewhere, Indian Oil Corp, the country's top refiner, will reduce its yearly oil purchase from Kuwait by 20% starting in April. To compensate, India's IOC has increased its term crude volume with Iraq's Oil Marketing Company (SOMO) by 20,000 bpd.

Product exports in February rose by 12% month-on-month to 5.06 million tonnes, with diesel accounting for 2.15 million tonnes.

The rise in exports comes despite India planning to extend restrictions on the export of diesel and gasoline after the current fiscal year ends this month to ensure the availability of refined fuels for the domestic market.

India's Russian oil purchases since Ukraine invasion more than double 2021 total

India has bought more than twice as much crude oil from Russia in the two months since its invasion of Ukraine as it did in the whole of 2021, according to Reuters calculations, as Indian refiners snapped up discounted oil that others have shunned. Refiners in India have placed orders for at least 40 million barrels of Russian oil since the invasion on Feb. 24, Reuters calculations based on information from crude tenders and traders show. The purchases are for loading in the June quarter.

That compares with total imports of Russian oil into India of 16 million barrels in the whole of last year, according to Reuters calculations. The world's third biggest oil importer and consumer ships in over 85% of its crude oil needs of 5 million barrels per day (bpd). Its refiners are buying cheaper Russian oil to partly offset the impact of higher official selling prices of some producers like Saudi Arabia, company sources said.

"We try to insulate consumers as much from price shocks as we can, but we need to protect our profits as well... so we are buying Russian oil," an official at one refiner, who declined to be named, said.

According to Reuters calculations, purchases of Russian barrels by private refiners Reliance Industries and Nayara Energy outstrip imports by state refiners Indian Oil Corp, Hindustan Petroleum Corp, and Bharat Petroleum Corp.

Reliance has purchased at least 15 million barrel of Russian oil so far for the June quarter, trade sources said last week. Reliance did not respond to a request for comment at that time.

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India to cut gas prices soon

India's cabinet is set to adopt a gas panel report this week, which has recommended capping the price for most local gas at $6.50 per million British thermal units (mmBtu) in April, two sources said recently.

India last year set up the panel, led by energy expert Kirit Parikh, to review India's gas pricing formula to ensure fair prices to consumers after state-set prices of gas from old fields and a ceiling price for output from hard-to-access, difficult blocks rose to record highs.

The panel suggested that the monthly price of gas produced from old blocks be fixed at 10% of the monthly average of the Indian crude basket, with a cap of $6.5/mmBtu and a floor price of $4/mmBtu.

The price will apply to industrial buyers and companies in the fertiliser and city gas distribution sectors and will be fixed on a monthly basis. The current price of gas from old blocks is set at $8.57 and is valid from October to end-March.

The average price of the Indian crude basket from 26th of the previous month to 25th of the current month would be used to determine the price of gas for the next month, one source familiar with the matter said.

Given that the average price of 10% of India's crude basket from Feb. 26 to March 25 is over $7/mmBtu, the price in April would be at the cap of $6.5/mmBtu, the source said.

Over 80% of India's yearly gas output of 91 billion cubic metres comes from old fields owned by the government-run Oil and Natural Gas Corp. and Oil India Ltd

Oman and Dubai crudes make up on average 75.6% of India's crude basket, with 24.5% coming from dated Brent.

India's current local gas prices are linked to global benchmarks and are revised twice a year in April and October.

The panel also recommended removing the price cap for gas produced from difficult fields.
India's oil ministry did not respond to Reuters' request for comment.

The move to overhaul gas pricing is also part of Prime Minister Narendra Modi's aim to raise the share of gas in India's energy mix to 15% by 2030 from 6.2%, to help India meet a 2070 net zero carbon-emission goal.

PNGRB amends regulation to allow unified tariff for natural gas pipelines

The Petroleum and Natural Gas Regulatory Board (PNGRB), the downstream regulator, announced it has amended the PNGRB (Determination of Natural Gas Pipeline Tariff) regulations to incorporate provisions for Unified Tariff for natural gas pipelines with a mission of “One Nation, One Grid and One tariff”. Based on the new regulations, PNGRB has notified a levelized Unified Tariff of Rs 73.93/MMBTU and created three tariff zones for Unified Tariff, where the first zone is up to a distance of 300 kms from gas source, second zone is 300 – 1200 kms and third zone is beyond 1200 kms. The Zonal unified tariffs will be effective from 1st April 2023.

The national gas grid covers all the interconnected pipeline networks owned and operated by entities viz. Indian Oil Corporation Limited, Oil and Natural Gas Corporation Limited, GAIL (India) Limited, Pipeline Infrastructure Limited, Gujarat State Petronet Limited, Gujarat Gas Limited, Reliance Gas Pipelines Limited, GSPL India Gasnet Limited and GSPL India Transco Limited.

With commissioning of newer interconnected pipelines, the national gas grid will keep expanding for Unified tariff. These entities will get the tariff as per their entitlement while customers would pay Unified tariff. The difference between the same will be settled between the Pipeline entities for which a settlement mechanism has been notified.

Well prepared for peak summer demand from power units: Coal secretary

The coal ministry is "well prepared" to handle the upcoming peak demand for coal and has taken preemptive steps for the anticipated requirement in the summer months, secretary Amrit Lal Meena told ET. The closing stock at pitheads will come at around 70 million tonnes in March end and overall coal production for the financial year is expected at 880 million tonnes, which gives comfort, he said.

The projected production in FY23 is likely to be around 13% higher than the FY22 production.

The statement comes in the backdrop of an expected rise in coal consumption at power plants with a projected 229 GW of peak demand in April, higher than the 211 GW clocked last year. Coal at power plants stood at 33.4 million tonnes as of March 13 and may increase to 35-36 million tonnes at best, as reported earlier by ET quoting sources.

While the projection is higher than the 25.6 million tonnes closing stock in March end last year, it will fall short of the coal ministry's target of 45 million tonnes at plants by the year end.

Concerns in the power sector grew if stocks at plants would meet the upcoming demand in the next two months. Last year, coal-based power plants faced fuel shortage in the summer months of April and May because of a sudden rise in demand and limitations in increasing coal transport facilities. "The targeted stock build-up fell short because of an increase in consumption of domestic coal in February and for that railway rakes availability will be increased to supply coal in April and May," Meena said.

He added that the railway rakes for coal transport are coming as per plan and at the current pace, sufficient stocks can be maintained at power plants. All contracts for coal supply in the financial year 2023-24 have been placed and a plan put together for every coal mine so that production in the first half of the year does not fall like in the past. The ministry has ensured that evacuation of coal from the pitheads does not fall in monsoon by ensuring cemented roads and conveyor belts at major mines, Meena said.

Govt successfully bids out 29 coal blocks for commercial mining

The 29 coal blocks which have been successfully bid out for commercial mining by the government are expected to enhance the average dry fuel output by an additional 7 per cent in the next two years, as the combined peak rated capacity (PRC) of these reserves is around 91 million tonnes.

The 91 million tonnes PRC of 29 coal blocks which have been bid out, would be an additional 7 per cent of the present national average PRC of coal reserves, sources said.

The Coal Ministry had put up 29 reserves on auction for commercial mining last month, all of which have been bid out, sources informed. The last of the 29 mines was bid out successfully earlier in the day, they added.

With all the 29 mines expected to begin production by 2024-25, i.e. by the next two years, the government is hoping that all these coal mines put together will enhance the overall

national average output by an additional 7 per cent.

The ministry launched the auction of coal reserves for commercial mining in the sixth round and second attempt of fifth round on November 3, 2022.

Forward auctions for these mines had started on February 27.

PRC pertains to the maximum production capacity of a coal mine, or in other words, the maximum quantity of coal which can be mined from it annually.

Commercial mining allows the private sector to mine coal commercially without placing any end-use restrictions. Private firms will have the option of either gasification of the coal or exporting it. They can also use it in their own end-use plants or sell them in the markets.

Coal imports fall by 25% in 3 yrs as India aims to up domestic production

Coal imports have seen a 25 per cent fall in the last three years as India strives to increase domestic production and reduce dependence on imports, despite the fact that owing to global geopolitical turmoil which has put a strain on supply chains, it, along with other nations, has been forced to enhance its dependence on the dry fuel instead of moving to greener sources of energy.

The government imported 248.54 million tonnes of coal in 2019-20, which has come down by 25 per cent to 186.06 million tonnes in the current fiscal of 2022-23 (till December 2022), according to Coal Ministry data.

In fact, coal imports have gradually come down since 2019-20, as in 2020-21, it was 215.25 million tonnes while in 2021-22, it further came down to 208.93 million tonnes. In 2022-23, it further slid below the 200 million tonnes mark to 186 million tonnes till December 2022.

In 2018-19, India's coal imports stood at 235.35 million tonnes and had risen to 248.54 million tonnes in 2019-20, a rise of 5.6 per cent. However since 2019-20 till the current fiscal, imports have been following a downward trajectory.

Though India imports coal from several countries like Australia, Canada, China, Mozambique, Russia, South Africa, New Zealand and the US, its bulk of imports are from Indonesia.

Mindful of the fact that due to the Russia-Ukraine war impacting supply chains of green fuels, it has to depend on coal, India is aiming to improve its domestic production of dry fuel and plans to produce 911 million tonnes in the current fiscal, in order to reduce dependence on imported coal.

Government plans to enhance production of coal to 1,012 billion tonnes in 2023-24 and further increase it to 1.3 billion tonnes in 2025-26.

India may begin to export coal by FY26

India, the world’s second-largest coal producer and a net importer of the fuel, is expected to begin exports by FY26 as the country expects output to exceed local demand over the next two years when supplies from new coal mines enter the market, coal secretary Amrit Lal Meena said.

Strong case to hike coal prices, could happen soon: CIL chairman

Coal India Chairman Pramod Agrawal on March 20 said there is a "strong case" for increasing coal prices, and the hike could be effected "very soon" as discussions are underway with stakeholders.

Mr. Agrawal also said he is confident the mining behemoth will achieve its production target of 1 billion tonnes by 2025-26.

“There is a strong case for increasing coal prices, as that has not happened in the last five-odd years. This year, the wage negotiation has taken place as well, which will have an impact on CIL’s financial condition, especially for a few subsidiaries where the manpower cost is very high.”

"There will be a lot of problems if prices are not hiked. Discussions are underway with stakeholders... It will happen very soon," Mr. Agrawal said at the Indian Coal Markets Conference here organized by Mjunction.

Elaborating on the 1 billion tonne production target, he said though CIL is on course to achieve this by 2025-26, it will depend on factors like the need of the country and the growth of the private sector.

"What is important is the readiness to produce. No country can develop unless its energy resources are secured - so we should be in readiness to produce if requirement is there, if not, the output can be adjusted accordingly," Mr. Agrawal said.

The CIL chief added that the company is aiming to raise underground coal production to 100 million tonnes by 2030 from around 25-30 million tonnes at present.

Cost of India quitting coal is $900 billion, think tank says

If India stopped burning coal tomorrow, over five million people would lose their jobs. But for a price tag of around $900 billion over the next 30 years, the country can make sure nobody is left behind in the huge move to clean energy to curb human-caused climate change, according to figures released by New Delhi-based think tank recently.

The International Forum for Environment, Sustainability and Technology, known by the acronym iFOREST, released two reports detailing how much it will cost for India to move away from coal and other dirty fuels without jeopardizing the livelihoods of millions who still are employed in coal mines and thermal power plants.

Ensuring that everyone can come along in the clean energy shift that’s needed to stop the worst harms of climate change and guaranteeing new work opportunities for those in fossil fuel industries, known as a just transition, has been a major consideration for climate and energy analysts.

“Just transition should be viewed as an opportunity for India to support green growth in the country’s fossil fuel dependent states and districts,” said iFOREST head Chandra Bhushan.

To get the $900 billion figure, the group researched four coal districts in India and identified eight different cost factors, like setting up infrastructure and getting workers ready for the transition.

The biggest single investment to enable a just transition will be the cost of setting up clean energy infrastructure, which the report estimates could be up to $472 billion by 2050. Providing workers with clean energy jobs will cost less than 10% of the total amount required for a just transition, or about $9 billion.

The think tank said $600 billion would come as investments in new industries and infrastructure, with an additional $300 billion as grants and subsidies to support coal industry workers and affected communities.

“The scale of transition is massive. If formal and informal sector workers are included, we are talking about an industry that is the lifeline for 15 to 20 million people,” said Sandeep Pai, a senior associate at the Center for Strategic and International Studies, a Washington D.C. based think tank. “Reports like this are extremely important since the just transition conversation is beginning only now in India ... we need much more.”

India is one of the largest emitters of planet-warming gases behind only China, the U.S. and the EU. The country depends on coal for 75% of its electricity needs and for 55% of its overall energy needs and is still a far way off quitting.

Earlier this month, the Indian government issued emergency orders stipulating that coal plants are run at full capacity through this summer to avoid any power outages. The country’s coal use is expected to peak between 2035 and 2040, according to government figures.

Prime minister Narendra Modi announced in 2021 that the country will achieve net zero emissions — where it only puts out greenhouse gases that it can somehow offset — by 2070. Recently, United Nations Secretary-General António Guterres urged nations to speed up their net zero goals, calling for developing countries to set a target of 2050. He was met with a muted response.

The reports recommend that the Indian government focuses on retiring old and unprofitable mines and power plants first. Over 200 of India’s more than 459 mines can be retired in this way.

“The energy transition has to start with coal,” said Jayant Sinha, who represents the coal-rich Hazaribagh constituency in the central Indian state of Jharkhand, adding that the switch to clean energy needs both funds and institutions to ramp it up. “Both of this must happen together for a successful transition,” he said.

Partnerships with developed countries to help the coal-reliant nations of South Africa, Indonesia and Vietnam make a just energy transition have been made in recent years. While these deals are steps in the right direction, they’re too small in scale to make a real impact, energy experts say.

It’s still not clear if India will be open to a similar just energy transition deal.

Indian leaders have expressed skepticism over climate funds promised by developed nations, pointing to a promise to give low-income and developing countries $100 billion every year to help with climate challenges back in 2009 that still hasn’t been met.

Coal Ministry to Sign Agreements for Mines Auctioned During 6th Round of Commercial Auctions

The Ministry of Coal will be signing the agreements for 28 coal mines auctioned under the 6th round and launching the seventh round of auction of mines for sale of coal soon.

India's energy consumption grows 10.4% so far in FY23

Energy consumption in India rose 10.4% during the April-February period in the current financial year (FY23), said union minister for power, R.K. Singh recently. In a written reply to a question in Lok Sabha, the minister said that the growth in energy supplied or consumed in February, 2023 is 8% as compared to February, 2022.

The peak demand in the month of March, 2023 has been projected as 212 GW whereas only 209 GW has been reported till date in the month of March, 2023, he said, adding that the month of April and May have been projected as high demand period. During the current year 2023-24, the peak demand is expected to be around 229 GW during the summer period.

Outlining the steps have been taken for meeting the increased demand for power, the minister said the generators have been directed to complete the maintenance work of their plants well before the period of high demand and no planned maintenance will be taken during the high demand period. Monitoring and coordination with ministries of coal and railways, on a regular basis, for increase in the production and dispatch of coal as much as possible. Further, all generators have been asked for timely import of required coal for blending purposes so that adequate coal stock is maintained in the plant, Singh said.

All captive coal blocks have been asked to maximize the coal production to supplement the coal supply from domestic coal companies (CIL and SCCL) and additional arrangement for gas for running gas based stations has been planned from GAIL, during high power demand months.

Imported-coal based (ICB) plants have been issued statutory directions to stock coal and generate power during high demand period. In another response to the parliament, Singh, who also holds the portfolio of new and renewable energy said that so far, a total of 168.96 GW renewable energy capacity has been installed in the country as on February 28.

India can achieve energy independence by 2047: US

India can achieve energy independence by 2047, when it celebrates 100 years of independence, according to a study by the US Department of Energy's Lawrence Berkeley National Laboratory. The study titled "Pathways to Atmanirbhar Bharat" also notes India's energy infrastructure needs an investment of $3 trillion in the coming decades.

It determined that achieving energy independence will generate significant economic, environmental, and energy benefits for India which include $2.5 trillion in consumer savings through 2047, reducing fossil fuel import expenditure by 90 per cent or $240 billion per year, enhancing India's industrial competitiveness globally, and enabling its net-zero commitment ahead of schedule.

"India's energy infrastructure requires a $3 trillion investment in the coming decades, and our study finds that prioritizing new energy assets that are cost-effective and clean is crucial for long-term financial sustainability," said Berkeley Lab staff scientist and co-author Amol Phadke in a statement issued by the Department of Energy.

The study shows that India's energy independence pathway would involve the power sector installing more than 500 GW of non-fossil electricity generation capacity by 2030, a goal already announced by the government, followed by an 80 percent clean grid by 2040 and 90 percent by 2047.

It says that nearly 100 percent of new vehicle sales could be electric by 2035. Heavy industrial production could shift primarily to green hydrogen and electrification, it said.

Most of the lithium needed (estimated 2 million tons by 2040) for manufacturing new electric vehicles and grid-scale battery storage systems could be produced domestically using newly discovered reserves, it said.

In addition, the Indian industry must transition to clean technologies such as EV and green steel manufacturing. India is one of the world's largest auto and steel exporters, with their largest markets

in EU countries committed to carbon neutrality and a potential carbon border adjustment tariff, it said.

Phadke said, "India can leverage the existing policy framework it has laid out to expand the clean energy deployment." India, the third largest energy consumer in the world, currently imports 90 percent of the oil it needs, 80 percent of the industrial coal, and 40 percent of the natural gas. Price and supply volatility in the global energy markets, as witnessed in recent years, strain India's foreign exchange reserves, resulting in economy-wide inflation, it said.

"The case for clean energy has never been stronger. India has achieved the world's lowest renewable energy prices and has found some of the world's largest lithium reserves," said Nikit Abhyankar, Berkeley Lab scientist and the lead author of the study. "This can propel India towards cost-effective energy independence in a way that is economically and environmentally advantageous," he added.

According to the press release, the study also finds that India has a unique advantage to leapfrog to a clean energy future since the bulk of its energy infrastructure is yet to be built.

"We find that India will embark on an ambitious energy transition in the coming decades," said Priyanka Mohanty, a co-author and researcher at Berkeley Lab. "However, the transition runway provides time to strategically deploy clean technologies at scale and plan for a just transition."

Smart prepaid meters to reduce power bills by up to 2.5%: Power Minister

Union Power Minister R K Singh recently urged electricity consumers to use smart prepaid meters, saying the device helps users bring down power cost by up to 2 per cent.

Installation of smart prepaid meters reduces the operational and finance cost for electricity suppliers as consumers credit their account in advance, the minister said while releasing the 'Enabling a consumer-centric Smart Metering Transition in India' report here.

"If you have a smart prepaid meter, your cost of electricity will come down by 2-2.5 per cent and the consumer gains (at benefit)," Singh said.

Usage of smart meters will lead to digitisation of systems, automation and further efficiencies. It will help in energy accounting, which helps in identifying the areas which need attention.

"Energy accounting system...is another challenge which we are still tackling," he said.

According to the findings of the report released, the users of smart prepaid meters are having better experiences compared to conventional post-paid metering systems of billing.

While 92 per cent surveyed consumers reported a smooth installation experience, 50 per cent reported improvements in their bills.

Around 63 per cent of the respondents said they would recommend smart prepaid meters to other consumers, as per the survey conducted by CEEW with the support of MacArthur Foundation and Bloomberg Philanthropies. Over 4,500 people across 18 districts of six states were surveyed.

The states were Assam, Bihar, Haryana, Madhya Pradesh, Rajasthan and Uttar Pradesh.
Around 44 per cent could not access detailed bills of their electricity usage.

Jitendra K Agarwal, Joint MD of smart metering firm Genus Power said, "These new-age smart meters help reduce the operation and maintenance cost, and enhance the quality of service. Metering is an important infrastructure for the country. Smart prepaid meters maintain accuracy in the billing of electricity usage.

India’s booming economy stretches coal and power supplies to limit: Kemp

India’s power generators and coal mines are being stretched to the limit to meet surging demand for power stemming from a fast-growing economy and rapid electrification.

Total electricity consumption increased by 13.5 billion kilowatt-hours (kWh) (+12 per cent) in January 2023 compared with January 2022, according to Grid-India's National Load Despatch Centre.

Peak consumption, a better measure of pressure on the transmission system, reached 211 gigawatts, up by almost 10 per cent from the corresponding month a year earlier.

Coal units increased generation by almost 16 billion kWh (+18 per cent) compared with a year earlier, in part to offset reduced output from expensive gas-fired units.

Temperatures around New Delhi were below the long-term average for 26 out of 31 days in January, before climbing above normal in an early heatwave in February. The extraordinary surge in demand is structural rather than weather-driven: total consumption increased by more than 6 per cent in 2022 and has risen at a compound annual rate of more than 4 per cent for the last decade. India's business activity is growing rapidly, with purchasing managers' surveys showing very broad-based increases in activity in manufacturing (55.4) and services (57.2) in January, continuing into February.

But domestic mines and the rail network are struggling to keep pace with the strong demand from power producers for fuel. Mine production and coal trains despatched to power plants both increased last year by 12 per cent, which was impressive but still below generators' requirements. India's railways loaded an average of 271 coal trains per day bound for power producers in February, well below the plan for 313 trains, and no higher than in February 2022.

The rail system is becoming a binding constraint on the ability to move more coal to generators and ensure they have sufficient fuel. Generators' stocks are currently equivalent to 12 days of consumption, an improvement on this time last year (9 days) but below the corresponding levels in 2021 (15 days), 2020 (28 days) and 2019 (18 days).

To stretch supplies further, the government has directed generators to import more coal to blend with domestic production ("India to boost coal imports to cope with harsh weather, freight snags", Reuters, January 17, 2023). The government has also ordered privately owned generators that rely on expensive imported coal to maximise output to relieve power shortages ("India to use emergency law to maximise coal power output", Reuters, January 30).

The massive deployment of renewable generation has helped prevent far worse shortages but the total is still too small to relieve the pressure on the coal system. Coal-fired generators supplied 76 per cent of all electricity to the transmission network in February despite the rapid deployment of wind turbines and solar panels. Renewable capacity increased by 15 per cent in January 2023 compared with a year earlier, and there were even more impressive increases in actual generation from wind (50 per cent) and solar (+37 per cent).

Coal-fired generation becomes even more stretched in the pre-monsoon season (March-May) and post-monsoon (September-October) when temperatures are higher but wind, solar and hydro output are not at their summer monsoon peak.

In the medium term, the government anticipates renewables deployment will stabilise and then reduce the need for coal. But that goal is still some years away. In the meantime, increasing domestic production and imports, and critically relieving bottlenecks at ports and on the rail network, is essential for avoiding widespread electricity shortages.

Power Prices Expected To Remain Firm Next Fiscal Amid Higher Demand: Crisil

CRISIL
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Power prices are expected to remain firm next fiscal on the back of elevated demand growth of 5.5-6 per cent, and the demand is set to close this fiscal up 9.5-10 per cent over 8.2 per cent last fiscal, a report said recently. The fears of a heat wave have seen the shortterm power prices soaring by a full 151 per cent. This was on the back of a 42 per cent onyear spike in prices in February, Crisil

said in a report. The demand growth would mark a decadal high rate of growth and almost double the 20- year average of 5.2 per cent, the report added. The report noted that demand growth weighed in at 7.7 per cent in February and averaged 10 per cent for the 11 months of the current fiscal despite a high base of fiscal 2022 due to extreme weather events and robust industrial and manufacturing activity.

March is unlikely to see any let up amid early warnings on possible heat waves in northern and central regions this summer, the report said.

According to Hetal Gandhi, a director with the agency, a hotter-than-usual summer with a high probability of multiple heat waves is expected to keep power demand growing even next fiscal at 5.5-6 per cent, despite two straight years of robust growth. The first half should see even higher growth.

On generation, non-hydro renewable sources are estimated to account for 11 per cent this fiscal and their share is expected to rise a notch next fiscal, with solar and wind accounting for 13 per cent. Hydro power accounts for another 11 per cent now.

But with limited storage capacities, thermal capacities will continue to shoulder the burden of meeting any sudden surge in demand, especially in the summer when water levels in hydro projects drop. In fact, the share of hydro dropped to 8 per cent last summer from average 11 per cent for the full year.

Meanwhile, power plants using imported coal, aggregating to 17 GW, or 8 per cent of the total thermal capacity, were operating at a low plant load factor of 21 per cent as of February, massively down the aggregate thermal plant load factor of 63 per cent. And nearly 97 per cent of these imported capacities are owned by private players, she said, adding, as a result, short-term power prices have surged.

To tame the prices, the power ministry has floated a tender to buy 1.5 GW from plants using imported coal with untied capacity for one month (April 10-May 10).

Though there is 8-GW overall untied thermal capacity available, the share of imported coal based plants without short and medium term power purchase agreements in this untied capacity remains a monitorable.

According to Surbhi Kaushal, an associate director at the agency, the government aims to pump this entire 1.5 GW to the short-term market at no cost to tame prices. Imported coal plants will bid on fixed tariff with an upside of price on variable charge indexed at Rs 5.34/kWh. This implies a 20 per cent mark-up on variable charge of Rs 4.4 at an estimated Rs 7,500 per tonne imported coal prices for Q1FY24. The move is in addition to the government's move to invoke Section 11 of the Electricity Act, mandating all plants using imported coal to operate at full capacity, enabling better supply position. Coal stocks remain at 12 days with the plants, compared to 14 days over the past 35 months, and all wheels are focusing on getting coal supplies on stream. Structural steps such as fast-tracking coal-based rail transportation projects are also being expedited. However, short-term markets have reacted. A surge in demand has led to purchase bids surpassing the sell bids in the short-term market by 6 GW on average in the past 15 days.

The result is a 42 per cent on-year increase in prices in February and a 151 per cent increase on the first day of March. The market clearing price in the day-ahead market (DAM) on the Indian Energy Exchange breached Rs 6.5/kWh in February, which is the highest level seen in the past eight months.

In 2022, the purchase-sell bid differential started turning positive in the first week of March, averaging over 3.5 GW. High prices forced the Central Electricity Regulatory Commission to intervene and reduce the price upper limit from Rs 20/kWh to Rs 12/kWh in April. Despite this, positive differential averaged over 10 GW in April-May 2022, pushing up prices to Rs 10/kWh on average over the period.

Crisil expects DAM prices to average Rs 6-6.5/kWh this fiscal, compared to average of Rs 3.1//kWh in fiscals 2015-19. Average price for next year in DAM market is expected to remain under Rs 7-8/kWh, with almost non-operational gas-based power

generation of 24 GW to become competitive with falling gas prices.

Subansiri Lower hydro-electric project likely to be completed by May 2023

The officials of NHPC recently informed the Arunachal Pradesh Deputy Chief Minister Chowna Mein that, the 2000 MW Subansiri Lower Hydro Electric (HE) Project is expected to be completed by May of this year and 2 units of 250 MW each will be commissioned by June of this year.

The NHPC officials also said that the remaining 6 units with a total capacity of 2000 MW of power will be completed by June of 2024.

Arunachal Pradesh Deputy Chief Minister recently visited the 2000 MW Subansiri Lower HE Project site in Gerakamukh, Lower Subansiri.

Mein was accompanied by MLA cum Adviser to Minister (Power), Balo Raja, MLAs Tarin Dakpe, Taniya Soki, and Rode Bui, Secretary Power Ajay Kumar Bisht and CE DHPD, R. K. Joshi.

The dignitaries visited the various sites of the project to take stock of the progress made.
He appreciated the progress of the work and lauded the project-executing team.

The project, which was taken over by NHPC Limited since 2000, is nearly completed, with 86 per cent of the overall progress made till date.

After the visit, Mein held a meeting with the NHPC officials at their Office complex and discussed the issues of Subansiri Middle (Kamala) and Subansiri Upper (Menga) HEP, allotted to NHPC by Govt of India in presence of local representatives and PRI leaders.

He urged them to expedite the execution of the project immediately and said that the matters pertaining to Subansiri Middle HEP will be taken up in the next Cabinet Meeting, after which an MoA will be signed between GoAP and NHPC as per the Cabinet decision.

Standard operating Procedures (SOP) for Subansiri Upper HEP should also be finalised soon, he said.

The Deputy CM also asked the NHPC officials to execute their work with professionalism and to achieve the target as per specification.

He urged them to ensure that no further delays in the project completion is made as it causes cost escalation and more losses to the State exchequer, amounting to loss of revenue.

The successful completion of the projects will also open up ample scope for the establishment of an industrial zone in the area, Mein added.

He also lauded the public for their cooperation in the smooth implementation of the project and asked the NHPC officials to win the confidence of the people through the efficiency of their works.

Mein also assured the NHPC officials of the Government of Arunachal Pradesh's full support and cooperation in the successful implementation of these projects.

During the site inspection, NHPC Executive Directors (Subansiri), Vipin Gupta and ED Itanagar, R K Chaudhary briefed the visiting dignitaries about the projects.

$3.9 bn hydropower project near China border in Arunachal Pradesh approved

India has approved the construction of the Dibang hydropower project, the largest of its kind in the country, as part of its efforts to build renewable energy generation to meet rising power demand. The 2,880-megawatt project will be developed by NHPC Limited. It is estimated to cost $3.9 billion and take nine years to build.

Hydropower has been classified as renewable energy in India and is seen as essential in the country's transition away from coal to help manage the fluctuations caused by intermittent solar and wind supplies.

When completed, the 278-meter-tall dam will be India's tallest structure. The project is located on the Dibang River in Arunachal Pradesh's Lower Dibang Valley District.

The project calls for the construction of a 278m high Concrete Gravity Dam (above the deepest foundation level), six horseshoe-shaped head race tunnels ranging in length from 300m to 600m with 9m diameter, an underground Power House, and six horseshoe-shaped tailrace tunnels ranging in length from 320m to 470m with 9m diameter.

Constructing dams often leads to large-scale environmental damage and dislocation of communities, resulting in local protests that delay projects and increase construction costs. The Dibang project, which will be built over more than 5,000 hectares of forest land, is expected to face similar risks, according to various experts.Government assistance for flood mitigation and supporting infrastructure, such as roads and bridges linking the building site, are included in the investment that has been approved.

NTPC Ltd registered 11.92% growth in generation i.e. 364.2 BU in FY23 till February month

Country's largest power generator, NTPC Ltd registered 11.92% growth in generation i.e. 364.2 BU in FY23 till February month, compared to the country's generation growth of 9.56%.
NTPC continues to demonstrate an increasing trend in coal production from its captive mines. NTPC Captive Coal production stood 2.6 Million Metric tonnes (MMT) whereas the despatch stood 2.5 MMT, thus registered a robust growth of 80% and 87% respectively, in February vis-à-vis previous corresponding year. On a cumulative basis, the coal production crossed 20 MMT in FY23.
NTPC has taken various steps to augment the coal production from its coal mines. The engagement of high-capacity dumpers as well as an increase in the existing fleet size of excavators has allowed the operational mines to increase their production.

NTPC announced commercial operations of first unit of 660 MW capacity of North Karanpura Super Thermal Power Station

NTPC Limited, India's Largest power PSU declared the Declaration of Commercial Operation Date of first unit of 660 MW capacity of North Karanpura Super Thermal Power Station (3x660 MW) on Commercial Operation w.e.f. 00:00 Hrs. of 01 March 2023. With this, standalone and group commercial capacity of NTPC will become 58979 MW and 71594 MW respectively. North Karanpura Thermal Power Station is an upcoming coal-based thermal power plant located in Tandwa in the Simaria subdivision of the Chatra district, Jharkhand. This power plant is owned by NTPC Limited.

Government Accepts Task Force Report on Smart Power Transmission System

The government has accepted the recommendations of a task force on modernizing India's power transmission system, paving the way for real-time monitoring, automated grid operation, and increased renewables integration into the power mix.

Other recommendations by the task force relate to equipping the transmission system for better situational assessment, enhanced transmission capacity utilization, centralized and data-driven decision-making, reduced forced outages through self-correcting systems, and greater resilience against cyber-attacks and natural disasters.
The task force was set up by the Ministry of Power in September 2021. It was chaired by the POWERGRID Chairman and included representatives from state and central transmission utilities, the Central Electricity Authority (CEA), and the Ministry of Electronics and Information Technology. Union Power Minister R.K.Singh presided over the deliberations over the task force report.

The system will be able to accommodate a higher proportion of renewable capacity in the power mix, facilitating India's progress toward meeting its renewable energy goals.

The recommendations have been divided into the following categories:

- Modernization of the existing transmission system
- Use of advanced technology in construction, supervision, operations, and management
- Intelligent and future-ready transmission system
- Up-skilling of the workforce

The recommendations have been further classified into short-term to medium-term interventions, which will be implemented over 1-3 years, and long-term interventions, which are proposed to be implemented over 3-5 years.

Singh emphasized the importance of a fully automated, digitally controlled, and smart transmission grid in achieving the government's vision of providing reliable and affordable 24×7 power to the people and meeting sustainability goals.

He also directed CEA to develop standards and regulations for the adoption of technological solutions and to set benchmark performance levels to build a robust and modern transmission network.

Advanced technologies: The task force has proposed a range of advanced technologies to modernize India's power transmission sector. These include centralized remote monitoring, SCADA-operated substations, flexible alternating current transmission systems, process bus-based protection automation, and hybrid substations that combine gas and air-insulated switchgear technologies.

The use of cybersecurity, energy storage system, drones, and robots for constructing and inspecting transmission assets is also among the suggestions. Robots are expected to minimize human intervention, reduce risks, and save time while ensuring accuracy during construction and maintenance.

The task force also recommended benchmarks for transmission network availability and voltage control based on the performance of global transmission utilities.

Last December, R.K. Singh unveiled a comprehensive plan to evacuate the planned renewable power capacity of 500 GW by 2030 at an estimated cost of Rs.2.44 trillion (~$29.64 billion).

In October last year, Singh stated that the government was planning to set up thirteen renewable energy management centers to address generation variability, uncertainty, and transmission systems for integrating an additional 52 GW of potential renewable energy zones by 2026-27.

NTPC plans to import 5.4 mt of coal in H1 FY24

State-run power generator NTPC plans to import 5.4 million tonnes (mt) of coal for its power plants in the first half of the next financial year, Parliament was informed recently.

"NTPC is planning to import around 5.4 mt of coal for its group stations to meet domestic coal supply shortage during the first half of financial year 2023-24," Power Minister RK Singh said in a written response to a query in the Rajya Sabha.

During the current summer season, India's peak power demand is expected to be around 230 gigawatts (GW) and the Ministry has taken several measures to ensure that peak demand can be met, Singh added.

On January 9, the Ministry directed Central and State Gencos and independent power producers (IPPs) to take necessary actions to import coal for blending at the rate of 6 per cent by weight through transparent competitive procurement in order to have sufficient stock at power plants, for smooth operations till September.

On February 7, in a written response to a query in the Upper House, Singh had said that the gap between daily domestic coal consumption and arrival ranges from 2.65 lakh tonnes (lt) to 0.5 lt between September 2022 and January 2023.

"If imports for blending had not been made, coal stocks in thermal power plants would have reduced to zero in September 2022. Therefore, Power Ministry advised Central, State Gencos and IPPs on January 9 to import coal through a transparent

competitive procurement for blending so as to have sufficient coal stocks at their power plants for smooth operations till September, 2023," he had said.

Power demand: The Central Electricity Authority (CEA) expects energy demand at 142 billion units (BU) in April , the highest for 2023, before tapering to 141.20 BU in May and 117 BU in November. The country's peak power demand is expected at 229 GW next month.

Coal consumption: India's current daily average coal consumption is around 2.3 mt, while production is about 3.3 mt per day. The Coal Ministry has said that as of March 9, more than 100 mt of coal is available in the country, which includes 64 mt at mine pitheads, 6 mt in transit at good sheds, washery & ports and 31 mt at thermal power plants

Power ministry seeks comments on draft carbon credit trading scheme

The power ministry on Monday issued a draft 'Carbon Credit Trading Scheme' with an aim to set up a framework for Indian carbon market and sought feedback from stakeholders.

The comments on the draft scheme would have to be submitted with the ministry by April 14, 2023, an office memorandum stated.

The parliament has passed the Energy Conservation (Amendment) Bill, 2022 and a notification for the same was issued in December 2022. One of the provisions of this amendment included empowering the central government to "specify carbon trading scheme", in consultation with Bureau of Energy Efficiency (BEE).
Now the ministry of power is in the process to finalise the Carbon Credit Trading Scheme (CCTS). The CCTS provides that an 'Accredited Carbon Verifier' means an agency accredited by the BEE to carry out validation or verification activities in respect of the CCTS.

The 'Carbon Credit Certificate' (CCC) means the certificate issued to the registered entity by the central government, or any agency authorised by it, in the CCTS where each certificate issued shall represent reduction or removal of one tonne of CO2 equivalent (tCO2e), it stated.

The 'CCTS' means the scheme for reduction or removal of greeen house gas (GHG) emissions notified by the central government, it stated.

The scheme provides for setting up of the Indian Carbon Market Governing Board (ICMGB). The governance of the Indian Carbon Market (ICM) and direct oversight of its administrative and regulatory functioning shall vest in the governing board, to be called as ICMGB. The ICMGB will be power and environment secretaries would be the ex-officio co-chairmen of ICMGB. The ICMGB shall meet at least once in a quarter of every year, or as may be required.

It will recommend procedures for institutionalising the Indian carbon market for the approval of the central government. The board will also recommend the central government the rules and regulations for the functions of ICM. It will recommend methodologies to be used under voluntary mechanism for the approval of the central government.

It will also recommend guidelines regarding sale of carbon credit certificates to outside India to the central government. It will also approve projects under the voluntary mechanism and recommend the central government or its designated agency for issuance of carbon credit certificate (CCC). It will approve the process/conditions for crediting period/renewal/ retirement of CCC and have oversight of the administrative and regulatory functions of Indian carbon market.

It will constitute any committee or working group as required in connection with ICM. The Bureau of Energy Efficiency shall be the administrator for the Indian carbon market and shall also work as the secretariat for the ICMGB. The Grid Controller of India Ltd shall be the registry for the Indian Carbon Market. The Central Electricity Regulatory Commission (CERC) shall be the regulator for the trading activities under the Indian carbon market.

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Nuclear power sector saves 41 mn tonnes of carbon emissions annually: Govt

India's nuclear power sector is saving 41 million tonnes of carbon dioxide emissions annually, compared to emissions that would have been generated by equivalent electricity generation from coal-based thermal power plants, Union Minister Jitendra Singh informed Lok Sabha recently.

In a written reply, Singh said as part of low carbon development of electricity systems consistent with enhanced development benefits, the government was exploring a significantly greater role for nuclear power.

Nuclear power currently comprises three per cent of India's total electricity generation, Singh said, adding that sufficient production and share of atomic energy was essential for ensuring the country's energy security.

Current policy targets a three-fold rise in nuclear installed capacity by 2032, said Singh, who is in-charge of the Department of Atomic Energy.

He said nuclear energy can be considered for delivering base load power free of intermittency in place of energy from fossil fuels.

Singh said the present installed nuclear power capacity is set to increase from 6,780 MW to 22,480 MW by 2031 on progressive completion of projects under construction and accorded sanction.

He added that in the next three years, capacity addition of 5,300 MW is planned on completion of two 700 MW units each at Kakrapar Atomic Power Station and Rajasthan Atomic Power Project respectively, two 1,000 MW power plants at the Kudankulam Nuclear Power Project and one 500 MW Prototype Fast Breeder Reactor at Kalpakkam.

In reply to a separate question, Singh said at present, out of the total installed capacity of 6,780 MW, Rajasthan Atomic Power Station-1 (100 MW) is under extended shutdown and Tarapur Atomic Power Station 1&2 (2X160 MW), Madras Atomic Power Station-1 (220 MW) and Rajasthan Atomic Power Station-3 (220 MW) are under project mode for taking up various upgrades / renovation and modernization activities.

The remaining 5,920 MW is being operated at its rated capacity, the minister said.

Union Minister Dr. Jitendra Singh says, 22 Nuclear Power Reactors operational in the country

India’s Nuclear Power capacity witnessed a quantum jump after 2014, in the year 2013-14 if the annual nuclear power generation stood at 35,333 Million Units, in the latest year of 2021-22 it stands at 47,112 Million Units which is nearly 30 to 40 percent increase within a short span of over eight and a half years.

This was stated here recently in the Rajya Sabha by Union Minister of State (Independent Charge) Science & Technology; Minister of State (Independent Charge) Earth Sciences; MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space, during a discussion in the Rajya Sabha on nuclear power reactors.

The Minister cited a number of path-breaking out-of-the-box decisions taken by Prime Minister Narendra Modi to supplement the rise of nuclear power generation in India. For example, he said, if there were only 22 reactors in the country before this government came in, the cabinet headed by Prime Minister Modi gave simultaneous bulk approval for as many as 11 indigenous pressurised heavy water reactors in 2017 at a total cost of Rs.1,05,000 crore and total capacity of 7,000 Mega Watts.

Not only this, Dr Jitendra Singh said, in another revolutionary decision as was done in the case of the Space Department which was unlocked for

private players, Prime Minister Narendra Modi also allowed Joint Ventures with Public Sector Undertakings (PSUs) to augment India's nuclear programme. Following a decision to this effect in 2015, the Nuclear Power Corporation of India Limited(NPCIL) is presently in two joint ventures one with National Thermal Power Corporation Limited (NTPC) and the other with Indian Oil Corporation Limited (IOCL).

Moreover, Dr Jitendra Singh informed that while in the past India's nuclear installations were mostly confined to South Indian States or in the west in Maharashtra and Gujarat, the Modi government is also promoting its expansion to other parts of the country. In this context, he cited the example of the upcoming nuclear power plant in Gorakhpur town of Haryana which will become functional in near future.

In reply to another question, Dr Jitendra Singh noted with pride that the world's first thorium based nuclear plant "Bhavni" using Uranium-233 is being set up at Kalpakkam in Tamil Nadu. It is going to be entirely indigenous and the first-of-its-kind, he said. The experimental thorium plant "Kamini" already exists in Kalpakkam, he added.

North India's first nuclear power plant is coming up in Gorakhpur, Haryana

North India's first nuclear power plant is coming up in Gorakhpur, Haryana, about 150 km north of the national capital, said Union Minister Jitendra Singh on Saturday.

He added that during Prime Minister Narendra Modi's regime, one of the major achievements would be the installation of nuclear/ atomic energy plants in other parts of the country, which were earlier confined mostly to the southern states like Tamil Nadu and Andhra Pradesh or in the west in Maharashtra.

The minister said that this was keeping in line the focus on increasing India's nuclear capacity. He added that a bulk approval of installation of 10 nuclear reactors came under the Modi government.
The minister said that the Department of Atomic Energy has also been given permission to set up joint ventures with PSUs for resources to open atomic energy plants, having the potential to fulfill India's energy needs in times to come.

According to Department of Atomic Energy, Gorakhpur Haryana Anu Vidyut Pariyojana's(GHAVP) having two units of 700 MWe capacity each of Pressurised Heavy Water Reactor (PHWR) indigenous design is under implementation near Gorakhpur village in Fatehabad district in Haryana.

Till date, an amount of ₹4,906 crore has been spent out of total allocated funds 20,594 crore.

Construction of other Main Plant buildings/structures viz. Fire Water Pump House (FWPH), Safety Related Pump House (SRPH), Fuel Oil storage area-1&2 (FOSA-1&2), Ventilation stack, overhead tank (OHT), Switchyard Control Building, Safety related & Non-safety related Tunnel & Trenches, Retaining walls and Garland Drain is progressing well. Ground improvement in Turbine Building -1 & 2, 220 kV Switchyard and IDCT-1A is completed.

Ground improvement in other areas IDCTs, 400kV Switchyard, Emergency makeup water pond and station roads are in progress. The contractors for IDCT package and Turbine Island Package have mobilized site.

Purchase orders for major long manufacturing cycle equipment/components like Primary Coolant Pumps, Calandria, Reactor Headers, Refuelling Machines Heads, Moderator and other D20 Heat Exchangers, etc. are already in place. End Shields and all Steam Generators for the first unit have been received at site. Manufacturing of other equipment is in various stages and delivery at site is expected well in time to meet the construction schedule.

Construction of Water Duct from Tohana to GHAVP for meeting operational cooling water requirements has been taken up through Haryana Irrigation & Water Resources Department (HI&WRD) as deposit work and progressing well.

8th Coal Summit
held on 18th January 2023

A National Seminar on Coal – 8th Coal Summit, 2023 with the theme – "Sustaining Coal – Gasification Route" was organised jointly by India Energy Forum, MGMI- Delhi Chapter and Indian School of Mines Alumni Association at Hotel Le Meridien, New Delhi on the 18th January, 2023.

INAUGURAL SESSION

Shri N N Gautam, Chairman, Coal Group, IEF & Former Advisor, Ministry of Coal

Shri N. N. Gautam, Chairman, Coal Vertical, India Energy Forum started the proceedings with words of welcome for Chief Guest Shri Amrit Lal Meena, IAS, Secretary (Coal) and other dignitaries seated on the dais.

He also welcomed all participants and Guests and introduced the three Organizers.

Going into the selection of the theme for the Seminar, he stated that Coal, despite it having been declared as the prime contributor to global warming and India having launched a very ambitious programme for Power Generation from Renewables , is bound to stay as an important Energy Source for India. In fact, Coal production in India will have to grow at least for next 2-3 decades for meeing the ever increasing Power requirement in the country.

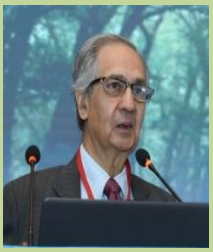
For trying to contain the polluting effect of Coal, like rest of the world, India is also trying to develop technologies for making Coal combustion generally more Environment friendly with Coal Gasification being one of the major initiatives in this direction.

In order that Coal Gasification becomes successful in India, adequacy of supply of right quality of Coal for gasification has to be ensured and Indian coal, generally having very high Ash content will have to be very beneficiated for meeting this requirement. This aspect has got to be looked into very seriously and the Beneficiation effort which had gained ground earlier and has now been abandoned, has got to be restarted.

He referred to the clarion call given by our Hon'ble Prime Minister for achieving Coal Gasification of 100 MT annually by 2030 and welcomed the setting up of National Coal Gasification Mission under Ministry of Coal for achieving this target.

He was confident that Coal Gasification programme in the country would become successful thanks to the close attention being given by Government and keen interest being taken by Coal Producers as well as technology developers

Shri Alok Perti, IAS (Retd.), Former Secretary (Coal) & Patron, National Advisory Board, 8th Coal Summit



Delivering his welcome address, Shri Perti referred to his association with activities of Indian Energy Forum. Even while in service, he participated in the Forum's activities and after his retirement, he joined the Forum as a regular member. He lauded India Energy Forum for having been very active on deliberating on different aspects of Energy scenario in India and even though its activities received a setback from the Pandemic, it continued its activities through Webinars and he congratulated the Forum for organizing more than 30 webinars on Energy issues during the Pandemic period.

Prior to the Pandemic ,under the auspices of a specially created platform by the Forum- Urja Vikas Manch regular meetings were organised to discuss the topical Energy related issues of the day and these were addressed by

Top Functionaries in Government like Secretaries and CMDs of Central Public Sector undertakings.He hoped that now, that we had moved out of the dark shadows of the Pandemic, we would resume organizing the meetings of Urja Vichar Manch on a regular basis.

Going down the memory lane, he remembered that at one stage , Mr. Kelkar, Former Secretary (Finance) had initiated deliberations on issue of Coal Gasification and a paper on the subject had also been prepared in December 2013 / January 2014.

which had been submitted to the then Planning Commission. With the change in Government and NITI Aayog substituting Planning Commission, this paper received latter's attention and a Conference on Methane economy was organized by the Aayog way back in 2015/2016. Subsequently, many other meetings also took place to discuss the issue of Coal Gasification but unfortunately, no physical activities were undertaken on ground.

It is gratifying to see that the matter has now engaged serious attention of Ministry of Coal. While the details will be explained by Shri Meena in his speech, he expressed his gratefulness to him for giving this matter his personal attention.

Adequacy of Energy availability has been very vital for the any country's development and India is no exception. In fact, India is on cross roads in this regard. While we are being pushed by international community to give up on Coal, the twin shocks caused by the Pandemic and Ukraine War have awakened Western world with a severe jolt that it is not that easy to shut Coal suddenly. It is in this context that the substitution of words "phased out" with " phased down" at Glasgow COP assumes great significance. He also felt that even when the World reaches the Net- Zero Carbon target, Coal will still be used – may not be primarily for Power but as feedstock for producing important items like Chemicals, Fertilizers, Pharmaceuticals etc.

He once again welcomed Shri Meena the Guests and participants in the Seminar and hoped that the deliberations of the Seminar will enable preparation of an implementable action plan which will give this Coal Gasification Mission a push to achieve its objective.

Shri P. S. Upadhayaya, President, MGMI-DC

In his address as one of the organisers of the Seminar ,Shri P. S. Upadhayaya, Former Director (Tech), NMDC and Chairman , MGMI-Delhi Chapter described the activities of MGMI in brief and stated that apart from organizing Seminar, Workshops, Roundtables etc. MGMI was contributing to the growth of mineral sector in India by participating in the deliberations of important Government Committees It was also publishing Magazines and Transactions and thereby serving the national need of the country for being kept up-dated about developments in Mineral sector.

He made a reference to some important issues in connection with Coal Gasification.

- The Gasification Technology which has been established in countries like USA and China is based on Superior Grade Coal of which India does not have large reserves. We could however, improve the quality of our low grade coal of which we have huge reserves by

Beneficiation. He therefore felt that the Government withdrawal of the mandate earlier given to specified Power Stations for using only (-) 34 % Ash which could be obtained only through Beneficiation deserved review.

• He referred to certain negatives about Coal Gasification like issue of production of high quantity of CO2 and cost of Power generated from SynGas being very high. He did however feel that the R&D work which are going on would take care of these negatives.

He also believed that the success achieved by Jindal Steel and Power Ltd on Coal Gasification at their Angul Plant would be a source of encouragement to the future developers in Coal Gasification Sector. He also hoped that the efforts put into this Seminar would pave the way for fast progress of Coal Gasification mission in India.

Presidential Address - Setting the Context by Shri R V Shahi, Former Secretary (Power), Government of India and President, Indian Energy Forum

He started his address by thanking the Chief Guest of the Event and the Energy Sector Experts who had graced the Seminar by their presence. He referred to his personal association with Shri Amrit Lal Meena, Secretary (Coal) and Chief Guest of the Event and recalled that as Power Secretary he had several interactions with Shri Meena who was then the Collector of Muzaffarpur in Bihar. He also made a mention of very successfulS tenure of Shri Meena in that assignment.

He also referred to the Webinars that India Energy Forum had organized during the two years period affected by the Covid Pandemic.

He stated that Energy was always a very point but it has now become the central point in as much as Energy issues have forced the shift from the globalization trend of past few decades to protection of individual interests by different countries.

He also pointed out that Ukraine war has shown that Energy issues had engulfed many of the developed countries and they are finding continuation of their erstwhile life-styale challenging since this war had upset the Energy balance of the World very substantially. Even otherwise as the World has moved from COP to COP, focus has moved to self- reliance. He made a mention in this connection to our own Prime Minister's Call for "Atma Nirbhar Bharat". He agreed that this development will not wash away the global nature of international economy but it will and has definitely caused a major rethink. Coal has been important even globally but for India it is very important since it accounts for 57%-58% of Energy Consumption. Admittedly, Petroleum and Natural Gas also make important contribution of 31%-32% but it has to be kept in view that we have to depend on import for more than 85% of these items and this import has a major hit on our foreign exchange resources.

He referred to his own calculation which shows that for improving per capita Power consumption of 1250 Kwh for India , which will be only ¼th of China and only about 33% of global average, India will have to depend on Coal till at least 2040-50.

Most certainly, the share of Coal in Energy consumption would come down to 30%-40% but in absolute terms India would require at least 2000 MT of Coal per year compared to about 1000 MT now.

Coal will therefore continue to be important for India in future also. We have however, to appreciate here that the quality of our Coal is Poor containing 40%- 50% Ash and that is why we are talking of Clean Coal technology. Gasification also has been mentioned in this connection for almost 55 years but no concrete action has been taken. At one stage BHEL was given the task of generating 5 MW of Power from SynGas but they are yet to achieve this task. It is gratifying to see that Government are serious about it now which is manifested in the Hon'ble Prime Minister setting a target 100 MT per annum of Coal gasification by 2030.

He complimented Shri Meena for achieving record rate in Coal Production of about 16% and he was sure that for the year as a whole also we would achieve a record growth in Coal production. He had also noted that Coal people also were very enthusiastic about it and they appreciate that sustainability of Coal will depend on success of Coal Gasification.

He also referred to production of Hydrogen from Coal. In this connection, he also felt that withdrawal of mandate for Coal Beneficiation by the Government has been a retrograde step.

He ended with the hope that the target of Gasification SS of 100 MT of Coal annually by 2030 will certainly be achieved.

Inaugural Address by the Chief Guest, Shri Amrit Lal Meena, Secretary, Ministry of Coal

Shri Amrit Lal Meena, IAS, Secretary, Ministry of Coal in his address as Chief Guest expressed his great happiness and pride for being given the opportunity of attending this Seminar on Coal – 8th Coal Summit, 2023 with the theme - Sustaining Coal – Gasification Route.

He thanked Shri R. V. Shahi, Former Secretary (Power) and President of India Energy Forum for giving this opportunity to him. He felt very happy when Shri Shahi phoned him to invite him to be the Chief Guest for this event. He had the good fortune of knowing Shri Shahi since his days as Power Secretary, Government of India, when he himself was PS to the Hon'ble Minister in Government of Bihar. Shri Shahi was always of great help in resolving his problems.

This opportunity of attending the Seminar has enabled him meet very experienced people who have led the Coal Industry in the past and brought it to its current position.

He appreciated that the theme of the Seminar was very topical and very relevant to the times and in fact the country has being discussing this subject for quite some time and now, the Ministry of Coal had been give mandate to push this gasification effort. The Gasification technology, its advantages and its relevance to Indian situation have been well known. The problem in its implementation was availability of Coal. Our Coal production organisations like Coal India Ltd. and Singareni Collieries India Ltd are producing just about adequate Coal to meet 80-85 % of Coal requirement of country's Power Sector. There has been ,however a welcome changes in policy and the Coal Sector has been opened to Captive mining initially and now Commercial mining as well. In all, 125 coal blocks have been allotted so far for captive and commercial mining and these have a capacity of producing 300 MT per annum. 40 of these blocks have already come into operation and Ministry of Coal has been making efforts for expediting the clearances required for opertionalisation of the remaining mines by following up the issues with concerned State

Governments and appropriate ministries in Central Government.

Another 141 coal blocks are on offer for Auction and the bidding process for them is scheduled to be completed by 31.01.2023.These blocks would have a total production capacity 150 MT per annum so that 450 MT of additional Coal will be available – 300 MT form 125 blocks already allotted and 150 MT from the blocks which are under auction.

He was hopeful that with 450 MT of Coal becoming additionally available, the Coal availability position in the Country will improve and there would be adequate Coal available for gasification and other diverse purposes like Conversion of Coal to a Liquid and production of Methanol, Ethanol and Ammonium Nitrate.

Ministry of Coal is also in touch with NITI Aayog for framing a policy which would enable private sector participate in the Coal Gasification efforts in the country. Gasification plants are capital intensive and they also take time to get commissioned. They are therefore thinking of some financial support being made available to private sector. Exemption of Coal Gasification from the additional duty of Rs. 400 per ton may also be considered.

He expressed confidence that the deliberations at the Seminar would help the Gasification efforts and he had therefore, deputed Shri Peeyush Kumar, Coal Gasification in - charge in the Ministry to attend the Conference and identify the issues discussed which would help in ensuring the success of these efforts.

Coming to Coal availability in general, he said tha India was in a situation that its power requirement would grow by large margins in times to come . In the current year from Apr'22 to Dec'22 ,the overall power requirement has gone up by 10.5% and Thermal power has grown by more than 11%. There has been substantial increase of 16% in Coal production also , but the problem of logistics is yet to be taken care of so that coal produced can reach the consumers on time and smoothly. In this connection, Government are examining the possibility of moving coal from the East coast to West coast through Rail-cum-Sea-cum-Rail route for which the point of origin would be Paradip Port. In this connection, NTPC, Gujarat Power Generation Company and Rajasthan Power Generation Company had already issued Tender Notices for finalizing the rates.

Further, under Hon'ble Minister's Gati Shakti Programme critical connectivity issues have been identified and these are receiving focused attention of Indian Railways. While some Projects related there with have already been completed, others are in progress. These Projects when completed would give a boost to Coal production from Chhattisgarh and Odisha. Ministry of Coal was also in touch with Ministry of Chemicals & Fertilizers and Ministry of Petroleum & Natural Gas for meeting their Coal requirement for production of Methanol and Ethanol and Ammonium Nitrate, which will be used by CIL themselves.

He asserted that an enabling Environment has been created by the Hon'ble PM setting a target of gasification of 100 MT per annum by 2030. He was certain that today's deliberations would give an impetus to Gasification efforts in the country.

He once again thanked the Organisers for giving me this opportunity of addressing the participants and expressed his great happiness in inaugurating the Seminar- 8th Coal Summit, 2023 with the theme - Sustaining Coal – Gasification Route.

Shri U Kumar, **Co-Chairman, Organising Committee and Former CMD, SECL/NCL**

Shri U. Kumar, Former CMD, SECL/NCL while proposing the Vote of Thanks**,** referred to the excellent service track record of the Chief Guest, Shri Amrit Lal Meena, IAS and Secretary, Ministry of Coal. He said that Shri Meena has the rare distinction of handling the tough assignment of District Collector as many as 5 important and large distinct in Bihar. He was known to accept challenges and meeting them successfully.

He continued that that Shri Meena is now heading the Ministry of Coal which is and which is going to be full of challenges He was very confident that he would repeat the same success in meeting these challenges as he did in Bihar and thanked him profusely for having spared his very valuable time for gracing the Seminar with his august presence and inaugurating it.

He also thanked Shri R V Shahi , Former Secretary (Power) and President, India Energy Forum who has brought new purpose and vigour to the activities of India Energy Forum.

He also thanked Shri Alok Perti, IAS (Retd.) and Former Secretary (Coal) for having guided the Organization of the Seminar with his mature leadership and spontaneity in dealing with problems.

He also thanked Shri P. S. Upadhaya, Chairman MGMI, Delhi Chapter who has maintained the excellent track record of the Institute in advancing the cause of the mineral sector in India.

He also thanked all who had participated in the difficult journey of organizing the Seminar.

Most importantly, he thanked all the Guests, who had the distinction of leading Coal and Power Sectors in the country and all the Participants who had spared their valuable time for attending he Seminar and making it a great success.

Session I:
"RELEVANCE OF COAL GASIFICAITON"

Shri Naveen Jindal, Chairman, JSPL

Shri Naveen Jindal in his remarks, referred to his steel plant based on coal basification technology in Angul Odisha. He said that this plant was commissioned in2014 but when it was ready the plant had no coal for gasification and thus production of steel has all the coal blocks which allocated by Ministry of Coal for captive use were cancelled by the Hon'ble Supreme Court. This was a big setback for our plants not only to our plant but to the coal industry. The plant struggle for coal due to the shortage of coal in the country, new coal linkages were difficult to come by. However, after struggling and incurring great financial losses, things started improving as the plant got some linkages and after that Govt of India decided to allocate coal blocks for commercial mining. Now the plant has got linkages from one particular source from MCL as well as we have been allocated some coal blocks in Odisha. Indian coal being a high ash we found it difficult to gasify this coal directly and later we decided to coal washery to improve the quality of coal before the gasification. This got very good result and the plant started giving good yield.

Now Ministry of Coal under the national Coal Gasification Mission has provided incentives to coal gasifiers by allowing them to pay only 50% of payment made to Govt of India for allocation of coal block if coal from this block is used for coal gasification. Govt of India is thinking of giving further incentives of coal gasification by providing direct financial support to gasification plants as well as waiving of the Rs 400 per tonne GST cess to the coal gasifier plants.

He stated that if some successful viable plants like one in Angur which established and show the benefits particularly higher efficiency of coal gasification then other will follow in a big way. He quoted the example of installation of power plants, when the GoI and the country wanted the power generation to increase in the country at that time we went for first time in the country for 250 MW units and installed 4 units at Tamnar at Raigarh which gave very good result in the plant very quickly became to financial success to the extent that we repaid all the loans taken on the plant in one and half years as against much longer projected period. The success of this plant motivated a huge number of entreprneurs to install a large number of power plants which gave a big boost to power generation in the country.

He expressed his happiness the Govt of India under the programme of Atamnirbhar Bharat and as per the call of the Hon'ble Prime Minister to gasify 100 MT of coal by the year 2030 has decided to support the coal gasification in a big way. He was also happy that a lot of research work has been undertaken to develop indigenous Indian technology to have efficient use combustion of Indian coal through gasification. Companies like Thermax as well as IIT Delhi are doing a great work to develop gasification pilot plant on Indian technology. He said he would be that JSPL would be very keenly look forward if they can get a proper project for coal gasification and would like to invest in this new technology.

Shri M Nagaraju, Addl Secretary, Ministry of Coal

He stated that now it is fully established that India cannot do away with coal as this is the only indigenous source available with us to meet the rising energy demand of the country. Thus, he stated that we have to ensure that we use coal in a very efficient and as environmental friendly manner as possible. Technology now available through gasification route where coal can be used in a more efficient and

environment friendly manner. We can use coal through gasification in production of steel. Since coking coal is not indigenously available and has to be imported we can use non coking coal abundantly available in the country for steel production through non coking coal gasification. We can also produce variety of chemicals which at present we are importing by using syn gas obtained from coal gasification.

There are many reasons for which it has become amply necessary for us to gasify coal for energy security of the country. China and Europe are far ahead in coal gasification and we too must follow this route. We have taken large number of steps for promotion of coal gasification to fulfil the target given by the Hon'ble Prime Minister to gasify 100 MT per annum by the year 2030. Ministry of Coal, in the auction of commercial coal blocks in the first tranch, provided an incentive of 20% rebate if the coal block is used for coal gasification and it is now further enhanced to 50%. To guarantee to a particular level of IRR, Govt of India is considering to guarantee the IRR when the international price of that commodity goes up. The Government will compensate the gap. Now a separate window for linkage too has been made available for coal gasification.

Emphasis has to be given in the development of indigenous gasification technology through investment in R&D. Only two companies Thermax and BHEL are doing coal gasification pilot projects. More and more companies must have pilot projects to increase the pace of coal gasification. International Financial institutions are shying away to give loan to coal projects. Public sector companies should come together and pool their resources to set up gasification plants. CIL is now collaborating with IOL and GAIL and have three coal gasification projects coming up. NLC too is taking up lignite pilot project as lignite can be used as coal gasification. To incentivise private sector to set up pilot plants, Govt of India will provide funds for setting up pilot plants. For private sector, Government of India is proposing financial support to private sector to reduce their interest burden.

He was very hopefull that the actions taken by the GOI there will be acceleration in setting up of coal gasification plants.

Dr R R Sonde, Professor IIT Delhi, Deptt of Chemical

He stated that as per the experience of 55 years in this sector he has seen that the discussion and the projection being made to phase out coal in India are far from reality. He has been working on the numbers for energy requirements of the country as well as capacities of various sources which can contribute to the energy need. We need renewable energy as much as we can.

He stated that the India energy equation is loud and clear. India's current energy consumption is 10500 TWH (electricity form just about 1400 TWH in this!). India's energy demands expected to grow to 35000 TWH by 2050 (25trillion $ economy). Assuming that we maximise solar –wind and in that use the latest high efficiency cells (30% plus), renewable energy can meet a maximum of 9500 TWH. Nuclear can met another 3000 TWH (360 GW of nuclear power). Biomass can meet another 2000 TWH (as hydrogen and fuels)

He posed the question that how are we going to meet the balance energy needs which is 20,500 TWH (58%) and he proposed that the answer lies in coal (& some oil & gas) to meet 20500 TWH of energy if we have to secure India's energy and growth. His analysis is that coal will contribute approximately 12250 TWH in the above which is 60% of this balance energy or 35% of the total energy. This would mean India's coal consumption will go up from current 1 BT to 2.6 BT.

He emphasised that it is necessary to think of the reduction in CO_2 as coal consumption would go up from near 1 BT to 2.6 BT via gasification route. Two reasons: The coal gasification gives higher efficiency of converting coal energy to final form of energy and second, gasification by its very construction captures CO_2 and hence there is no need for a separate CO_2 capture in CCUS step.

Coal gasification is perhaps toughest in design, fabrication and operation. Complicated by India's high ash coal with moderate reaction activity (sub bituminous) and then need to operate at high pressure and manage high coal and ash flow. Systematically over few years even before the CTM project sanctioned by DST and NitiAayog, the work began to meet the above challenges. Faced several challenges and some failures on the way. We had clarity that we cannot design gasification for high ash coal assuming that we will blend high ash with low ash fuels like pet coke.

Completely indigenously developed technology specifically design for high ash Indian coal High ash content makes gasification challenging. Challenges overcome and successfully demonstrated in numerous campaigns at variety of conditions. High ash content leads to unique contaminant profiles, so that clean-upbecomes challenging (and expensive). Overcome with novel indigenous developments

Process developed jointly by Thermax and IIT Delhi and backed by state-of-the-art R&D initiatives at IIT Delhi

The pilot plant is the beginning giving us the viability of fluid bed technology with its own gas clean up system. There have been innovations which have gone into this concept, design, engineering, installations and operation.

Next critical steps: Scale up to a size to a commercial level with VGF –viability gap funding mechanism put in place. Government of India has already declared such VGF for gasification technology. Technology improvement based on continuous pilot plant campaigns and also doing optimization studies. Many laboratories need to be part of this continuous improvement and building the vast network of suppliers of components and catalysts. Integrate it with a CCUS –CPO2 capture and utilization and storage technology. Capture is already a part of the technology and need to be now taken to it conversion or storage or use it as CBM. Coal to hydrogen (blue hydrogen) is the next step and we are working on the same.

He concluded that India needs to leap frog in meeting its energy demands while securing all its energy needs and also do it responsibly to meet climate change obligations. What is presented above is just a first step-and renaissance-and we are confident that this will multiply in the coming years to meet the target of 100 million TPD coal gasification. All round collaboration is the need of the hour to further improve the technology and also bring many new concepts in gasification and CO2 capture. CSIR –IMMT hopefully will be a leading partner in this journey!

Shri S Prabhakar, **GM, BHEL**

He stated that BHEL has been working on India's energy transition and challenges. BHEL's contribution to thermal power plant equipment manufacturing in the past six decades has made the nation self-reliant. 57%+ of the established domestic coal-based thermal power capacity is based on BHEL state-of-the-art technologies equipment. Reserves of 300+ Billion tonnes of coal and yet country's dependence on expensive imported natural gas for fertilisers and chemicals is there. Thus, we have to find new imperative to ensure self-reliance & security in raw material for Chemicals. We need to shift away from Imported Natural gas to available Indigenous Coal through gasification route.

He gave details of 6.2 MW PFBG Plant at BHEL, Trichy. Seed funding was provided by USAID and co-sponsors were BHEL and PETC-USA. Commissioning was done in 1997. Operating pressure and temperature was 12 kg/cm2,1100 °c respectively. Coal used was 168 tpd. Syngas generation was 450 tpd and Gas calorific value was 1200 kcal / nm3.

He quotated the comments of Padma Bhushan Dr S K Saraswat , Member, NITI Aayog on the 0.25 TPD Coal to methanol pilot plant at BHEL, Corporate R&D Hyderabad.

"Extrmely happy to witness India's First Indigenous Developed 0.25 TPD Coal to methanol pilot plant producing methanol with puri 99.2% at BHEL, Corporate R&D Hyderbad. The project was funded

by India's DST on the initiatives of Niti Aayog, PMO and Coal Ministry."

He summarised that high-end chemicals are either produced from Imported Natural Gas or directly imported. Coal gasification process would lead to production of these chemicals & result in self-reliance. More than 10K hours Operational experience of in-house designed PFBG Gasifiers is available with BHEL.

BHEL is fully geared up to design and manufacture commercial coal gasification projects, aligning with the Hon'ble Prime Minister of India's vision of 'Aatma-Nirbhar Bharat' and would be willing to promote the design and manufacture of commercial coal gasifying plants with support of the industry.

Shri Asheesh Kumar, Chief Manager (Mining), CMPDIL

At the very outset, he gave details of **R&D** activities in development of indigenous technology for gasification of high ash indian coal in India **and gave details of the following plants:**

- IICT, Hyderabad: 24 te of coal/day Fixed Bed Lurgi Gasifier commissioned in 1983.Coals tested from Vardha Valley , Raniganj, Singrouli, North karanpura and Neyveli Lignite.

- BHEL, Trichy: 162 te of coal/day Fluidized Bed Lurgi Gasifier integrated with 6.3 MW IGCC Electric Power Generating facility. Work on IGCC development in India was taken up by BHEL in early eighties.
- CIMFR, Dhanbad- Developed 1.5 TPD Oxygen Enriched Pressurized Fluidized Bed Gasifier (PFBG)
- EIL/BPCL/Thermax – Pilot Gasification Plant-Fluidized Bed

He also gave the following details of the supports being provided by the Ministry of Coal to promote coal gasification in the country.

- The Ministry of Coal has formed a new coal-linkage policy for coal gasification projects
- Production of Syn-Gas from coal gasification to be considered as a subsector of Non-Regulated Sector (NRS)
- Policy for concessions of 50% in revenue share for commercial auction of coal blocks has also been introduced.
- PLI scheme for surface coal gasification project is also being prepared in consultation with different stakeholders

He also prescribed the the following projects in the pipelines:

- Talcher Fertilizer Ltd.,A Joint Venture of CIL, GAIL ,RCF and FCIL is establishing a new coal gasification-based Fertilizer Complex at Talcher.
- CIL planned to establish a Coal to Chemical project at ECL,SECL &WCL

He talked about three major projects being implemented by Coal India Ltd.

UTKARSH at WCL with production of Ammonium Nitrate Melt (0.66 MMTPA) using 0.78 MMTPA coal.

SHILPANCHAL at ECL where product is Methanol (0.66 MMTPA) using 1.35 MMTPA coal.

MAHAMAYA at SECL where product is Ammonia (0.72 MMTPA) using 1.35 MMTPA.

He did a SWOT Analysis of the potential of production of chemicals through coal gasification.

Strengths

- Availability of substantial resource of coal SECL Chattisgarh in Korea Riva coalfield and ECL in West Bengal has reserve of high quality low ash coal.
- Availablity of the proven Surface coal gasification technology for good quality coal (with low ash upto 25% ash coal
- CO2 Capture is easy
-

Weakness

- Most of the coal available in the country is High ash content coal.

- Syn gas produced from gasification cannot be transported to a higher distance and must have end use plant close by.
- New area for Coal Companies
- GHGs emission
- Expensive CUS technology

Opportunties

- urgent need to use the coal for alternative purposes due to environmental concern
- Coal projects with evacuation constraint will prefer to setup pit head SCG plants.
- Coal gasification can be a forex saver option to meet the future requirement of chemicals in the country.

Threats

- Competitive Dynamics
- Price War
- Regulatory environment Changes
- Geo Political situations in some Markets

He talked about insitu underground coal gasification projects which are deep seated and economically unviable to work through conventional means. Underground gasification have been tried since last 50-60 years. Many countries opened many projects but generally they did not meet any viable success. However, some projects are still in operation such as Angren (USSR) since 1961, Alberta (Canada) since 2021, Leigh Creek, (South Australia) since 2018 and Majuba (South Africa) since 2007.

He talk also of the Indian efforts in UCG in the past. Vastan Lignite Block (Surat) project of ONGC with GIPCL. Project could not be started and Allotment of Block was cancelled; Merta Road Lignite Block (Rajasthan) of CIL - The project could not be pursued further on apprehension of contamination of ground water; Lignite Blocks viz. Dipside Tadkeshwar & Dungra, Dipside of Valia & Rajpardi (Gujarat) of NLC - Tender was floated for selection of Technology Provider for Technical Feasibility & UCG Pilot Study but could not be finalised;

However, only one project is still under consideration. Kasta (West) Coal Block (ECL), Raniganj Cf of CIL - Discussions with Technical Service providers are underway.

He however stated that CMPDI is still working on the underground coal gasification with the hope that with this technology can be made successful with further efforts.

Shri Rajeev Mathur, Former ED, GAIL

He thanked all the panellists for making excellent presentation through which the relevance of coal gasification in Indian context was fully established and for sustaining future for coal, coal gasification is the right answer.

Mr Navin Jindal, Chairman of the Session, in his opening remarks stated that he has been in this field for past over 20 years trying to gasifying high ash Indian coal and establish gasying unit based on important technology for steel plant in Angul in Odisha. This plant faced a lot of problems particularly of coal supply and also on the technological front. However, now he is getting Coal from MCL for one dedicated source and as well as technological breakthrough for using washed coal. Mr Jindal also appreciated the efforts of the government to provide lot of incentives for coal gasificaion, MoC is also thinking of further incentives. He thanked Mr Jindal for introducing the subject very aptly for the Panelists to take it up further.

Mr Nagaraju gave the current policy of Ministry of Coal which is promoting the coal gasification in a very encouraging and positive manner. Mr Nagaraju emphasised the importance of India's energy security which is so much dependence on the only energy source that is coal in the country. Mr Nagaraju also spoke of the challenges being faced by the coal industry as bank loans are not avialble for coal projects to take off. Mr Nagaraju has emphasised that we have to find the ways and means of indigenous financial support for coal gasification plant. In that direction, MoC also giving all incentives including financial incentives for public and private sector. He thanked Mr Nagaraju for the very encouraging and informative address.

Dr Sonde very clearly emphasised that taking the future energy needs of the country, the coal has to stay. Even the best efforts of making the full potential efforts of renewable energy will not be possible for solar, wind and hydro sources of renewable energy country's demand. Thus, coal will be there for many decades to come. Dr Sonde said since the coal production of the country will rise 2.6 times from the present level by the 2050 and thus to his mind the only way to sustain this higher production is by gasification of coal.

Shri Prabhakar informed the work being done by BHEL for promoting indigenous technology for coal gasification at its 6.2 MW PFBG Plant at Trichy. He also informed about BHEL research work at its 0.25 TPD Coal to methanol pilot plant at BHEL, Corporate R&D Hyderabad. He appreciated the work been done BHEL at its R&D Centre.

Mr Asheesh Kumar informed that CIL is seriously pursuing the 3 coal gasification projects namely WCL, SECL and ECL where bids have been called for production of Ammonia Nitrate, Methanol and Ammonia respectively.

He also gave the present status of UCG globally as well as in India.

Mr Mathur thanked all the learnt panellists for making such informative presentation and Mr Jindal the chairman of the Session and august audience which very patiently with apt attention listen to the presentations.

Session II: International Status & Indian Updates

Shri Alok Perti - Session Chairman : During last couple of years two major shocks, the Covid 19 and the Ukraine war has resulted in Global energy market in a total disarray and there is a major rethink as to what should be the future energy mix Globally, going forward. It is also realized that one cannot do away completely with fossil fuel as the recent developments in major European Countries are forced to reopen some closed coal mines. As far as

India is concerned, we cannot wish away utilizing our coal for next few decades before it can be slowly phased out. Our way forward is gradual increase of using renewal energy while utilizing the thermal and chemical properties of coal to harness our vast natural resources and coal gasification is the right way forward to achieve our objective of net zero emissions.

Shri Sunjoy Joshi- Chairman ORF: The decade of twenties has turned out to be a decade of uncertainty due to Covid and the Ukraine war and even the most rich and powerful countries experienced scarcity something unknown to them. The myth that arrow of time only moves forward was shattered as the arrow really moved backwards resulting in de-growth in Global economy.

Today, globally about 40 million people have no access to energy and food and this situation cannot be allowed to continue. We cannot accept the developed world expecting the developing countries cut down use of fossil fuel while they continue to consume more and more energy at the cost of greenhouse emissions. This is not the way to achieve the net zero goal. India's focus on Coal gasification is very significant and need to be pursued in focused way.

Dr A K Balyan, Secretary General, Coal Gasifies Association of India (CGAI)

Dr Balyan dwelt upon future of coal globally , the surface coal gasification ,advantages of coal gasification technology , important mile stones in coal gasification in India, recent developments and project initiatives . He also listed out suggestions by Coal Gasification Association of India to Ministry of Coal for encouraging the coal gasification in India. He urged upon all stakeholders to join and contribute in the efforts of CGAI.

Dr Mahesh Murthy, CTO Thermax Ltd.

Dr Murthy made a presentation on "Indigenous coal to Chemical Technology: Enabling India's 100 MT Coal Gasification by 2030 Aspiration "Coal is here to stay despite India's ambitious goals for renewables and with rising environmental concerns gasification of coal for its sustainable use is inevitable. Fluidized bed technology is most suitable for high ash Indian coal and Thermax has successfully developed Gen-3 design after a decade of efforts.

First batch of Methanol produced at Thermax Gen 3 pilot plant in Pune in February 2022, through indigenously developed end to end demonstration plant of 1tpd coal to methanol plant. Now light House scale 1500-3000 TPA plant is critical to move forward.

Dr Sujay Karmakar, GM-Green Chemical, NTPC Vindyachal

Through a presentation on NTPC efforts on CCUS technologies in thermal generation Shri Karmakar elaborated on NTPC's efforts for IGCC for high ash Indian coal both with International and Indian efforts culminating in pilot plant testing and analysis of available data. He further stated that for decoupling economic growth from GHG emission greening of coal is necessary and very importantly NTPC has taken step towards 10 tpd CCU project and keeping provision for 40% reduction of CO_2 intensity from all its coal based plants.

Shri Anil Kumar Jha, Chairman, JPL & Session Co-Chairman:

Shri Jha complimented the organizers for organizing a conference on such an important subject like coal gasification and brilliant presentations by the distinguished speakers. He further stated that it has been unambiguously concluded during the conference that future of coal lies in gasification and thanked the Government of the day for very important initiatives to promote coal gasification on a Mission mode.

PANEL DISCUSSION

Shri Anil Razdan IAS (Retd), Former Secretary, Ministry of Power – Chairman

After Inaugural Session followed by two Technical Sessions Shri Razdan appropriately highlighted the approach India needs to adopt during the Panel Discussions in which Rajiv Agarwal from IEL & Kapil Dhagat from JSPL also participated.

Shri Anil Razdan highlighted that per capita power consumption of India is one third of Global average. With the growing economy of our country, India should be in top 3 to 5 in per capita power consumption. We do hope to achieve the same. India not only has huge coal resources for power sector, it is also playing an important role in economic growth of the country by its contributions in various ways such as taxes, cesses etc. Coal industry contributes financial health of Railways by subsiding passenger rail fare from high rail freight on goods, specially coal freight which contributes substantially due it huge volume of moving coal by rail across the country.

Developed countries have done more damages to Global warming than India but the entire world has face this catastrophic. India, however, has limited options and has to find its own solutions. Mr Razdan highlighted three major concerns:

- Man to land ratio is rather very poor
- Financial resources per capita are limited.
- We have lot of diverse resources like Solar, Wind, Coastal etc but not fully tapped.

Further India has limited Petroleum-NG resources and has to import 80% of its Consumption. Further there is lot of price volatility especially in the present situation due to war between Russia and Ukraine.

India has good Hydro potentials but we have mainly been focusing in Run of River Hydro potentials. This was primarily due to young Himalayas with soft rocks compared to Deçan Palateu. Developing Hydro projects from NE to J&K not only has long gestation period but is capital intensive also. Our present experience in Joshimath, Uttrakhand has given the signals of devastating impact may be there and so not to be depended upon.

Keeping this in view IEF started to work on natural gas based economy but now with Global uncertainties and price volatility in Gas and oil sector in Today's deliberations we need to develop our own strategies. We are not only to focus on carbon capture but for carbon neutralization. So I am glad that now Coal to gasification option is being looked into.

Dr Sonde at the very outset stressed that we are not for carbon capture alone but for its utilization like coal to gas along with appropriate technology for use of intermediate products and capture entire value chain for economic advantage.

In oil sector, nothing goes as a waste product and same should apply to coal. Sun which is not only meant of light but for energy also? Similarly, coal is not for burning alone. Coal is not only gold but a diamond for its full value chain as such each bit of coal and products, out of it need to used.

Mr Rajiv Agarwal from EIL agreed with the views of Mr Anil Razdan and repeated further again that 55% source of energy is from coal and rest from oil, gas followed RE. Energy from oil and gas is always

price sensitive and so we need to self-reliant. Our Prime Minister has given a clarion call for gasification of 100 million tonnes of coal annually and high powered committee have been set up. EIL along with NLC are doing feasibility study production of Methanol, NG etc. IEL has also done some study for gasification to set up Pilot Plant along with Thermax. Thermax also has further developed and set up Pilot plant in Pune with even better version. EIL is also working on coal gasification to Hydrogen. Ministry of Coal and Industry need to get involved as clean coal technology has lot of future. There are challenges due to high ash Indian coal and so we have to find our ways to develop our own technology. We need to set up commercial plant and someone has to spend money so it need to take up by MoC and Industry.

Build Own and Operate (BOO) made is one of the possibility for the generation Hydrogen for use from refineries on the basis of transitional stage as one of the options.

Mr Anil Razdan was of the view that coal is not only for burning also and produce power out of it etc., the ash produced by burning coal is not a waste but has to be put to VARIOUS uses as it is residue. Instead of using top soil for filling purposes of low lying areas or road making and instead spoiling the top soil coal ash need to re-used.

Mr Kapil Dhagat from JSPL stated that for

integrated steel plant we need Oxygen, use of coal power (for captive use) high ash so produced for back till of its captive open-cast, coal mines, for building material, high ash coal is washed to 30/35 ash & washed coal is used for gasifying, middling and rejects for power plant so almost entire coal and ash is used for various other uses.

Mr Kapil Dhagat further highlighted that with the expected production of 920 million tonnes in 2022-23 (700 from CIL and 120 from captive may be100 million by from SCCL). We can see reduction in import component of coal and so in next 2 or 3 years surplus coal should be made available for research work for effective use of coal in gasification and with further encouragement in giving rebate in taxes by State Govt gasification from coal shall become affordable etc.

Mr Anil Razdan also proposed to look with possibilities of in-situ coal gasification and for that India need develop its own technology and not follow other countries.

Valedictory Session

Shri C K Mishra IAS (Retd), Former Secretary, MoEF&CC

He said this topic of use of coal must have been agitating our mind and about two years back of the issue for increase in production of coal but as Secretary, MoEF&CC. I should be thinking of reduction in production of coal.

But after rethinking I thought to do better analysis what we cannot do away then we need to find out better option and so analysis again. How do we better things from here such as

- Energy transition to RE etc.
- Sustainability – talk of it in every aspects as we are now catching on reality.
- Climate change is a real so business not usual as in the international context climate change is here. Where globle stand and where India stands today? World is not giving us money so we cannot adopt new technology cannot be accepted now. Each country has to deal in its own way.

  Each country has to deal in its own way, Paris COP24 every country made commitment but every one kept on changing. India has also been talking and change has only been in english. Coal is a burning issue but how much you want to burn. CIL has targeted 2 Billion

Tonnes by 2040. Looking at every aspect from the lens of our own requirement for India coal shall remain main source of energy for many years. India talks of responsive growth and so no coal to better coal for India is an option. So India needs coal and shall use the same. Global goal on energy transition is plus 95% RE and not from one source of power. Transition is wholistic issue. We need to plan what exactly we have. Gasification of coal is accepted by everyone as critical but India is not yet ready to adopt it due to its high ash in Indian coals and we are not in that mission mode as of now and we see in it an answer but we cannot follow. Washing of coal have gone back we claim we are very good in technology but we say Government takes long time in accepting or adopting technology. Public and private compete in delays. I see no sense of urgency in R&D work and no coal to better than use of better coal.

Coal gasification – liquification be used for transport fuel and cooking fuel & insulate India from speculation of international crude / gas price etc. Energy conversion through gasification is better route. We know but we don't move forward. Now hydrogen debate and so discussion in different direction. In auto industry we moved from BSIV to BSVI made all adjustments in this sector and now EV and then hydrogen and so on. What to follow with cost of green hydrogen is going to be very high. Coal to gasification to hydrogen may be cheaper option.

Decarbonisation is the final answer where green hydrogen cost effective and there is no emission of carbon. Only one guiding factor – is seen and one tool i.e. handling of climate change our target. Public private sector need to put in money to move forward for use of coal from better to much better use. It is pertinent to note that this conference on Gasification of Coal should meet our needs.

Panel Discussion on DSM Regulations, 2022 On 7th February 2023

A Panel Discussion (virtual) was organized by India Energy Forum on CERC's DSM Regulations,2022 on 7th February,2023 in virtual mode. Shri Sushant Chatterjee, Chief (Regulatory Affairs), CERC, Shri S.C. Saxena, ED, NLDC and Shri BB Mehta, Director, Orissa SLDC and EX-Chief Engineer, Gujarat SLDC were the Panellists. Shri Rakesh Nath and Shri BP Singh were the moderators. About 100 persons participated. Its summary of the proceedings and Recommendations are given below:

1. Shri Rakesh Nath gave a brief background of the subject (a note had been circulated in advance). The frequency profile of the regional grids prior to introduction of UI mechanism in 2002 was extremely poor. CERC notified the UI Regulations,2009 with the objective of maintaining grid discipline through commercial mechanism. The UI charges were linked to grid frequency. These regulations had inbuilt financial incentives to users to provide grid support during high and low frequency and disincentives for deviations from schedule which were detrimental to maintaining frequency. The UI mechanism brought a dramatic improvement in the frequency regime of the regional grids.

2. CERC notified DSM Regulations,2014 with the objectives to maintain grid discipline and grid security through control mechanism for settlement of deviations from schedule by the users. The deviation charge was linked to grid frequency (zero at 50.05 Hz and 824 p/kWh at 49.7 Hz). These regulations were amended on five occasions from 2014 to 2019. By 4th amendment in 2018, the deviation charge was linked to price discovered in Day Ahead Market (DAM) for the time block along with the grid frequency. In the 5th amendment notified in the year 2019, a sign change rule was introduced under which in every 7th block the sign of deviation was required to be changed or maintained within tolerance band of +/- 20 MW

and failure to do so attracted an additional charge.

3. The frequency regime of the grid improved considerably over the years. The frequency spectrum of the National Grid from FY 2018-19 to 2021-22 reveals that frequency was maintained between 49.90 to 50.05 HZ for about 75% of total time and for only 5-7% of total time was below 49.9 Hz and for 15-20% above 50.05 Hz.

4. In DSM Regulations,2022 made effective from 5.12.2022, drastic changes have been made. The deviation charge has been delinked from frequency. Any deviation is required to be managed by the NLDC/RLDCs as per Ancillary Services Regulations and the users are required to pay the deviation charges for deviation in injection/drawl linked to the weighted average ancillary services charges. However, for one year or such time as may be notified by the CERC, the deviation charges would be linked to the highest of the weighted average ACP of Day Ahead Market segments or weighted average ACP of Real Time Market segment or weighted average Ancillary Service Charge of all regions for that time block.

5. As a result of implementation of the DSM Regulations,2022, the users have been subjected to very high deviation charges, sometimes as high as Rs 40 per kWh. Some generating companies in the normal course of providing mandatory primary regulation of frequency through automatic governor action as per the provisions of IEGC are getting penalized and are indulging in manual interventions to minimize the penalty which was detrimental to the grid security. The objective of correcting the deviations by users through ancillary services market has not worked due to limited liquidity of reserves in the grid. The frequency regime, on the other hand, deteriorated. CERC reviewed the situation and by Suo-Motu orders dated 26.12.2022 and imposed a ceiling on deviation charge. However, the situation did not improve. CERC again reviewed the situation and by order dated 6.2.2023 made some course correction by exercising its powers to amend and remove difficulties by delinking deviation charge to ancillary service charge, relaxing the operating band for sellers and additional clauses for users for conditions when frequency is below 49.95 Hz or above 50.05 Hz to incentivize them to assist in maintaining grid frequency. It has also been decided to constitute an expert committee to go into detail the causes of inadequate primary and secondary response and suggest remedial measures. It has also been decided to roll out Tertiary Reserve Ancillary Service (“TRAS”).

PANEL DISCUSSION

6. Shri RV Shahi, President, IEF stated that the variation in frequency after implementation of the new DSM Regulations was a cause of concern. Though CERC has been quick in responding and making some course correction the desired results could not be achieved. The improvement in frequency regime had been brought about after introducing the UI mechanism and further refining it in 2014 regulations to frequency linked DSM mechanism. Any change in the system which had been working well should have been made after making all preparations and taking into consideration the ground realities.

7. Shri Sushant Chatterjee after a disclaimer that the views expressed by him were his own and not that of the Commission, explained that the users plan their schedules a day in advance based on their anticipated load and availability of resources. The deviations are bound to take place during the course of the day due to variation in actual load and generation but the same have to be made good from an organized market. The objective of revisiting the DSM Regulations was to give a strong message to the stakeholders not lean on the grid to meet their energy requirements and meet the deviations from schedule through organized Real Time Market and Ancillary Service Market. The revised regulations have cajoled the stakeholders from their comfort zone and hence the objection. However, the regulations may not be perfect and their refinement is an evolving process. The CERC is closely monitoring the situation and has also made interventions and issued interim orders making some

modifications in the regulations. The Commission has also decided to constitute a high-level committee of experts to examine the issues and make recommendations. The control area for schedule and dispatch according to IEGC is a State and each State is required to take care of its deviations and control area error in real time. The DSM Regulations,2022 address to correct the regional deviations only as legally it is not permissible for the Central Commission to include the intra-State reserves in its regulations. At the same time, it cannot wait indefinitely for development of intra-State ancillary services market. However, efforts are being made through Forum of Regulators to develop intra-state RTM and ancillary services market.

8. Shri SC Saxena, ED, NLDC explained that the system has been operating satisfactorily since 2018 after several modifications made from time to time since 2014. DSM Regulations 2022 has brought about significant changes as it envisages deinking frequency from deviation settlement mechanism. Many essential steps and preparation need to be done before it can be implemented. Resource adequacy was a pre-requisite for reliance on ancillary services alone to meet the deviations. Adequate reserves are presently not available in our system. He was of the opinion that frequency was an essential common signal and delinking the same at this stage in DSM mechanism was not desirable. Due to deinking of frequency the passive control that was available to the system in the previous regulations is also now absent. There were wide variations in frequency within a time bock of 15 minutes which made the task of deploying reserve through ancillary service by the system operators difficult. He stated that frequency was still used by some advanced countries in their deviation settlement mechanism even though they have achieved resource adequacy. In fact, South African system control team studied the Indian DSM which was linked to frequency and adopted a similar system. In our case, frequency linkage should continue even after adequacy is achieved. He said that deviations should be inadvertent only. The need for sign change regulations where the users ensure sign change in deviation within the specified time blocks was with the intent to ensure that deviations are truly inadvertent and utilities do not stray far from the schedules.

9. Shri BB Mehta, Orissa SLDC, explained the difficulties in controlling deviations from scheduled drawal due to large consumers having variable loads, lack of reserve capacity and large operating range permissible to solar and wind resources under the regulations. The State had been subjected to huge deviation charges consequent to implementation of the new DSM regulations for deviations from drawal schedule which were beyond their control. He endorsed the suggestion for frequency signal as an input in the DSM and need for sign change regulations to discourage advertent deviation.

10. In the QA session a number of suggestions were given by the participants. The general feeling was that the power system was operating satisfactorily with the DSM Regulations,2014 and any change with the objective for bringing further improvement should have been done after taking into consideration the ground realities and inputs given by the system operators and after making necessary preparations.

CONCLUSION AND RECOMMENDATIONS

11. The conclusion and recommendations considering the views expressed by the panelists and some of the participants are as under:

    i. The record of the operating parameters since the year 2018-19 indicates that the power system was operating satisfactorily and no major problem was being faced which necessitated drastic changes in the DSM regulations. The system is not yet ready for the changes introduced in the DSM Regulations,2022.

    ii. Frequency still remains an important input in DSM to get passive assistance from available resources and should continue even when adequacy is achieved.

iii. Sign change requirement would help in discouraging advertent deviations and tendency to lean on grid to meet energy deficit.

iv. State Electricity Regulators have to introduce regulations to ensure resource adequacy, including reserves and development of ancillary services in the State to keep area control error within limits.

v. The DSM Regulations,2022, need to be reviewed thoroughly based on the experience gained since their implementation in consultation with all stakeholders. Input from system operators is very important and should be given due consideration to keep the ground realities and constraints in view before making any modifications in the DSM regulations.

vi. It is suggested that the Expert Committee constituted by CERC may hold consultation with the stakeholders including experts having domain knowledge and accordingly its terms of reference may include such consultative process.

vii. The Commission after reviewing the impact of the interim arrangements directed by its recent order may consider to keep the DSM Regulations,2022 in abeyance and restore the earlier DSM mechanism till a modified system is devised.

Panel Discussion on "MoP Draft Guidelines to promote Development of Pump Storage Projects in the Country "on Monday, 27th February 2023

A virtual Panel Discussion was organized by IEF on MoP Draft Guidelines to promote Developmentof Pump Storage Projects in the Country" on 27th February 2023. The Distinguished Panelists were Shri Ajay Shankar, Former Secretary, Govt of India; Shri Rakesh Nath, Former Chairperson, CEA; and Shri Anil Sardana, MD & CEO, Adani Transmission. While the welcome address was given by Shri H L Bajaj, Chairman, Power Group, IEF, the Presidential Address was given by Shri R V Shahi, President, IEF. The comments/ recommendations emerge during the discussion were submitted to the Secretary, Ministry of Power. The same are given below:

General

1. IEF welcomes the initiative by the Ministry of Power for promotion of Pumped Storage Projects as accelerated development of PSPs is a priority to meet the national targets of decarbonization.

2. Out of 4.7 GW existing installed capacity of PSP about 1/3rd capacity is operating satisfactorily in pumped storage mode round the year, about 1/3rd capacity is operating intermittently and the balance capacity is not in use due to certain constraints. Three pumped storage projects have been under construction out of which two (Tehri PSP of THDC and Kundah project of TANGEDCO) have been delayed inordinately. There is also a success story of execution and operation of Purulia PSP (900 MW). The information related to these success stories and reasons for non-operation / partial operation of existing PSPs and delays in execution should be available with CEA. It is suggested that the guidelines should adopt good points from the success stories and address the issues faced in non-operational or delayed projects and take into account these learnings for the new projects.

<u>Allotment of project sites (para 3.1)</u>

3. It has been proposed to allot project sites to CPSUs and State PSUs on nomination basis for prompt development and to private sector through competitive bidding. GoI vide order dated 8.12.2022 has indicated identified PSP sites with total installed capacity of about 70 GW against CPSUs. Earmarking more than 70% identified potential of PSPs of the country for development by CPSUs is not advisable. It is

suggested that the same norms of allotment namely, through competitive bidding, should be used for both public and private sector. If some projects of strategic importance are allotted to CPSU/PSUs on nomination basis, it should be done with a commitment of date of commissioning, expected completed cost, efficiency of plants and identified conditions precedents to be completed in the specified time schedule.

4. Projects should be allotted through tariff based competitive bidding based on annual fixed charges, availability of project and plant efficiency on the tested and tried UMPP model used in the past for development of thermal projects where a SPV is created by PFC or REC for pre-construction activities such as preparation of project report, land acquisition, environment and forest clearance, etc, and carrying out the bidding process and finally the SPV is transferred to the successful bidder at a price to cover the expenses incurred by the SPV. To facilitate this, the MoP may prepare the bidding documents and identify through CEA off-riverine sites in Western Region and Southern Region where the geology is not fragile and environmental impact of

   the project is minimal. A few projects may be initiated by SPVs of REC/PFC under an initiative of MoP. The States should also be encouraged to develop projects through TBCB.

5. PSPs may also be required to be developed as industrial activity for commercial and industrial consumers by developers who may be allotted project sites with home State having right of first refusal up to 40% of project capacity through competitive bidding on the basis of fixed charges for project capacity offered to home state and availability and efficiency of the plant. The balance capacity may be used by the developer for commercial & industrial consumers or for blending with other RE capacities to bid against RE-RTC tenders or requirements.

   <u>Charges to be paid by developers and cancelation of project (para 3.2)</u>

6. The proposal for no upfront premium to be charged by State Government is welcome and the States need to be persuaded to declare their policy in this regard.

7. The time period of 2 years provided to begin construction by the developer after allotment of site is too short for preparation of project report and obtaining environment & forest clearance and concurrence of CEA under section 8 of the Act. The period may be fixed on realistic basis after taking necessary measures to simplify and reduce the time taken in the process of obtaining these statutory clearances.

   <u>Benchmark Cost of Storage (Para 3.4)</u>

8. It has been proposed that only viable projects are taken up for construction u/s 62 of the Electricity Act,2003, the Central Government may notify the benchmark cost of storage for investment decision of CPSUs. It is suggested that the provision of notification of benchmark price by the Central Government may be deleted and the decision to develop a project may be left to the developers, the buyers and the Appropriate Commission as per the provisions of the Act.

   <u>Taxes & Duties (Para 3.5)</u>

9. It has been proposed that the State Government should consider reimbursement of SGST on hydropower project components and exempt off-river PSPs from payment of stamp duty and registration fee. Also, PSP may be suitably considered to avoid double taxation. It is suggested that a separate category may be created for PSP for taxation purpose as PSPs are essentially required for integration of large RE capacity targeted to meet our national goals for decarbonization.

10. Another issue that may be faced based on the past experience of industry is that the State utilities and State Commissions may consider the energy procured for pumping by PSP to cause storage of water as non-generation activity. This aspect be clarified in policy as a generation activity and should not be subjected to Cross Subsidy surcharge and/or Additional Surcharge. The electrical energy used for pumping operation at PSP is not consumed by

industry but is converted into potential energy and stored and re-used during high load or peak hours and should not be subjected to surcharge and additional surcharge by the distribution licensee. Necessary clarification may be provided by MoP in the guidelines and the Tariff Policy.

Exemption from free power and local area development fund (Paras 3.6& 3.7)

11. The proposal to exempt PSP from free power obligation and local area development fund is welcome.

Utilization of exhausted mines to develop PSPs (Para 4.1)

12. It is suggested that the developer of the mines or those willing to rehabilitate such areas, may be allowed to develop PSPs on the exhausted mines and use capacity for own captive use or sell capacity to distribution licensees u/s 62 or sell capacity and energy in the market place.

13. The period of ISTS benefits for input RE power as well as Output from PSP shall be aligned similar to recently issued policy on Hydro development.

14. To further encourage setting up of PSP, if a developer enters into PPA to supply power to a group of industrial and commercial consumers, through a composite arrangement of Conventional, Renewable Power and PSP to facilitate full supply, and consumers do not have to depend on Discom for supply of power, there should be no obligation of Open Access Surcharge or Additional Surcharge in such cases.

15. The water share in reservoir catering to more than one state shouldn't be an impediment to developing PSP (using one of such reservoirs), as long as share of water of state is either agreed by specific state or else no consumptive water is drawn from such a reservoir and only buffer storage capacity is put to use by PSP.

12th Nuclear Energy Conclave
2nd March 2023

The 12th Nuclear Energy Conclave on "Role of Nuclear Energy in Achieving Net-zero Energy Mix" was held on 2nd March 2023 in Hotel Samrat, New Delhi.

More than 100 delegates attended. All units of DAE, Niti Ayog, representatives from a wide spectrum of manufacturing industry, NPCIL, EDF, Rosatom, and Nuclear Councillors of French & Russian Embassies attended the conclave. Sh. KN Vyas Secretary, DAE was the chief guest. CMD NTPC also graced the occasion.

A brief report is given below.

The programme was moderated by Sh. SM Mahajan, Former ED/ BHEL and Convenor, Nuclear Energy Group, India Energy Forum.

Sh SM Mahajan welcomed all invitees, speakers, delegates, etc. to the Conclave. He mentioned that the Conclave is fully supported by the Department. Of Atomic Energy and the Manufacturing Industry. The plans to add nuclear power capacity through various technologies and the preparedness of the Indian manufacturing industry to meet the increasing demand will be discussed

Dr. RB Grover, Member AEC and Chairman of NEG-IEF touched upon the role that has to be played by nuclear energy in achieving a net zero energy mix by 2070 to set the context of the conclave. He shared the information that at the end of 2022, there were 438 commercial nuclear power plants in operation in 33 countries. Installed capacity rose from 388.6 GW at the end of 2022 to 393.6 GW, an increase of slightly more than 1.2%. Nuclear energy remained the second largest source of clean electricity after hydroelectric power accounting for 10% of global electricity production.

Globally, low-carbon sources having significant shares in the electricity mix are hydro (~15%), nuclear (~10%), wind (~6.7%), and solar (~3.5%), and all are being used to produce electricity. To decarbonize the energy sector, India has to go in for massive electrification. Estimates by DAE indicate that for a highly developed India (that is for having an HDI above 0.9), per capita electricity availability must be of the order of 16,000 kWh. Assuming a population of 1.5 billion in 2070, this translates to a total generation of 24,000 TWh per annum. About 60 to 70% of this will be used as electricity and the rest for the generation of hydrogen by electrolyzers. The total generation by utilities and captive power plants in the last fiscal year was about 1600 TWh and it may rise to 1700 TWh this year.

Touching on the Nuclear generation in India, he recalled that, at the start of the nuclear power programme, India opted for PHWR technology and that continues to be the mainstay of its nuclear power programme. At present, India is constructing several 700 MW PHWRs and as an addition to the ongoing PHWR programme, India decided to go in for large light water reactors, and NPCIL is operating two large reactors set up in collaboration with Russia, and 4 more are under construction. NPCIL is negotiating with vendors from other countries specifically with France and the USA. Further, BARC is working to design and develop a small modular reactor. To reach a net zero energy mix, these efforts are not enough. Nuclear needs to grow faster and faster. NTPC is also looking at setting up nuclear power plants.

In January this year, the Government of India announced the National Hydrogen Mission with the aim to develop a green hydrogen production capacity of at least 5 million metric tonnes per annum with an associated renewable energy capacity addition of 125 GW in the country. The annual requirement of hydrogen in India in 2070 will be many times more, maybe anywhere between 110 to 180 million metric tonnes. The amount that can be produced by other means such as from biomass or waste is nowhere near this number and the only way to produce low-carbon hydrogen is to deploy nuclear for this purpose.

The need to use nuclear electricity to produce hydrogen has been realized by other countries. On 13 February, the European Commission published rules that could allow hydrogen produced by nuclear electricity to count towards EU clean energy goals. However, in a debate to promote clean hydrogen produced by nuclear, the EU is a divided house. While some nations led by France favour it, Germany and Spain are opposing it.

It is reported that the UK government is examining a proposal to give nuclear power projects a green status enabling it to be included in the country's green taxonomy. The move is expected to be announced in the coming weeks and will support investments in the proposed nuclear projects across the UK.

In his Concluding remarks, Dr. Grover emphasized the need for aligning near-term policies with long-term decarbonization goals, nurturing all low-carbon technologies and providing them with a level playing field, using electrolyzers for producing hydrogen and also for providing dispatchable load, and carrying out life cycle energy flow analysis of all technologies for a better understanding.

Sh KN Vyas, Chairman AEC and Secretary, DAE

in his keynote address-titled **Aspects related to Fuel Cycle for NPP** covered all aspects of the Nuclear Fuel Cycle including uranium exploration, mining, milling, fuel fabrication, power generation, spent fuel reprocessing, and waste management. He explained how the expertise and infrastructure have been built by DAE in the areas of mining, milling, conversion, fuel fabrication, use in a reactor, spent fuel storage and reprocessing, and waste management. Participants were very appreciative of DAE having achieved a very high level of self-sufficiency in exploitation of nuclear energy for peaceful purposes

Sh Gurdeep Singh, Chairman and Managing Director, NTPC spoke about the plans of the Government of India to build up a capacity of 500 GW from non-fossil sources by 2030 and the initiatives of NTPC to be a part of it. NTPCa is already involved in two proposed nuclear power plants and would gradually scale up its participation. NTPC is involved in almost all power generation technologies like coal, hydro, solar, and now in nuclear. It would be a key player in the planned 60-65 GW nuclear capacity through repurposing of old coal-based power plants, where SMRs could play a crucial role. With mentoring from DAE & NPCIL, NTPC will be able to contribute in scaling up nuclear power generation for achieving net zero emission

Sh RV Shahi, President, India Energy Forum, in his presidential address mentioned that IEF has been very actively propagating nuclear power generation and held a couple of webinars in the past 2-3 years before organizing the present conclave. He complimented the scientists and engineers on achieving a high degree of performance and safe operations. The plant load factor of NPPs is more than 80%. They have given a high level of confidence that nuclear power is dependable. He showed his concern that despite all the scaling up, the current share of nuclear power in the overall generation still remains about 3%. Perhaps there is a need to amend the Atomic Energy Act to permit the private sectors to participate in nuclear power generation.

Sh. B. Bhambhani, Secretary General –IEF proposed the vote of thanks for the inaugural session and briefly highlighted the activities of IEF.

The session on **"Power Generation Capacity Build up with various Technologies"** was chaired by **Sh. SC Chetal,** Former Mission Director, AUSC & Director, IGCAR.

On behalf of CMD, NPCIL, **Associate Director Sh Sameer Hajela** made a presentation on 700 MW PHWR- Workhorse for adding nuclear power capacity in India. The 700 MW PHWR design is based on experience & expertise developed by DAE. He shared the safety aspects of 700 MW in detail. The design of 700 MW PHWR has been standardized and NPCIL has enough trained manpower to operate the reactors according to the requirement of the regulator. NPCIL has acquired 580 reactor years of safe operation of nuclear power plants.

Sh. Hajela also spelled out in detail the plans for additional capacity build-up by NPCIL from PHWRs and LWRs

Sh. Stephane Salib, Director, India Laison Office, JNPP brought out common features of the Net Zero emissions route of India and France. He said that France has 56 Reactors with an installed capacity of 61.4 GW. He shared the status of EPRs build up in various countries. EDF has a comprehensive portfolio of large-size EPRs of 1650 MW rating, midsize 1200 MW, and upcoming Nuward SMR of 2x170 MW. The EPR technology is proving its adaptability, robustness & efficiency
EDF manages the entire nuclear power plant life cycle comprising design, building, operating, and decommissioning. He shared details of the 6x1650 EPRs under discussions with NPCIL for the Jaitapur NPP. He spelled out details of JPNPP in terms of capacity, CO2 emissions reduction, and localization targets. The details of the Nuward SMR under construction were also shared. He spelled out opportunities for India for SMRs as a credible option to replace aging coal-based power plants. He offered support for the early deployment of SMRs in India

Sh Thomas Mieusset , Nuclear Councillor, French Embassy made a presentation on Indo-French partnership. He shared that France has 61.3 GW of total nuclear power generation capacity and produced 361 TWh of electric energy. He shared details of nuclear power plants in France and presented pathways to carbon neutrality by 2050. France recognizes that nuclear energy generation will significantly increase to achieve a net-zero electricity mix by 2050 that will also need massive development of Renewable energy. He further shared that France is making a substantial investment in the development of SMRs and AMRs. He looked forward to enhanced Indo French Co-operation in exploiting nuclear energy for benefit of both countries and assured continuous participation in IEF activities.

He invited Indian stakeholders to the 5th edition of WNE in Paris from 28th to 30th Nov 2023.

Dr. AK Mohanty, Director, BARC made a presentation on the Design and development of SMRs in India. He shared the developments being carried out by BARC on SMRs. He emphasized that in keeping up with climate change goals, the old coal power plants will have to be phased out gradually. Due to smaller footprints and enhanced safety, SMRs offer an effective replacement for coal power plants. BARC is also working on advanced Gen IV reactor concepts for thorium utilization.

Sh SC Chetal in his concluding remarks appreciated the presentations made in the session and hoped for a greater cooperation between India and France

The session on **"Manufacturing Capacity Built Up and Expectations from DAE" was chaired by Sh. Ranjay Sharan, Director Projects- NPCIL**
The presentations were made by the manufacturing industry leaders involved in the manufacture of equipment for the nuclear power plants to the NPCIL design. **Bharat Heavy Electricals Ltd was represented by Sh. Yatindra Mohan, General Manager, Nuclear Business Group, Larsen Toubro by Vikram Sehgal, Sr. DGM-HED and Godrej and Boyce by Sh SK Joshi Asstt. VP and Head Engg**. These speakers spelt out their experience in manufacturing nuclear power plant equipment and the facilities built to meet the requirement of NPCIL. They reiterated their capability & capacity to meet the enhancing requirement of NPP equipment. However non continuity of regular orders puts constraints on the efforts. NPCIL should reduce the order placement cycle and ensure sufficient orders are released as the plans are very encouraging

Dr. Komal Kapoor. Chief Executive, Nuclear Fuel Complex detailed the infrastructure built by DAE for the in-house manufacture of critical parts of nuclear reactors for its various plants. NFC caters to the requirements of manufacturing fuel bundles, alloys & tubes for the nuclear power sector.

Nuvia India, represented by Ms. Minu Singh, MD & CEO also made a presentation on their product profile for the Nuclear Industry in terms of instruments needed. She also mentioned the efforts being made by Nuvia toward localization and assured of Nuvia,s commitment towards meeting NPCIL requirements.

Ms. Olga Lukerchik, Chief Expert, ASC-JSE, Rosatom shared the efforts and initiatives of Rosatom in developing local industry to meet the requirements of 1000 MW VVER being set up at Kodamkulam. She explained the constraints in developing local industry due to different standards followed. There is need of harmonization of standards to increase level of localization. She assure the industry of sincere efforts by Rosatom in this direction
Sh. Ranjay Sharan, in his impressions about the session, assured the manufacturing industry that NPCIL is working towards ensuring the regularity of orders that will help reduce the manufacturing cycle of critical items. Cost plus ordering also needs to be explored as the 700MW design is now standardized, sources developed, and technical requirements are frozen.

Dr. Anil Kakodkar, Chancellor of Homi Bhabha National Institute, and Former Secretary-DAE delivered his valedictory address through a recorded message. India has to meet its developmental aspirations and also reach the goal of a net-zero energy mix by 2070. For this purpose, India has to deploy all forms of renewable energy and also nuclear energy. This would require massive electrification of the end-use sectors and call for about 10,000 TWh per annum of energy as electricity and additional 15000 TWh per annum of energy as hydrogen. This may be compared to the present electricity generation of about 6000 TWh. To meet these requirements, it is very clear that nuclear energy has to play an increasing role in India's energy mix. Several studies, particularly by MIT and NEA OECD have shown the importance of nuclear energy as a base load source to control the cost of energy at the consumer end.

Dr. Kakodkar opined that the nuclear-installed capacity must reach to a level of 1000-1500 GW to meet clean energy requirements by 2070. He referred to the approval by the Government for setting up ten reactors in fleet mode by NPCIL and said that four to five more fleets need to be approved. This needs to be supplemented by the development and commercial deployment of SMRs at locations vacated by coal-fired plants and also at other places. Today NPCIL is the only agency for nuclear power generation. NTPC has already started developing its capabilities in the area. Other PSUs like ONGC, IOCL, etc. should also be roped in to participate in the nuclear energy program. Gradually, we must bring in the private sector also with appropriate checks to ensure that issues related to nuclear security and nuclear material accounting are appropriately addressed.

Dr. Kakodkar ended his address by stressing that an increase in nuclear-installed capacity should be a national endeavor, and India Energy Forum should play an important role to make this a reality.

Sh RV Shahi, while summing up, appreciated the quality of the presentations and deliberations of the Conclave. He thanked all speakers and participants and referred to the observations of Dr. Kakodkar for the need of bringing more companies to accelerate

the pace of the addition of nuclear power installed capacity, which no doubt is essential. Full Budgetary support of the government will be difficult to meet the quantum jump needed for achieving net zero targets. Institutional changes are urgently needed. We have to ramp up the nuclear power availability to enhance per capita electricity consumption to a level 4 to 6 times the present consumption of 1250 kWh. He mentioned that 86 % of crude is imported putting a huge constraint on the economy.

He also expressed his concerns about nuclear fuel availability to meet the levels of huge nuclear generation capacity needed for a net zero electricity mix. He gave the example of impediments of non-availability of gas which has become a serious constraint in operating the 28000 MW of gas-based projects installed in the country. He hoped that the nuclear power program will not suffer because of a shortage of fuel. Finally, he advocated scaling of manufacturing capacity and the release of more fleet mode projects supported by financial backup and Institutional changes in the nuclear power sector. He assured that the India Energy forum will help to promote the initiatives being taken up.

Dr. RB Grover also expressed his admiration for the successful conduct of the Conclave that covered PHWR, LWR, and SMR technologies and plans to help the country move towards a carbon-free electricity mix. He assured that DAE has taken steps to ensure fuel availability for nuclear power plants and negotiated international agreements for this purpose. He said that fuel for nuclear power plants can be easily stored for five to ten years and any geo-political disturbance will not last for such a long time. Therefore, the situation of fuel shortage as has happened in the case of gas-fired plants was not likely to arise in the case of nuclear power plants.

He further observed that we should talk of electricity generation rather than installed capacity for a real understanding of the contribution of various technologies. We also need to come out with a national plan for nuclear power.

Sh. SM Mahajan proposed the vote of thanks to all Speakers and Participants of the Conclave for making it lively and useful. He thanked DAE for its all-round support and participation. Delegations of EDF & Rosatom and presencre of Embassies was an indication of global interest in India's net zero energy mix efforts

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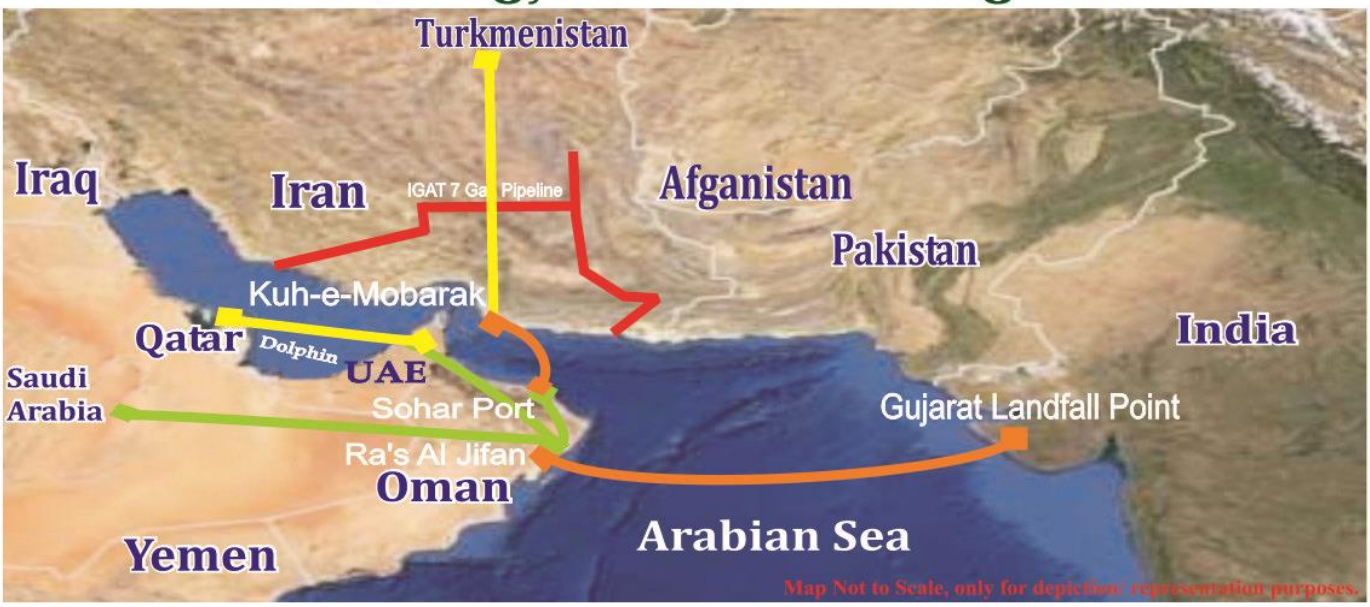
Undersea Natural Gas Pipeline from Oman/UAE to India

New Energy Corridor to bring Gas



In India's quest for Energy Security, through a New Route, SAGE, a Global Consortium, is developing a $4.5 Billion world's deepest Common Carrier Natural Gas Pipeline, directly from Oman/UAE to Gujarat coast in India, through the Arabian Sea.

(A route via Oman & UAE is being looked at, in order to explore options to import gas from UAE/Saudi Arabia/Iran/Turkmenistan/Qatar, a region with 2500 TCF Gas Reserves).

Gas Qty: 31.1 mmscmd under a 20/25 years Long-Term Gas Supply Contract.

Pipeline tariff: USD 1.75 to 2.00 per mmbtu range.

Fuelling India's **'Make in India'** plans and **Gas based Economy** vision by this path-breaking infrastructure Project, for higher economic growth & moving to a **5 trillion USD economy** by year 2025.

Meeting needs of Power/Fertilizer Industry for affordably priced gas, while moving to a low carbon economy, after Paris Climate Change Deal. Increasing gas share to 15% in Energy basket will create a demand of 700/800 mmscmd gas annually.

Alternative & geo-politically safer route to bring/swap Turkmenistan/Iranian & other region's Gas to India Gujarat coast. There have been new large gas discoveries in Oman/UAE/ Saudi Arabia too recently.

Gas Pipelines are more competitive than LNG upto a distance of 2500/3000 kms, due to high cost of gas liquefaction/transportation/re-gasification (5-6 USD / mmbtu). LNG prices very volatile still as seen lately.

Annual saving of USD one billion approx. (Rs.6000/7000 Cr.) in comparison with similar quantity LNG import.

A Reconnaissance Survey already done in 2013 by Fugro OSAE for Oman-India route.

DNV-GL, Norway / Engineers India Ltd. (EIL) / SBI Capital Markets Ltd. confirmed Project Feasibility.

GOI/MOPNG diplomatic & political support required to move Project on Fast Track and create a new Energy Corridor /Gas Highway to India.

The recent crisis for Russian Oil/Gas makes issues even more urgent.

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Middle East to India
Deepwater Gas Pipeline

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